Partially Recirculated Draft Environmental Impact Report

Grayson Repowering Project

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Prepared for:

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A NOTE FOR REVIEWERS

This Partially Recirculated Draft Environmental Impact Report (PR-DEIR) updates two section of the 2018 Final EIR for the Grayson Repowering Project ("Project") which can be found at http://graysonrepowering.com/ and provides additional analysis in two new impact categories (Energy and Wildfire) that were added after 2018. Existing text from the 2018 Final EIR is in black text and additions and corrections to existing text are in blue. Deletions are indicated as strikethrough black text (i.e. ~~text~~).

Executive Summary

INTRODUCTION AND BACKGROUND

The overall purposes of the California Environmental Quality Act (CEQA) process are to:

- Identify the significant effects to the environment of a project, identify alternatives, and indicate the manner in which those significant effects can be avoided or mitigated.
- Provide full disclosure of the project's environmental effects to the public, the agency decision makers who will approve or deny the project, and the responsible and trustee agencies charged with managing resources that may be affected by the project.
- Provide a forum for public participation in the decision-making process with respect to environmental effects.

Section 15123(b) of the CEQA Guidelines requires that an EIR contain issues to be resolved, including the choices among alternatives and whether or how to mitigate significant impacts. The major issues to be resolved regarding the Project include decisions by the lead agency as to whether:

- The EIR adequately describes the environmental impacts of the Project.
- The recommended mitigation measures should be adopted or modified.
- Additional mitigation measures need to be applied.

The Grayson Repowering Project is a power plant repowering project that removes 238 megawatts (MW) gross (219 MW net) of aging and inefficient generation equipment and replaces it with approximately 270 MW gross (262 MW net), state-of-the-art modern equipment ("Repowering Project," "Project," or the "proposed Project"). The Project is located within an industrial area of the City of Glendale, at 800 Air Way, Glendale, California 91201, just northeast of the Interstate 5 and Highway 134 interchange.

A Notice of Preparation (NOP) for the Project prepared and circulated on December 15, 2016 through January 20, 2017 for the required 30-day review period and was extended an additional six days. The public review period for the Draft EIR was September 18, 2017, to November 20, 2017, for the required 45-days, plus an additional 17 days for a total of a 62-day review period. The City received a total of 1,133 comment letters on the Draft EIR. The City responded to all comments received on the Draft EIR and prepared a Final EIR that was considered by the Glendale City Council on April 10, 2018 (the 2018 Final EIR). The City did not certify the Final EIR, instead directing GWP to consider greener alternatives as part of the Project. In response, GWP issued a Clean Energy Request for Proposals (RFP), evaluated, and modeled the proposals received through the Clean Energy RFP, and identified a cleaner portfolio to meet the City's energy needs. That portfolio was presented to the City Council in GWP's 2019 Integrated Resource Plan on July 23, 2019. This Partially Recirculated Draft EIR includes a description and analysis of two additional alternatives identified through the RFP and Integrated Resource Planning process and also updates the analysis where appropriate based on new information or requirements.; a Final EIR was completed including responses to all public comments and was agenized for review and consideration by the Glendale City Council on April 10, 2018 (the “2018 Final EIR”).

The Glendale City Council reviewed and considered all the evidence, testimony, opinions, reports, and analysis presented in the 2018 Final EIR, however, the Glendale City Council decided to take no action and instead directed City staff to evaluate additional clean energy alternatives to the Project. Per the City Council’s direction, the City issued a Clean Energy RFP and based on responses to that RFP two clean energy alternatives were selected for further analysis.

PARTIALLY RECIRCULATED DRAFT ENVIRONMENTAL IMPACT REPORT

As requested by the Glendale City Council, this PR-DEIR examines new clean energy Project alternatives selected from the Clean Energy RFP, provides an update on Cultural and Paleontological Resources impacts and adds the analysis required for the new Energy and Wildfire environmental impact categories. Section 15088.5 of the CEQA Guidelines specifies that;

“A lead agency is required to recirculate an EIR when significant new information is added to the EIR after public notice is given of the availability of the draft EIR for public review under Section 15087 but before certification. As used in this section, the term “information” can include changes in the project or environmental setting as well as additional data or other information. New information added to an EIR is not “significant” unless the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect of the project or a feasible way to mitigate or avoid such an effect (including a feasible project alternative) that the project’s proponents have declined to implement. “Significant new information” requiring recirculation include, for example, a disclosure showing that:

> (1) A new significant environmental impact would result from the project or from a new mitigation measure proposed to be implemented.
>
> (2) A substantial increase in the severity of an environmental impact would result unless mitigation measures are adopted that reduce the impact to a level of insignificance.
>
> (3) A feasible project alternative or mitigation measure considerably different from others previously analyzed would clearly lessen the environmental impacts of the project, but the project’s proponents decline to adopt it.
>
> (4) The draft EIR was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded.

(b) Recirculation is not required where the new information added to the EIR merely clarifies or amplifies or makes insignificant modifications in an adequate EIR.

(c) If the revision is limited to a few chapters or portions of the EIR, the lead agency need only recirculate the chapters or portions that have been modified.

(d) Recirculation of an EIR requires notice pursuant to Section 15087, and consultation pursuant to Section 15086.

(e) A decision not to recirculate an EIR must be supported by substantial evidence in the administrative record.

(f) The lead agency shall evaluate and respond to comments as provided in Section 15088. Recirculating an EIR can result in the lead agency receiving more than one set of comments from reviewers. The following are two ways in which the lead agency may identify the set of comments to which it will respond. This dual approach avoids confusion over whether the lead agency must respond to comments which are duplicates or which are no longer pertinent due to revisions to the EIR. In no case shall the lead agency fail to respond to pertinent comments on significant environmental issues.

(1) When an EIR is substantially revised and the entire document is recirculated, the lead agency may require reviewers to submit new comments and, in such cases, need not respond to those comments received during the earlier circulation period. The lead agency shall advise reviewers, either in the text of the revised EIR or by an attachment to the revised EIR, that although part of the administrative record, the previous comments do not require a written response in the final EIR, and that new comments must be submitted for the revised EIR. The lead agency need only respond to those comments submitted in response to the recirculated revised EIR.

(2) When the EIR is revised only in part and the lead agency is recirculating only the revised chapters or portions of the EIR, the lead agency may request that reviewers limit their comments to the revised chapters or portions of the recirculated EIR. The lead agency need only respond to (i) comments received during the initial circulation period that relate to chapters or portions of the document that were not revised and recirculated, and (ii) comments received during the recirculation period that relate to the chapters or portions of the earlier EIR that were revised and recirculated. The lead agency's request that reviewers limit the scope of their comments shall be included either within the text of the revised EIR or by an attachment to the revised EIR.

(3) As part of providing notice of recirculation as required by Public Resources Code Section 21092.1, the lead agency shall send a notice of recirculation to every agency, person, or organization that commented on the prior EIR. The notice shall indicate, at a minimum, whether new comments may be submitted only on the recirculated portions of the EIR or on the entire EIR in order to be considered by the agency. (g) When recirculating a revised EIR, either in whole or in part, the lead agency shall, in the revised EIR or by an attachment to the revised EIR, summarize the revisions made to the previously circulated draft EIR." (PRC Sections 21083 and 21092.1; *Laurel Heights Improvement Association v. Regents of the University of California* (1993) 6 Cal. 4th 1112.

Here, the City is recirculating two sections of the 2018 Draft EIR and is adding analysis in two new CEQA impact categories in this Partially Recirculated Draft Environmental Impact Report ("PR-DEIR"). This partial recirculation complies with CEQA Guidelines section 15088.5, and recirculation of the entire 2018 Draft EIR is not required, because:

1. The revision is limited to “a few chapters or portions” of the 2018 Final EIR. Specifically, the PR-DEIR updates two sections of the 2018 Draft EIR: Alternatives and Cultural and Paleontological Resources, and provides Project impact analysis in the two new environmental impact categories -Wildfire and Energy - that were added to CEQA Guidelines Appendix G in 2019; and
2. There are no changes to the proposed Project and no new significant environmental impacts would result from the Project that were not previously analyzed in the 2018 Final EIR; and
3. New potentially feasible Project alternatives are being added and are being analyzed in the PR-DEIR, and the City is voluntarily adding new Cultural and Paleontological Resource mitigation measures; and
4. There is no evidence to support a finding that the 2018 Draft EIR was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded. The City received over 1100 comments on the 2018 Draft EIR and the EIR underwent an extended to 60 public comment period.

ORGANIZATION OF THE PR-DEIR

The content and organization of this PR-Draft EIR are designed to meet the requirements of CEQA. The following is a “road map” to PR-DEIR.

Section 4.0. Environmental Impact Analysis – contains an updated, detailed environmental analysis of the potential for the Project to result in significant environmental effects with respect to the topics evaluated in this PR-DEIR. Topics included in this PR-DEIR are as follows:

- **Cultural and Paleontological Resources** – At the request of the Glendale Historical Society, the City of Glendale has agreed to treat the Grayson Steam-Electric Power Plant Boiler Building as a discretionary historical resource in the PR-DEIR. Therefore, the Cultural Resources Section is updated in the PR-DEIR. The paleontological resources section was updated with mitigation based on the possibility that such resources could be uncovered based on the depth of anticipated excavation for the Project.
- **Energy** – New analysis based on 2019 update to Appendix G of the CEQA Checklist.
- **Wildfire** – New analysis based on 2019 update to Appendix G of the CEQA Checklist.

Section 5.0. Alternatives, discusses the new Clean Energy alternatives to the Project that have been developed and analyzed that avoid or lessen the impacts. These alternatives include the “No Project Alternative,” required by the State CEQA Guidelines, along with six other alternatives.

Section 8.0. References, presents a list of the principal documents, reports, maps, and other information sources referenced in this PR-DEIR.

Section 10.0, MMRP provides the mitigation monitoring for project implementation should the project be adopted and constructed.

Appendices provides information and technical studies that support the environmental analysis contained within the PR-DEIR. Appendices from the 2018 Final EIR can be found at: http://graysonrepowering.com/.

THE FOLLOWING DESCRIBE PROJECT-RELATED DEVELOPMENTS SINCE THE APRIL 10, 2018, HEARING ON THE 2018 FINAL EIR.

CLEAN ENERGY RFP AND 2019 INTEGRATED RESOURCE PLAN

On May 4, 2018, GWP issued a Request for Proposals ("RFP") for "Local and Regional Renewable, Low-Carbon, And Zero Carbon Energy and Capacity Resource Options to Serve the City of Glendale" i.e. the "Clean Energy RFP". The intent of the Clean Energy RFP was to identify potential clean energy alternatives to the proposed Project and to solicit offers of local clean energy resources that could supply electricity to GWP without reliance on existing or new transmission capacity. The RFP was open to any technology and the proposed projects could be as small as 1 MW in size.

GWP received proposals from 34 firms that included offers for renewable energy, energy efficiency, demand response, energy storage, and thermal generation. The proposals were screened for completeness and feasibility with proposers given an opportunity to correct deficiencies in their proposal. Proposals that satisfied the completeness and feasibility screening were evaluated based on the criteria set forth in the RFP: Proposer's experience and expertise to complete the project; environmental performance with respect to impact on Renewables Portfolio Standards, air quality and other environmental attributes; administrative burden and contract terms; and the project's ability to supply reliable energy and capacity. After the proposals were evaluated and scored, the evaluation team held in-depth interviews with the high-ranking proposers. Following interviews, the candidate pool was narrowed to seven firms. Thereafter, the City's Integrated Resource Planning consultant, Ascend Analytics, undertook in-depth modeling of the top-ranking proposals from the Clean Energy RFP, through which it identified the net benefit for individual proposals, as well as combined and tested various combinations of proposed projects to identify an optimal portfolio for GWP's Integrated Resource Plan (IRP).

An IRP is an "electricity system planning document that describes how utilities plan to meet their energy and capacity resource needs, policy goals, physical and operational constraints, and other utility priorities (such as reducing rate impacts on customer bills)."[1] Senate Bill 350 requires publicly-owned utilities of a specified size "to adopt an integrated resource plan and a process for updated the plan at least once every 5 years to ensure the utility achieves specified requirements."[2] While the requirement was to plan out to 2030, GWP elected to model using a longer horizon, to 2038 (approx. 20-years). As such, the IRP was a 20-year forecast with regards to energy demand, peak load, and the resources that GWP would deploy to meet California's regulatory and environmental requirements.

The 2019 IRP identified an expected net growth in load due to electrification of transportation and other fossil energy uses growing faster than the deployment of local renewable resources, demand response,

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[1] California Energy Commission's *Publicly Owned Utility Integrated Resource Plan Submission and Review Guidelines* (Revised Second Edition; October 2018) at page 1.

[2] California Public Utilities Code Section 9621.

and energy efficiency. The IRP also identified that peak load was also expected to grow. In developing the new alternatives to include in the EIR, GWP based its evaluation on past peak loads (~350 MW) and not the forecasted higher peak loads (more than 400 MW).

The 2019 IRP modeled 7 different proposals, ranging from Portfolio A – base case of building nothing new, to Portfolio G – 100% Clean with energy storage, but no new fossil fuel assets. Intermediate portfolios between Portfolios A and G considered a variety of combinations of utility-scale batteries, local demand side management, demand response, energy efficiency, behind-the-meter (customer side) solar/ storage resources, and thermal resources. All portfolios were built using resources selected from the Clean Energy RFP along with generic renewable energy resources necessary to comply with Senate Bill 100 and meet Renewables Portfolio Standard requirements.

Table ES-1 IRP Table 1 "IRP Portfolios Considered" – found within the July 23, 2019, Staff Report to the Glendale City Council

Portfolio		**B-NG Repower**	**C-ICE Repower**	**D-50 MW Batt + 6xICE**	**E-75 MW Batt +5xICE**	**F-100 MW Batt +3xICE**	**G-100% Clean**
Candidate Resource		**Nameplate Capacity (MW)**					
Clean Energy + Load Reduction	Residential DER			13	13	13	13
	Public Spaces DER			10	10	10	20
	Residential and Large Commercial EE+ER			7.5	7.5	7.5	20.5*
	Small Commercial EE+DR			20.4	20.4	20.4	20.4
Imported Renewable Resources	Solar	140	140	130	130	130	130
	Wind	140	140	130	130	130	130
Storage	Utility Battery	50	50	50	75	100	150
Conventional Generation	CC	71					
	CT	120					
	ICE		149	112	93	56	

Composition of Portfolio options considered. Portfolio A – Base Case has no assets included and has therefore been excluded from the table above.
*This resource had large segments (13 MW) of the proposal deemed infeasible due to siting, permitting, and cost concerns. For candidate portfolios B-F these infeasible portions were excluded. However, for the 100% Clean portfolio GWP took the optimistic approach of assuming that all components of this proposal were feasible and including them in the modeled portfolio.

The portfolios were evaluated for reliability, flexibility, sustainability, and cost effectiveness.

The 2019 IRP concluded that Portfolios A, F, and G are not feasible from a reliability standpoint:

- Portfolio A adds no new local generation, threatening local reliability.

- Portfolio F – 100 MW/400 MWH of energy storage -- is insufficient to ensure GWP can reliability serve peak loads as well as being reliant on full transmission to serve load and to charge the energy storage system during summer loads.
- Portfolio G – which includes 150 MW/ 600 MWH of energy storage – that level of energy storage would be sufficient to ensure GWP can reliably serve peak loads; however, it requires more transmission capacity than is available to import enough energy to serve load and to charge the energy storage system during summer loads.

From a sustainability standpoint, the 2019 IRP concluded that Portfolios B and C were not the optimal portfolio because their carbon emissions were at the upper end of the portfolios considered.

The 2019 IRP found that the remaining Portfolios, Portfolios D and E, have similar costs and reliability. Thus, the more environmentally sustainable Portfolio E was the recommended portfolio option.

The 2019 IRP-recommended Portfolio E includes five reciprocating internal combustion engines, each with 18.67 MW of capacity, totaling 93 MW of new thermal capacity, coupled with a 75 MW/ 300 MWH battery energy storage system (BESS), as well as approximately 50 MW of clean distributed energy resources, such as demand response and energy efficiency and distributed energy resources which were identified through the Clean Energy RFP process. As required by California Senate Bill 350, the Clean Energy and Pollution Reduction Act, GWP submitted its 2019 IRP to the California Energy Commission. The 2019 IRP was approved by the CEC on February 20, 2020.

This PR-DEIR evaluates the proposed 93 MW of thermal capacity coupled with a 75 MW/ 300 MWh BESS from Portfolio E of the 2019 IRP as one of the proposed Project alternatives. In addition to energy storage and thermal generation options now included in the Alternatives to the proposed Project, GWP is proceeding with implementation of several clean distributed energy resource programs, including projects identified through the Clean Energy RFP and modeled in the 2019 IRP, and intends to achieve 50 MW of distributed energy capacity in accordance with the 2019 IRP preferred Portfolio E. This PR-Draft EIR analysis assumes 50 MW of clean distributed energy resources are included in the City's resource portfolio.

GWP has executed contracts and is in the process of implementing the residential and commercial demand response and energy efficiency programs selected through the Clean Energy RFP, in addition to other demand management and energy efficiency programs implemented through GWP's Public Benefit Charge program. GWP is negotiating with the shortlisted vendor for the proposed rooftop solar plus storage (i.e. a virtual power plant). GWP has also retained a consultant to identify City-owned properties viable for solar/ storage development, and a separate Owners' Engineer to develop plans for structural upgrades to a City parking structure to accommodate a solar facility.

SCAQMD RULE 1135 "EMISSIONS OF OXIDES OF NITROGEN FROM ELECTRICITY GENERATING FACILITIES"

The South Coast Air Quality Management District (SCAQMD) amended Rule 1135 "Emissions of Oxides of Nitrogen from Electricity Generating Facilities" on November 2, 2018. This rule is applicable to all power generating facilities within SCAQMD including Grayson Units 1-9. The amended Rule, set forth in section 1135(d)(1)(A), requires that existing boilers and gas turbines, such as Units 1 through 9, must meet current-day emissions standards by January 1, 2024. Further, the Rule in section 1135(d)(7) requires that facility owners submit an application to SCAQMD prior to July 1, 2022 to modify their air permit conditions to comply with the current emissions limits if they do not already comply. In effect, the rule change requires owners to upgrade their existing units to meet current-day emissions requirements or cease to operate them prior to January 1, 2024.

At the present time, Units 1 through 8 at Grayson cannot operate in compliance with the current day emissions limits specified in Rule 1135. Upgrading the boilers for Units 1 through 5 is considered economically infeasible as well as unworkable from an operational standpoint because the boiler units are unable to start up quickly, requiring them to be kept on-line for days at a time in anticipation that they might be needed. Units 8A and 8BC could be economically upgraded to meet current emissions standards.

ADDITIONAL TRANSMISSION CAPACITY

The City is a participant in the Intermountain Power Project (IPP), a coal-fired plant located in Delta Utah. Through its participation in the IPP Project, GWP has a share of the transmission capacity on the Southern Transmission System (STS) line from Utah to Adelanto, CA. By virtue of its participation in the IPP Project, GWP also has transmission rights from Adelanto, CA to Glendale, CA under a contract with the Los Angeles Department of Water & Power (LADWP). The City’s contractual transmission rights from the STS to Glendale depend on the City’s continued participation in the IPP Project. The amount of transmission rights that the City receives matches the amount of the City’s IPP generation rights, and if the City were to exit from the IPP project, it would forfeit those contractual transmission rights.

In 2015, the City entered into renewal agreements for the IPP project. The IPP renewal agreements allow for a repowering of the IPP project that will convert the IPP plant from an 1,800 MW coal-fired power plant to a 1,200 MW natural gas generation facility, or an “alternative repowering” as may be determined by the IPP participants. In 2015, the City Council authorized GWP to participate in an offer and acceptance process to subscribe up to a 50 MW share of the repowered IPP Power Plant, subject to the City’s right to take an “off ramp” that would allow the City to decide to exit the IPP project or reduce its project share by 20 percent, if it so chose, by August 2019.

GWP participated in the IPP offer and acceptance process and subscribed to a 4.166 percent share of the proposed repowered IPP project, which would give the City approximately 55 MW of IPP generation and 128 MW of transmission through June 15, 2077, an increase of 72 MW above GWP’s existing STS transmission rights. In July 2018, the Glendale City Council and the other IPP project participants authorized an Alternative Repowering that reduced the size of the IPP natural gas repowering plan from 1,200 MW to 840 MW. The Alternative Repowering reduces the City’s share of IPP generation to 35 MW but the City will have 128 MW of transmission beginning in June of 2027, when the IPP repowering is scheduled to be completed.

In July of 2019, the City Council elected not to take the “off ramp” and opted to continue the City’s participation in the IPP project. The City has subscribed to a 4.166 percent share of the IPP project. Thus, the City has rights to a 4.166 percent share (128 MW) on the STS transmission line and a 128 MW contractual share of the corresponding, LADWP-owned transmission segment from Adelanto to Glendale through June 15, 2077.

Accordingly, beginning in June 2027, when the repowered IPP project is scheduled to come online, GWP will have 72 more megawatts of transmission capacity from the Southwest, compared to the amount of transmission capacity that were described in the 2018 Final EIR, This PR-Draft EIR reflects this increase in Glendale’s transmission capacity rights starting in 2027.

SENATE BILL 100 AND THE 100% CLEAN BY 2030 STUDY

Senate Bill (SB) 100 was signed into law in September 2018. SB 100 requires utilities to generate 60 percent of their electricity from renewable resources by 2030 (increased from the 50 percent renewable by 2030 requirement under SB 350). SB 100 establishes a policy that eligible renewable energy resources and zero-carbon resources supply 100 percent of electricity to California end-use customers and 100 percent of electricity procured to serve all state agencies by December 31, 2045.[3]

Pursuant to the Glendale City Council’s direction, in 2020 and 2021, GWP undertook a study to identify a plan or methods to achieve 100 percent clean energy by 2030 (the Study), 15 years ahead of the date established by SB 100. The Study, performed by Ascend Analytics as a consultant to the City, built upon the 2019 IRP and was presented to the Glendale City Council on March 21, 2021.

Based upon the assumptions made in the Study, the Study concluded that by 2030, GWP could reliably serve 89 percent of load with clean energy, around-the-clock. In order to move past 89 percent, the Study concludes that GWP would need to acquire additional transmission capacity to import additional renewable energy, and/or technology would need to develop such that fossil-fueled resources could be powered by renewable fuels such as green hydrogen. The Study modeled various portfolios of energy resources, and concluded that 89 percent clean energy could be achieved by 2030 with the following mix of planned, proposed, and hypothetical future resources:

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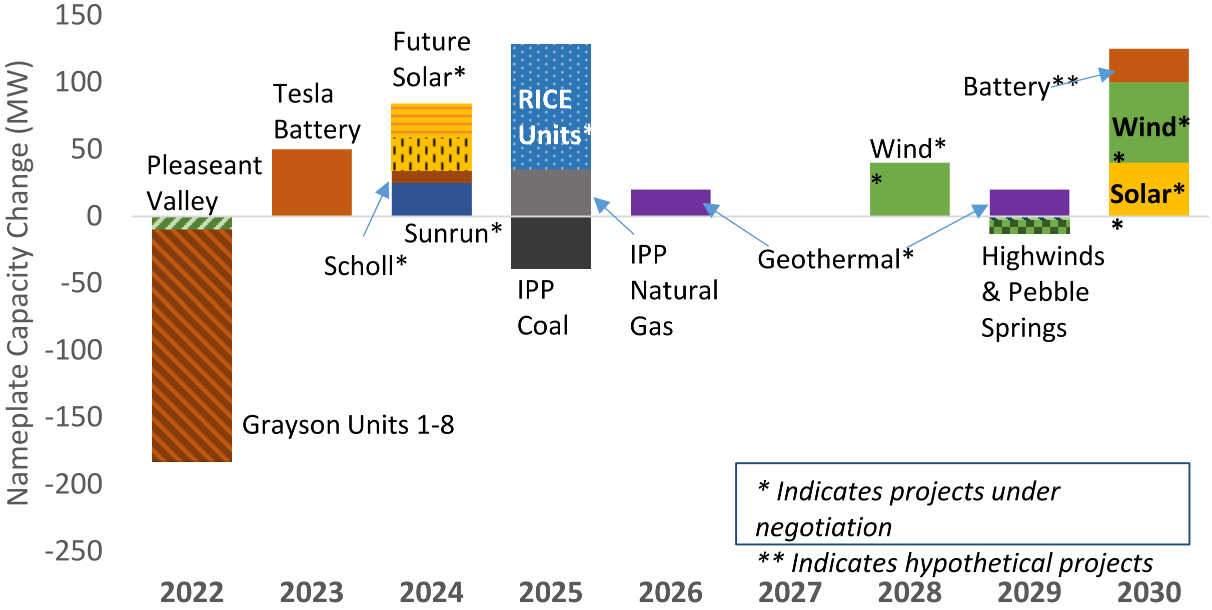
[3] California Public Utilities Code Section 454.53.

Figure ES-1 Figure 3 Annual Capacity Additions and Retirements for GWP in the Modeled Plan – found in the Ascend Study



The Study was premised on certain assumptions about GWP's power supply. It assumed that by 2022, Grayson Power Plant Units 1 through 8 would be retired, by 2023, that GWP would install 50 MW of battery energy storage at Grayson, that by 2024, GWP would add new, as-yet-unidentified wind and solar projects to its portfolio, and that by 2025, 93 MW of reciprocating internal combustion engines (RICE) would be installed at the Grayson Power Plant, The Study noted that GWP would need to acquire additional geothermal, wind, solar, and battery storage through 2030 to the extent possible given constraints on GWP's transmission capacity.

The Study found that pollution and carbon emissions would drop considerably, even with the 93 MW of RICE in the portfolio. The Study estimated achieving 89% percent Clean Energy by 2030 would raise electricity rates by 28 percent by 2030 compared to 2021 rates.

The Study and all regulatory requirements, including SB 100, inform the analysis and alternatives presented in this PR-Draft EIR.

SEPTEMBER 2019 ROLLING BLACKOUTS

On September 4, 2019, GWP was forced to implement rolling blackouts for several days when an auxiliary transformer on a main bank transformer failed, along with a cable failing due to being heavily loaded during a heat wave with high system load conditions. While the immediate issue was corrected and the rolling blackouts terminated after repairs and moderation of the heat wave, as a long-term solution, GWP proposes to add a new switching station (called the Glendale Switching Station) at the Grayson Power Plant. The proposed new Glendale Switching Station would provide additional resilience to the GWP system and serve as a partially redundant backup to the Kellogg Switching Station. This PR-Draft EIR evaluates two new Alternatives (7 and 8) which both include the proposed new Glendale Switching Station.

STORMWATER MANAGEMENT

This PR-Draft EIR reflects changes to the proposed stormwater plan since the 2018 Final EIR.

For the proposed Project, stormwater falling on-site, except for equipment containment areas that would be retained, would sheet flow into localized gutters and then through underground piping to infiltration basins whereupon the water could percolate into the ground. Any excess stormwater would sheet flow across the site to the south and flow into the Verdugo Wash and Los Angeles River through existing stormwater outfalls. Stormwater that fell into the containments would be retained, sampled, and only released if it was clean water.

Since the time of the proposed Project, the stormwater plan has been upgraded so that the “first flush” of stormwater falling onto and traversing the site is now collected, retained, and then sent to the GWP sewer system for processing. On-site stormwater runoff would continue to flow via surface sheet flow and localized gutters to on-site storm drain piping as before; however, the storm drain piping would now direct the stormwater to an on-site detention basin and pump station. The stormwater that is collected in the detention basin would be pumped to a new on-site storage tank. Stormwater would then flow from that tank to the Glendale sewer system. During storm events that exceed the design capacity of the stormwater system, overflow runoff would be discharged into the adjacent Verdugo Wash and Los Angeles River through existing stormwater outfalls as before; however, this would only occur after the initial stormwater flows washed over the site.

CHANGE IN AIR QUALITY/GREENHOUSE GAS EMISSIONS BASELINE CONDITIONS SINCE THE 2018 FINAL EIR

At the time the 2018 Final EIR was prepared, landfill gas from Scholl Canyon Landfill was conveyed through an existing unground pipe system to the Grayson Power Plant (Grayson), combined with natural gas, and burned in boilers at Grayson to make steam for electricity generation. Since that time, none of the existing operating turbines at Grayson have the capacity to burn landfill gas. During the process of evaluating potential environmental impacts of the proposed Project, the City learned that emissions from combusting the landfill gas in the existing Grayson boilers exceeded potential health risk notification and action plan thresholds established by the SCAQMD. Accordingly, since April 1, 2018, the City ceased combusting landfill gas at Grayson and has been flaring all the landfill gas at Scholl Canyon Landfill in compliance with the existing SCAQMD permit. As a result, the City has updated the environmental impact analysis within Section 5.0 (Alternatives) to consider air quality/greenhouse gas emissions baselines conditions of two separate scenarios: one while landfill gas was being combusted in the existing boilers at Grayson Power Plant and another one that considers flaring of landfill gas at Scholl Canyon Landfill. This analysis shows that the proposed Project’s potential air quality and greenhouse gas emissions impacts would be less than significant regardless of which of the two baseline conditions are utilized (refer to Tables 5-2, 5-8, and 5-10.

NEW INFORMATION REGARDING POTENTIAL FOR UNIT 8A AND 8BC UPGRADE

During the course of work on the Tesla/Wartsila alternative (Alternative 7), the City became aware of another utility with gas turbine generators similar to Unit 8A and 8BC that was performing an upgrade to comply with the new SCAQMD Rule 1135 air emissions requirements for older units (discussed above). Upon further review, the City concluded that Units 8A and 8BC were viable candidates for similar upgrades.

As a result, this PR-Draft EIR includes a new Alternative (Alternative 8) that would refurbish the Unit 8A and 8BC gas turbine generators and replace the balance of the plant equipment to meet the new Rule 1135 requirements. Alternative 8 proposes the refurbished and upgraded units 8A and 8BC, in concert with the same 75 MW/300 MWH BESS that is being considered as part of Alternative 7.

COLLABORATION WITH THE GLENDALE HISTORICAL SOCIETY

The City Council requested staff work with the Glendale Historical Society (“TGHS”) to resolve TGHS concerns over the demolition of the Grayson Steam-Electric Power Plant Boiler Building (“Boiler Building”). After several meetings, a site visit to the existing Power Plant, and discussions between TGHS and the City, the City agreed to treat the Boiler Building as a discretionary historical resource under CEQA and is updating and recirculating the Cultural Resources section of the 2018 Draft EIR to reflect this treatment and the addition of new mitigation measures that will require the City to perform a Historic American Engineering Record (HAER) survey of the Boiler Building. The City has also added mitigation measures requiring installation of an informational plaque on Flower Street and preservation of a piece of salvaged equipment from the Boiler Building for informational display that will provide the public with the opportunity to learn about the history of the Boiler Building and Grayson Power Plant.

CONFLUENCE PARK

Confluence Park is part of the Glendale Riverwalk plan. The construction of Phase 1 was completed in December 2012, which included half a mile of native landscaping, walking and bicycling trails, public art inspired by Stop Motion, and an equestrian facility which allows horse-owners to exercise their horses before heading out to Griffith Park. Phase 2 was completed after October 2018 and includes two small parks (Flower Plaza on Flower Street and Fairmont Avenue, and Confluence Park by the Los Angeles River and Verdugo Wash further downstream). Phase 3, otherwise known as the Glendale-Los Angeles Garden River Bridge Project, includes the planning, development, design, and construction, of the bridge over the Los Angeles River. The Final 2018 EIR proposed Project did not include Confluence Park as a potential sensitive receptor as it was not yet built. Now that the park exists, it has been included and evaluated in the PR-DEIR for the proposed Project and Alternatives evaluation.

Proposed Project Location and Description

Pursuant to the requirements of the California Environmental Quality Act (CEQA), the City of Glendale (City) has prepared this Draft Environmental Impact Report (EIR) to evaluate the potential environmental impacts of the proposed repowering of the Grayson Power Plant (“Repowering Project” or “Project”). The

Project site is located at 800 Air Way, Glendale, California 91201, northeast of the Interstate 5 freeway and Hwy 134 interchange.

A majority of the equipment and facilities at the existing Grayson Power Plant were completed between 1941 and 1977, and are proposed to be replaced with more reliable, efficient, flexible, and cleaner units. With the exception of the 2003 simple cycle peaking plant (Unit 9), the City is proposing to replace the existing generation equipment and related facilities with a combination of new combined cycle and simple cycle gas turbine generation units. The generating capacity would increase from 267 megawatts (MW) net to 310 MW net (an increase of 43 MW net) which is necessary for the City to serve its customer load and meet a regulatory requirement for reliability. Because the Project involves less than a 50 MW increase in generation capacity, it is not subject to the California Energy Commission's Power Plant Licensing jurisdiction. The City is the CEQA Lead Agency for the Project.

The Project is designed to provide reliable generating capacity, avoid electrical capacity shortages, facilitate the use of more renewable energy by freeing up transmission line capacity to bring more renewable-based electricity to the City, and to provide flexibility to operate efficiently over the wide range of electrical loads placed on the City's electric system. The Project will allow the City to maintain reliable service, keep rates affordable, and facilitate compliance with state regulations regarding renewable energy supplies mandated through the Renewable Portfolio Standards without the need for new transmission lines. The Project will also allow the City to meet its existing and future electrical demands even if the City is separated from existing interconnections with the electric grid, it will minimize the City's reliance on importing power from remote generation locations across a congested transmission grid, and it will support water conservation efforts by eliminating the use of potable water for generation purposes.

Additional background including the site's history as a power plant, purpose and need, objectives, and benefits of the Project are included in Section 2.0. A detailed Project description is included in Section 3.0. Please see http://graysonrepowering.com/ for these Sections. There are no changes to these Sections and are therefore not being recirculated within this PR-DEIR.

Environmental Impacts and Mitigation Measures

Topics evaluated in this Draft EIR have been identified based on preparation of an Initial Study (Appendix A [2018 Final EIR]), the responses to the Notice of Preparation (NOP), and the review of the Project by City staff. The City determined through this initial review process that impacts related to aesthetics, air quality, geology and soils, greenhouse gases, hazards and hazardous materials, hydrology and water quality, noise, traffic and transportation, and tribal cultural resources could be potentially significant and require an assessment in ~~this~~ its 2018 Final ~~Draft~~ EIR.

Based on the analysis in the ~~Draft~~ 2018 Final EIR, the City determined that the Project would result in less than significant impacts to air quality, geology and soils, greenhouse gas emissions, hydrology and water quality, and tribal cultural resources. However, it was also determined that aesthetics, hazards and hazardous materials, noise, and transportation and traffic would, with associated mitigation measures, also be reduced to a less than significant level. The Project has no potentially significant impacts that could not be mitigated in the 2018 Final EIR.

The City determined through this update that impacts related to the following sections and environmental topics would require an assessment in this PR-DEIR:

- Alternatives
- Cultural and Paleontology Resources;
- Energy; and
- Wildfire.

Based on the analysis in this PR-DEIR, the City determined that the Project would result in less than significant impacts to Energy and Wildfire. The Project would result in a significant and unavoidable impact to cultural resources due to the demolition of the Boiler Building, which the City has elected to consider a discretionary historic resource. Demolition of the Boiler Building would also be required for Alternatives 2 (Energy Storage Project Alternative), 4 (150 MW Project Alternative), 5 (200 MW Project Alternative), 7 (Tesla/Wartsila Repowering Project Alternative), and 8 (Unit 8 Refurbishment Project Alternative). Alternatives 1 (No Project) and 3 (Alternative Energy Project Alternative) would do not involve re-development at Grayson Power Plant and the Boiler Building would not be demolished. Therefore, only Alternatives 1 (No Project) and 3 (Alternative Energy Project Alternative) would avoid the significant and unavoidable cultural resources impact associated with the proposed Project and five other alternatives evaluated. A statement of overriding considerations will be required should the City elect to certify the EIR.

The required mitigation measures for the Project are summarized ~~below~~ in Section 10.0 Mitigation Monitoring and Reporting Plan. ~~A more detailed summary of all the Project's environmental impacts is included in Table 2-4 and detailed environmental impact analyses are in Section 4.0.~~

Aesthetics

During the construction period, construction activities may contrast with the existing visual character/quality of views in the Project area. Mitigation Measure AES-1 requires screening construction activities and laydown areas to reduce their visibility.

Cultural and Paleontological Resources

Research and analysis for the 2018 Final EIR concluded that the Boiler Building is not an historical resource due to the many additions and modifications to the Boiler Building, after further consultation with TGHS and is a reasonable abundance of caution, the City is using its discretion to treat the Boiler Building as an historic resource and impose feasible mitigation measures in in response to demolition of the Boiler Building. However, even with mitigation, the demolition of the Boiler Building, whether in connection with the Project or a Project Alternative, with exception of the No Project Alternative or Alternative Energy Project Alternative, will result in a significant and unavoidable impact on an historic resource. The. Consequently, the City will prepare a statement of overriding considerations to consider in connection with the certification of the final EIR. Mitigation Measures CR-1, CR-2, and CR-3 would be implemented to reduce this potentially significant impact but would not reduce this impact to less than significance.

The Initial Study prepared for the Project determined that paleontological resources might be present in the subsurface, and the literature review performed for the Project has confirmed that sediments in the Project area over 10 feet in depth have high paleontological potential. Implementation of Mitigation Measures PAL-1 through PAL-3 would reduce adverse impacts to paleontological resources to a level of less than significant.

Hazards and Hazardous Materials

There would be a potentially significant temporary hazards and hazardous materials impact. The demolition and construction phases of the Project may create temporary hazards and hazardous materials impacts due to the use of fuels, handling of petroleum-impacted soils, and handling of materials containing asbestos/lead based paint. Mitigation Measures HAZ-1, 2, 3, 4, and 5 require adherence to a Soil Management Plan, Hazardous Materials Management Plan, Asbestos and Lead Paint Management Plan, and safe fuel handling practices/spill response.

In addition, to mitigate the off-site consequence of the worst-case accidental release of ammonia during Project operation. Mitigation Measure HAZ-6 requires the surface area of the proposed and existing ammonia tank containment systems to be effectively reduced by 90 percent or greater which would restrict the concentrations of concern within the site boundary.

Transportation ~~and Traffic~~

During the demolition and construction phases, traffic would increase in on adjacent public roadways and the acceptable circulation standard at the San Fernando Rd./Doran St. intersection could be exceeded during construction. Mitigation Measures TRA-1, 2, 3, 4, 5, 6, 7, 8, and 9 require adherence to a Traffic Control Plan and number of public safety precautions as well as limiting the number of vehicle trips at the San Fernando Rd./Doran St. intersection during construction.

Noise

The noise from the Project operation has been reduced through engineering design and controls as described in Mitigation Measures NOI-1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 which require limits on source noise levels and controls to ensure acceptable noise levels during facility operation are not exceeded.

Mitigation Measures

Implementation of the above mitigation measures would reduce the Project's potentially significant impacts to aesthetics, hazards and hazardous materials, noise, and transportation ~~and traffic~~ to a less than significant level. When the Final EIR is certified, a mitigation monitoring program would be adopted to ensure that the mitigation measures are fully implemented. With the implementation of these mitigation measures, the Project would not result in any significant and unavoidable environmental impacts for these categories. However, as previously indicated, and with exception of the No Project Alternative (Alternative 1) and the Alternative Energy Project (Alternative 3), both the Project and the remaining any Project alternatives would have significant and unavoidable cultural resources impacts due to demolition of the Boiler Building. In order to adopt the either the Project or Alternatives 2, 4 through 8, decision-making body must adopt a statement of overriding considerations in connection with certification of the Final EIR and approval of either the Project or Alternatives 2, 4 through 8.

Alternatives to the Project

A reasonable range of alternatives that could feasibly attain some of the basic objectives of the Project and their potential environmental impacts are evaluated in the Draft EIR. These alternatives include use of a battery energy storage system, off-site utility-scale renewable energy generation combined with the addition of new high voltage transmission capacity and interconnections, a combination of reduced on-site generating capacity combined with the addition of new high voltage transmission capacity and interconnections, and a combination of reduced on-site generating capacity and a battery energy storage system. A summary of each alternative evaluated in this Draft EIR is set forth below. Two additional Alternatives have been included in this PR-DEIR. A more detailed evaluation of alternatives is set forth in Section 5.0.

No Project Alternative – Alternative 1

The No Project Alternative would involve running the existing power plant to failure and not proceeding with repowering of the Grayson Power Plant. The No Project Alternative would result in reduced environmental impacts over time as the units are shut down and would have less potential environmental impacts than those of the Project.

However, the No Project Alternative is not a viable alternative in that it would not serve the needs of the City as the City could no longer meet its obligations as a load serving entity for its residents and customers, placing them at significant risk for decreased electrical system reliability and availability. Moreover, the No Project Alternative would not meet the Project objectives and would fail to comply with Federal and State reliability standards.

Energy Storage Project Alternative – Alternative 2

The Energy Storage Project Alternative would involve replacing Units 1 – 8 at the existing Grayson Power Plant with a battery energy storage facility. Use of the City’s existing Unit 9 electrical generation, the City’s allotment from the Magnolia Power Plant, and transmission capacity to serve the City’s electrical load and charge batteries when excess capacity is available. Energy stored in the batteries would then be discharged to serve the electrical load when demand exceeds available transmission and generation resources.

The Energy Storage Project Alternative’s potential for local air quality, greenhouse gas emissions, hydrology and water quality, noise, and traffic and transportation impacts are less than those of the Project. More distant impacts due to the additional night-time generation needed to charge the batteries, when renewable solar energy will not be available, are potentially increased. Additionally, during the summer season, it is not possible to import enough electricity to charge the batteries to serve the daytime load. For these reasons, this Alternative was not selected because it does not feasibly meet the Project objectives to the same extent as the Project.

Alternative Energy Project Alternative – Alternative 3

The Alternative Energy Project would involve some combination of photovoltaic or wind power production (including remote and local resources) with energy storage and transmission lines. While the Alternative Energy Project Alternative reduces local potential air quality, greenhouse gas emissions, hydrology and water quality, and noise impacts local to the Grayson Power Plant site, it increases off-site impacts due to the need for increased transmission as well as the large area needed for a wind farm or solar field.

Because of the very limited ability to site solar or wind resources within the City, combined with the energy storage considerations discussed in the preceding Energy Storage Project Alternative, as well as the complications associated with building a new transmission line to import alternative energy, the Alternative Energy Project Alternative was not considered an adequate replacement for the power that would be generated by the Project. This determination is reinforced by the results of the Clean Energy RFP, the 2019 IRP, and the 100% Clean by 2030 study. Additionally, the Alternative Energy Project Alternative does not feasibly meet the Project objectives to the same extent as the Project.

150 MW Project Alternative – Alternative 4

The 150 MW Project Alternative would involve a reduced size power project located on the existing project site with a new transmission interconnection. While the 150 MW Project Alternative would have ~~incrementally~~ less potential air quality, greenhouse gas emissions and noise impacts than those of the Project, the potential impacts at the Grayson Power Plant site are generally similar.

~~However, t~~The 150 MW Project Alternative also included construction of a new transmission line that has the potential to result in greater potential impacts to aesthetics, agriculture and forestry resources, cultural/tribal cultural resources, geology and soils, land use and planning, and population and housing. The subsequent availability of an additional 72 MW of additional transmission capacity starting in 2027 could meet that need. Thus, in 2027, ~~In addition to the potential environmental impacts,~~ the 150 MW Project Alternative does ~~not~~ feasibly meet many of the Project objectives or meet them as well as the Project.

200 MW Project Alternative – Alternative 5

The 200 MW Alternative would have reduced air and greenhouse gas emissions and noise from one less generation unit compared to the Project, with the reduction of one unit offset by the addition of a battery energy storage system (one that is smaller than the earlier alternative). The battery energy storage system adds the impact of the cost of periodic battery replacement as well as the need to dispose/recycle the batteries when they reach end of life. If sufficient transmission capacity were not available for charging the BESS, then the air emissions may not be reduced due to the need to operate additional unit(s) to charge the BESS.

Reconfigured Tesla/Wartsila Repowering Project - Alternative 6

This alternative is identical to Alternative 7, described immediately below, but with a different physical arrangement that would have replaced the existing units, with the exception of Unit 9, with the same equipment proposed in Alternative 7. Ultimately, during the engineering phase of the development of this Alternative, it was determined to be technically infeasible because the design requirements for Wartsila's structures necessitate all existing on-site piles be removed and these piles could not be backfilled with anything that would impede the ability to drive new piles. Given that it was not possible to adjust the locations of the Wartsila foundations within the available space to avoid overlap and the close proximity of existing and new piles involved with this Alternative, further analysis was terminated. Rather than re-number the Alternatives that were retained for further study and consideration, Alternative 6 is mentioned in this list in order to provide information and to avoid confusion in the number of the remaining alternatives that were considered in more detail.

Tesla/Wartsila Repowering Project Alternative – Alternative 7

The Tesla/Wartsila Repowering Project Alternative, identified in this PR-DEIR as "Alternative 7 ," replaces the existing units with exception of Unit 9 with the following: Five Wartsila 18V50SG reciprocating internal combustion engine units producing approximately 93 MW net at average annual site conditions, and a BESS providing 75 MW/300 MWH of power and energy. This alternative, like the Project, also necessitates removal of the Boiler Building to provide sufficient space for the new facilities. Alternative 7 also adds a switching station to the site in place of the existing Glendale Rack to improve system reliability.

Unit 8 Refurbishment Project Alternative - Alternative 8

The Unit 8 Refurbishment Project Alternative, identified in this PR-DEIR as "Alternative 8," would replace the existing units with the exception of Unit 9 and Units 8A and 8BC. The Units 8A and 8BC gas turbine-generators would be retained, refurbished, and the units reconfigured into one simple cycle unit (8A) and one fast-start combined cycle unit (8BC) with new balance-of-plant equipment for both units. As with Alternative 7, Alternative 8 would add a 75 MW/300 MWH BESS. This alternative, like the Project, also necessitates removal of the Boiler Building to provide sufficient space for the new facilities. As with Alternative 7, a switching station would be added to the site in place of the existing Glendale Rack to improve reliability.

Alternatives Considered but Not Evaluated in this EIR

A number of alternatives were considered but eliminated from further consideration in this Draft EIR. The alternatives that were considered but not evaluated include Alternative 6, the Reconfigured Tesla/Wartsila Repowering Project, which as indicated above is identical to Alternative 7, but with a different physical layout configuration that would have replaced the existing units with the exception of Unit 9 with the same equipment proposed in Alternative 7, but in a different arrangement. Alternative 6 was determined to be infeasible from a practical standpoint because of the close proximity of existing and new piles required to implement Alternative 6. As mentioned above, rather than re-number the Alternatives that were retained for further study and consideration, Alternative 6 is mentioned in the list of Alternatives selected for further study in order to provide information and to avoid confusion in the number of the remaining alternatives that were considered in more detail.

Other alternatives considered by not evaluated further include power plant sites, and a variety of alternative technologies (generation technology, fuel technology, and alternative power plant cooling). These alternatives are more fully discussed in Section 5.1.4.2.

Environmentally Superior Alternative

The Tesla/Wartsila Project Alternative and Tesla/Unit 8 Refurbishment Project Alternative would meet all Project objectives while resulting in the fewest impacts when compared to the proposed Project and alternatives evaluated. While the potential environmental impacts between these two alternatives are very similar, the Tesla/Wartsila Project Alternative was estimated to have slightly lower noise impacts and is therefore considered the environmentally superior alternative. Refer to Section 5.2.9 for additional details on the comparison of the proposed Project to the evaluated alternatives and identification of the Environmentally Superior Alternative.

SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES OF THE PROPOSED PROJECT

A summary of the potential environmental impacts of the Project and the measures identified to mitigate these impacts is provided in Table ES-2 below for each topic addressed in this EIR. Table ES-2 has been arranged in four columns: the identified impact under each EIR issue area; the level of significance prior to implementation of mitigation; mitigation measures that would avoid or reduce the level of impacts; and the level of significance after implementation of mitigation measures.

Table ES-2 Summary of Updated Project Impacts

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
Aesthetics			
The presence of demolition equipment and demolition activities would be temporarily visible to sensitive viewer groups near the southern portion of the Project site. Visual impacts associated with demolition would be localized and short term. As such, demolition activities would not contribute to the degradation of existing visual resources.	Less than significant	No mitigation is required.	Less than significant
Temporary construction activities occurring near the south side of the Project site, as well as temporary construction equipment that exceed the height of the 12-foot masonry walls would be temporarily visible to sensitive viewer groups. In addition, the construction materials stored at the off-site construction laydown area would be visible to sensitive viewer groups within the area. The increased presence of construction activities, and storage of	Potentially significant	**AES-1: Screen Laydown Areas.** Staging and laydown areas within view of residences, motorists, and recreational facilities shall be located away from public views or effectively screened using opaque fencing to limit views of materials, equipment, vehicles, and other items used during construction. All laydown areas shall be effectively reclaimed immediately following completion of their use.	Less than significant

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
construction materials would temporarily contrast with the existing visual character and quality of views throughout the Project area during the 27-month construction period.			
Key observation points (KOP) were evaluated to determine if implementation of the Project would degrade the long-term visual character of the Project site and its surroundings. KOP-1 through KOP-5 were evaluated for vividness, intactness, unity, overall existing visual quality, and overall visual quality with the Project. The overall existing visual quality at each KOP remained the same with the incorporation of the Project. The Project would have the same potential for emission of visible water vapor plumes as the existing facility and would not likely be the source of any increase in visible water vapor plumes. Operation of the Project would have a less than significant impact on the existing visual quality and character of the Project site.	Less than significant	No mitigation is required.	Less than significant
Although proposed to typically occur during daytime hours, demolition and construction activities may periodically require portable lighting for safety and security. The perimeter wall and proposed shielding of light fixtures would screen ground-level views of construction lighting. The varying lighting conditions from Project construction would be most noticeable from elevated views. Viewers on the adjacent elevated freeway are expected to have low sensitivity to visual changes since their views are of short duration. The remaining sensitive receptors with elevated views occur at distances in which these changes would blend with existing industrial and urbanized nighttime lighting conditions.	Less than significant	No mitigation is required.	Less than significant
Proposed lighting installations during Project operation would be restricted to areas required for safety and operation. The Project would design and install all permanent exterior lighting with LED lights and fixtures that would not cause obtrusive spillover beyond the Project site, excessive reflective glare, or directly	Less than significant	No mitigation is required.	Less than significant

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
illuminate the night sky. In addition, the Project would incorporate switched lighting circuits for areas that would not require lighting for normal operation or safety. These areas would remain dark at most times and would minimize the amount of lighting visible off-site.			
Air Quality			
The SCAQMD daily construction emissions thresholds are 75 pounds/day of volatile organic compounds (VOC), 100 pounds/day of nitrogen oxides (NOx), 550 pounds/per day of carbon monoxide (CO), 150 pounds/day of sulfur oxides (Sox), 150 pounds/day of particulate matter less than 10 microns (PM10), and 55 pounds/day of particulate matter less than 2.5 microns (PM2.5). The maximum daily emission caused by construction activities were calculated to be below the significance daily mass emission threshold for all criteria pollutants. Nevertheless, voluntary measures will be taken to further reduce emissions from construction equipment, and compliance with SCAQMD Rule 403 will also further reduce construction-related emissions. The Project would not conflict with or obstruct implementation of the air quality plan.	Less than significant	No mitigation is required.	Less than significant
The net increase of CO, PM10, PM2.5, and SO$_X$ emissions from Project operations are estimated to be below the significance daily mass emission thresholds. Additionally, an ambient air quality impact analysis demonstrates that the Project would not be expected to cause or significantly add to a violation of national and California ambient air quality standards. Furthermore, the net emission increase of PM10 and SO$_X$ will be offset using emission reductions from SCAQMD internal account to account for Rule 1304(a)(1) offset exemptions for replacement of functionally identical equipment. The net increase of NO$_X$ emissions of 553 pounds/day (normal operation) or 1,475 pounds/day (maintenance/testing of combustion turbines, hours of operation in this mode are limited), from Project operations are estimated to	Less than significant	No mitigation is required.	Less than significant

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
exceed SCAQMD's daily mass emission significance threshold of 55 pounds/day. However, an ambient air quality impact analysis shows the NO_2 emissions from this Project will not exceed the National and California ambient air quality standards. Additionally, the increase in NO_X emissions from the Project will be offset through the purchase of Emissions Reduction Credits in the open market and allocations from SCAQMD internal accounts. The net increase of VOC emissions of 90 pounds/day (normal operation) or 102 pounds/day (maintenance/testing of combustion turbines, hours of operation in this mode are limited), from Project operations are estimated to exceed the daily mass emission significance threshold of 55 pounds/day. Additionally, there is no ambient air quality standard for VOC and no guidance to determine the significance of ambient concentrations of VOC. The increase in VOC emissions attributed to the Project will be fully offset using emission reductions from SCAQMD internal account to account for Rule 1304(a)(1) offset exemptions for replacement of functionally identical equipment.			
The net emission increase attributed to the Project are expected to be below the Prevention of Significant Deterioration significance thresholds. Based on the SCAQMD engineering evaluation, the potential annual emissions of Unit 9 are 45 tons for NO_X, 30.8 tons for CO, 15.4 tons for PM10/PM2.5, and 3.8 tons for SO_2. Therefore, the plant-wide annual emissions after the modification are estimated to be 96.5 tons for NO_2, 68.4 tons for CO, 30.5 tons for PM10/PM2.5, and 12.6 tons for $SO_{2.}$ These emission levels are below the Prevention of Significant Deterioration major source threshold of 100 tons per year for any of the attainment pollutants.	Less than significant	No mitigation is required.	Less than significant
Modeling of Project operation emissions show that local ambient concentrations of NO_2, CO and SO_2 are below state and federal ambient air quality thresholds after emissions from the	Less than significant	No mitigation is required.	Less than significant

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
Project are considered. The results also show that although ambient PM2.5 and PM10 currently exceed state and federal standards, the incremental increases in ambient concentrations of these pollutants are below significance thresholds established by SCAQMD.			
The Project is not expected to violate any air quality standard or contribute substantially to an existing or projected air quality violation. The air quality impact during the construction phase does not exceed the mass daily significance thresholds; and the air quality impact in operating the facility will be below the ambient air quality standards based on the air dispersion modeling conducted.	Less than significant	No mitigation is required.	Less than significant
The closest K-12 school will be Mark Keppel Elementary school, which is located more than 0.6 miles northeast from the emission sources. The nearest residential receptor is located approximately 694 feet (211 meters) from the emission sources and the nearest worker/commercial receptor is located approximately 572 feet (174 meters) from the emission sources. Both receptors are in the northeast direction of the emission sources. Based on the results of an ambient air quality analysis, criteria pollutant concentrations from the Project are expected to disperse substantially before reaching any sensitive receptors. The Project will neither cause, nor substantially add to an existing violation of state or federal ambient air quality standards. Additionally, impacts from construction activities are expected to be below daily significance thresholds as well as localized significance levels.	Less than significant	No mitigation is required.	Less than significant
Toxic Air Contaminant emissions associated with the Project will consist primarily of combustion byproducts produced by the new turbines, the existing turbine (Unit 9), and the emergency engine. Maximum individual cancer risk (MICR) and non-cancer acute and chronic health risks were calculated for residential receptors and worker receptors. The MICR and hazard index (HI) values were calculated based on the combined impact of all chemicals. MICR	Less than significant	No mitigation is required.	Less than significant

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
was calculated as 1.09E-06 for residential receptors and 0.04E-06 for worker receptors with a significance threshold of 10.00E-06. Acute HI was calculated as 0.008 for residential receptors and 0.008 for worker receptors with a significance threshold of 1.00. Chronic HI was calculated as 0.003 for residential receptors and 0.003 for worker receptors with a significance threshold of 1.00. Therefore, health risks that the Project poses to nearby residential and worker receptors are expected to be below the significance thresholds. The MICR for residential receptors were calculated to be greater than the 1.00E-06 threshold to trigger the Cancer Burden analysis. Cancer burden of this Project were determined based on the distance of 627 meters, where the MICR falls below one in one million, a highly conservative population density default value of 7,000 persons per square kilometer, and the MICR at the residential receptor of 1.36E-06. The cancer burden was calculated to be 0.012, which is below the significance threshold of 0.5. Toxic air contaminants emissions associated with the earth moving activity will consist primarily of combustion byproducts from off-road equipment and vehicles trips. The construction of the facility is anticipated to take place over a period of 27 months. Therefore, Toxic Air Contaminants emissions from construction activity are not expected to have health significant impacts on cancer and non-cancer chronic risks because these risks are typically assessed for continuous exposure for 30 years. Additionally, the heaviest impacts of earth moving activity can be expected to occur within the fence line of the power plant. Therefore, the Toxic Air Contaminants emission impacts from the earth moving activity are expected to be less than significant.			
Cultural and Paleontological Resources			
The Boiler Building is a discretionary historical resource and is located on the Project site. Demolition of the Boiler	Potentially significant	**CR-1:** Prior to demolition of the Boiler Building, the City shall prepare Historic American Engineering	Significant and unavoidable impact

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
Building would cause a substantial adverse change in the significance of a historical resource as defined in 14 CCR Section 15064.5.		Record (HAER) documentation for the Boiler Building. That documentation shall include preparation of a written narrative, photography, and drawings that meet the latest requirements in HAER History, Photography, and Drawing Guidelines. Archival and electronic full copies of that completed documentation shall be submitted to the HAER program in accordance with the most recent edition of "Preparing HABS/HAER/HALS Documentation For Transmittal." The City shall maintain the HAER documentation at the Glendale Central Public Library and information about accessing that information shall be available on the City's website. HAER documentation, as described, shall be complete and accepted by the HAER program before any demolition or dismantling of the Boiler Building. The City shall also display up to four (4) archival quality photographs of the historic Boiler Building in a publicly accessible location within the City's Perkins Building, **CR-2:** City shall provide permanent plaque to be located at the Flower Street entrance to the Grayson Power Plant that identifies the location of the former historic Boiler Building and provides a narrative statement about the Boiler Building that provides historic context **CR-3**:City shall salvage and preserve a piece of equipment from the Boiler Building and display the piece of equipment along with an historic context statement in a publicly accessible location in the City.	
Demolition to implement the proposed Project may involve ground disturbance into previously undisturbed sediments in order to remove existing piles or soils that may have been contaminated. Construction plans include excavations across the Project area, including areas with up to 20 feet beyond current depths of development, placing the total depths of excavation into high potential	Potentially significant	**PAL-1:** Worker training. A paleontologist who meets professional paleontological standards as defined by Murphey et al. (2019) shall design a Worker's Environmental Awareness Program reviewed and approved by a qualified consultant retained by the City that will provide training that communicates requirements and	Less than significant

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
sediments that are expected to begin at around 10 feet below ground surface (bgs). Where ground disturbance extends beyond 10 feet bgs into previously undisturbed sediments, either in entirely undisturbed areas or beneath the depth of previous disturbance, sediments with high paleontological potential will be encountered. As a result, demolition and construction associated with this Project may have either direct or indirect impacts on paleontological resources.		procedures for the inadvertent discovery of paleontological resources during construction, to be delivered by the paleontologist or their designee to the construction crew prior to the onset of ground disturbance. The training will be provided by qualified consultant retained by the City. **PAL-2:** Paleontological Monitoring. A paleontologist meeting professional standards as defined by Murphey et al. (2019) shall be retained to oversee all aspects of paleontological mitigation, including the development and implementation of a Paleontological Monitoring and Mitigation Plan (PMMP) tailored to the Project that provides for paleontological monitoring of earthwork and ground disturbing activities into undisturbed geologic units with high paleontological potential (undisturbed sediments over 10 feet in depth), to be conducted by a paleontological monitor meeting professional standards (Murphey et al. 2019). **PAL-3:** Inadvertent Discoveries. In the event that paleontological resources are encountered during construction activities, all work must stop in the immediate vicinity of the finds while the paleontological monitor documents the find and the designated project paleontologist assesses the find. Should the qualified paleontologist assess the find as significant, it should be collected and curated in an accredited repository along with all necessary associated data.	
Geology & Soils			
There is low to moderate potential for surface rupture from the Verdugo fault and other nearby active faults during the design life of the Project. Strong ground shaking can be expected at the Project site during moderate to severe earthquakes in the general region and the Project area is located within a liquefaction zone and site conditions may	Less than significant	No mitigation is required.	Less than significant

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
be susceptible to seismically induced liquefaction in the event of a major earthquake. However, with the implementation of applicable building codes and recommendations made within the Geotechnical Study (Stantec, 2015), geological impacts are expected to be less than significant.			
Earth-moving activities during demolition and construction, including trenching, excavating, stockpiling, and grading would result in exposure and mobilization of onsite soils, increasing the chance of erosion. An erosion control plan, SWPPP, Dust Control Plan and BMPs would be implemented to minimize erosion. With implementation of these required plans and procedures, impacts from soil erosion are anticipated to be less than significant.	Less than significant	No mitigation is required.	Less than significant
Due to estimated surface settlements, as well as minimal slopes, depth of groundwater, and non-expansive soils at the Project site, impacts related to stability, landslide, lateral spreading, subsidence, and liquefaction of collapse are considered less than significant.	Less than significant	No mitigation is required.	Less than significant
Greenhouse Gas Emissions			
The proposed new combustion gas turbines are expected to generate less GHG emissions on a pound per megawatt-hour basis than the existing equipment that is to be removed from service. The Project will result in GHG emissions due to both construction and operation activities. The GHG construction emissions would be generated primarily by the off-road construction equipment and on-road vehicles. Total CO_2e emissions during construction of the Project would be 1,327 metric tons per year. During facility operations, natural gas combusted in the new combustion turbines, diesel fuel combusted in the emergency engine, and facility occupancy related activities will contribute to GHG emissions. The net increase of GHG emissions from the operation of the Project, 415,832 metric tons per year, exceeds the significance threshold of 10,000 metric tons per year. CO_2e emissions would be reported, and	Less than significant	No mitigation is required.	Less than significant

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
allowances and offset credits would be acquired to mitigate 100 percent of GHG emissions from the combustion equipment and transformers. Net emissions after mitigation will include only emissions related to facility occupants and will be well below the 10,000-metric ton significance threshold.			
Emissions from the Project will be fully offset through the retirement of GHG allowances held by GWP, and additional credits to be purchased by GWP. The Project will allow the City to maximize the import of renewable energy sources through the limited existing transmission capacity into the City which will further assist the City in meeting the Renewable Portfolio Standards and GHG reductions specified in the Greener Glendale Plan. The Project would not conflict with any applicable plan, policy or regulation adopted for reducing the emissions of greenhouse gases.	Less than significant	No mitigation is required.	Less than significant
Hazards & Hazardous Materials			
Demolition activities involving the removal of hazardous materials including asbestos containing material and lead-based paint could create a significant hazard to the public.	Potentially significant	**HAZ-1:** Prior to demolition of facilities associated with the Grayson Repowering Project, hazardous materials stored onsite and not required for continued operation of the facility shall be inventoried, packaged, removed, and disposed in accordance with a Hazardous Materials Management Plan prepared by the demolition contractor and submitted to the City for review and approval prior to initiating demolition activities. **HAZ-2:** Buildings or equipment to be demolished containing lead based paint or asbestos shall be either decontaminated or encapsulated prior to removal from the Project site and disposed in accordance with an Asbestos and Lead Paint Management Plan prepared by the demolition contractor and submitted to the City for review and approval prior to initiating demolition activities.	Less than significant
Petroleum hydrocarbons and VOCs may be encountered during subsurface demolition activities. Excavation,	Potentially significant	**HAZ-3:** Contaminated soil encountered during demolition activities shall be handled, removed,	Less than significant

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
handling, and transport of contaminated soil has the potential to impact workers and the public if not handled and contained properly.		and disposed in accordance with regulatory requirements and the Project's Soil Management Plan.	
Hazardous materials used during construction of the Project will include gasoline, diesel fuel, motor oil, hydraulic fluid, solvents, cleaners, sealants, welding flux, various lubricants, paint, and paint thinner. The quantities of hazardous materials that will be used onsite during construction will be limited to the quantities required to complete construction of the Project. The potential exists for fuels, oil, and grease to drip from construction equipment. Spills of fuel may occur during onsite refueling operations if refueling operations are not conducted properly. It is not anticipated that spills related to refueling operations would be large and would be limited to the immediate area and cleaned up at the time of the spill using spill kits stationed on the fuel truck. It is unlikely that the volume of refueling spills will travel beyond the immediate area of the spill and impact offsite receptors.	Potentially significant	**HAZ-4:** Hazardous materials used during construction shall be limited to the quantities required for construction and shall be stored and handled in accordance with regulatory requirements. **HAZ-5:** Utility trucks and refueling trucks operating onsite shall have a spill kit onboard at all times. Small spills of petroleum products or other hazardous materials during construction operations shall be reported to the Construction Supervisor and a Spill Response form completed with a description of the type and quantity of the spill accompanied by photographs and a description of the disposition of the spill material. Hazardous spill material shall be disposed according to regulatory requirements. In the event of a large spill of hazardous materials equal to or above reportable quantities federal, state, and local reporting requirements shall be followed.	Less than significant
The types and quantities of hazardous materials anticipated to be used and stored onsite during operation of the Project is consistent with the types and quantities of hazardous materials currently used and stored onsite. Use, storage, handling, disposal, and reporting of these hazardous materials would be consistent with current practices and regulatory requirements and not create a significant hazard to the public or the environment.	Less than significant	No mitigation is required.	Less than significant
The Project would maintain an existing 19-percent aqueous ammonia above ground storage tank and would add a second tank of the same volume and containment system. An offsite consequence analysis assumed the complete failure of the storage tank, the immediate release of the contents of the tank, and the formation of an evaporating pool of aqueous ammonia within the	Potentially significant	**HAZ-6:** The surface area of the proposed and existing ammonia tank containment systems shall be reduced by 90 percent or greater through the installation and maintenance of three-inch diameter high density polyethylene balls or similar method.	Less than significant

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
secondary containment structure. In this event, evaporative emissions of ammonia would be subsequently released into the atmosphere. The dispersion and transport of these emissions into the atmosphere would be subject to meteorological conditions at the time of the release. The offsite consequence analysis for the worst-case release of ammonia indicates that 75 parts per million concentration would extend 528 feet from the ammonia tank/release. This distance would extend beyond the Grayson Power Plant eastern property boundary and is considered a potentially significant impact.			
Hydrology & Water Quality			
Soil temporarily exposed during excavation and grading activities may be subject to sheet erosion during rain events thereby increasing the level of suspended solids in flows emanating from the site. In addition, the demolition of the existing facility may result in the exposure and/or disruption of contaminated soils, which may impact surface water quality during storm flows. A SWPPP containing structural treatment and source control measures, including BMPs, appropriate for the Project would be prepared and incorporated. Implementation of the measures included in the SWPPP as well as those included in the Project's Soil Management Plan (Appendix E.4) would ensure that RWQCB water quality standards are met, the drainage pattern of the site would not result in substantial erosion or siltation on- or off-site.	Less than significant	No mitigation is required.	Less than significant
Stormwater that falls within the plant in pavement areas and outside the process equipment containment areas would flow via surface sheet flow and localized gutters to catch basins and on-site storm drain piping to be discharged to the Verdugo Wash and Los Angeles River. Stormwater that is not captured in containment areas would be captured via a storm drain system and processed before being discharged either to the sanitary sewer or to the Verdugo Wash or Los Angeles River. The system would meet all applicable effluent discharge standards set by the RWQCB and other	Less than significant	No mitigation is required.	Less than significant

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
regulatory agencies before discharging through the existing stormwater outfalls and would not substantially alter the drainage pattern or result in substantial polluted runoff. The proposed stormwater capture, treatment and infiltration system would result in improved drainage conditions and stormwater runoff quality compared to the existing system.			
Noise			
Demolition and construction would result in noise from the operation of conventional construction equipment and associated vehicles. Construction related activities will be conducted Monday through Saturday between the hours of 7:00 AM and 7:00 PM and will therefore be in accordance with the City of Glendale noise ordinance related to construction noise. It is possible that some concrete pouring activities could be conducted at night. Predicted noise levels at receptors were modeled and would be below City nighttime noise standards. Any construction work conducted outside the above times and days would be subject to issuance of a City variance. Construction related noise would therefore not expose persons to or generate noise levels in excess of established standards and potential impacts would be less than significant.	Less than significant	No mitigation is required.	Less than significant
Noise (including low frequency) from operation of the Project was modeled to predict resulting noise levels at sensitive receptors. Many of the primary noise sources and levels associated with Project operation have been guaranteed by the equipment manufacturer and were considered in the modeling. However, some ancillary equipment which would contribute to noise has not yet been identified. If this ancillary equipment does not meet specific noise levels, operation of the Project could expose persons to noise levels in excess of established City standards.	Potentially significant	**NOI-1: Noise Source and Required Noise Control Measures: Cooling Towers** - The noise emissions from each cooling tower shall be limited to 57 dBA at 400 feet (107 dBA sound power level). Mats may be required to limit the water splash noise. **NOI-2: Noise Source and Required Noise Control Measures: Cooling Tower Fan Motors and Gearboxes** - The sound power levels for cooling tower motors shall be limited to 98 dBA (85 dBA at 3’) the motors shall be placed on the west side of the towers. **NOI-3: Noise Source and Required Noise Control Measures: Fuel Gas Compressors** - The noise emissions from each of the two fuel gas	Less than significant

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
		compressor areas shall be limited to 44 dBA at 400 feet. Compressor enclosures or properly designed noise barriers can be utilized. Under the current assessment scenario open air compressor equipment packages with total sound power level of 108 dBA were treated with 21-foot sound barrier to yield appropriate results. **NOI-4: Noise Source and Required Noise Control Measures: Water Treatment Area** - The noise emissions from the water treatment area shall be limited to 48 dBA at 400 feet. It is expected that this level can be achieved through a combination of equipment selection, small enclosures and barriers **NOI-5: Noise Source and Required Noise Control Measures: Boiler Feed Water Pumps for Combined Cycle Units** - The sound power levels for boiler feed water pumps shall be limited to 105 dBA when placed outside near the respective HRSGs. **NOI-6: Noise Source and Required Noise Control Measures: Circulating Water Pumps for Cooling Towers** - The sound power levels for circulating water pumps shall be limited to 101 dBA when placed outside near the respective cooling towers. **NOI-7: Noise Source and Required Noise Control Measures: Generator Step-up Transformers** - Standard NEMA 95 MVA rated transformers or lower shall be utilized. **NOI-8: Noise Source and Required Noise Control Measures: Steam Turbine Building** - The sound power level of the noise breaking out from the steam turbine building shall be limited to 95 dBA and 115 dBC (45 dBA and 65 dBC at 400 feet).	

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
		Specialized enclosures for the gearboxes shall be required and steam turbine building walls and roofs shall have an STC 40 composite transmission loss rating. **NOI-9: Noise Source and Required Noise Control Measures: Steam Pipe Rack** - The sound power level for the steam pipe rack shall be limited to 82 dBA per meter of piping. **NOI-10: Noise Source and Required Noise Control Measures: Steam Sky vents and safety valves** - Steam sky and safety valves shall be equipped with silencers to limit their noise emissions to 115 dBA sound power (approximately, 90 dBA at 5’).	
No significant ground-borne noise effects are expected during the construction or operation of the Project. Project vibration levels beyond the Project site boundary during operations are expected to be negligible. Demolition and construction activities are expected to involve potential sources of ground borne vibration such as pile driving. At the higher end of the diesel pile drivers, the expected vibration amplitude defined in terms of peak particle velocity (PPV) is 1.52 in/s. For demolition activities, the vibration levels equivalent to 1.5-ton ball drop from 10’ can be used (3.89 in/s PPV at 25 feet). Predicted maximum demolition and construction vibration levels are below the preferred vibration thresholds at the nearest residential and commercial buildings. The Project would therefore not result in exposure of persons to or generation of excessive ground borne vibration or ground borne noise levels nor would damage to the nearby structures would be expected.	Less than significant	No mitigation is required.	Less than significant
The Project noise results in a permanent increase in area ambient sound levels of less than 2.5 dB during nighttime hours and less than 1 dB during daytime hours.	Less than significant	No mitigation is required.	Less than significant
A substantial temporary increase in ambient noise levels may result from the demolition and construction activities	Less than significant	No mitigation is required.	Less than significant

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
associated with the Project. Such increases will fluctuate with changing activities and duration. Construction would be limited to the daytime hours of 7:00 am to 7:00 pm Monday through Saturday, excluding Holidays consistent with the City's Noise Ordinance. It is possible that some concrete pouring activities could be conducted at night. Predicted noise levels at receptors were modeled and would be below City nighttime noise standards. Any construction work conducted outside the above times and days would be subject to issuance of a City variance. Steam blows during commissioning will utilize silencers. Other commissioning activities will be no louder than normal plant operations.			
Transportation & Traffic			
The majority of truck traffic would access the site using the northbound right-turn lane on Fairmont Avenue. The entrance driveway is 25 feet wide and is designed to accommodate most truck movements. However, larger trucks (CA-Legal 65 feet) will require a wider turn radius and encroach into the number two northbound through lane.	Potentially significant	**TRA-1**: To accommodate turning movements by large trucks (CA-Legal 65 feet) and public safety on Fairmont Avenue, the demolition and construction contractor shall be required to prepare a traffic control plan for City review and approval prior to initiating demolition and construction activities that includes the use of large trucks entering and departing the Grayson Power Plant from Fairmont Avenue.	Less than significant
During the demolition phase (June 2018 – March 2019) the Project will require between 25 and 60 construction personnel daily. Between five and 22 trucks delivering equipment or hauling demolition materials will travel to and from the project site daily. During the construction phase (April 2019 – December 2020) the Project will require between 35 and 150 construction personnel daily, with a peak demand of between 170 to 240 personnel during the December 2019 – May 2020 period. Between two and nine trucks delivering equipment or hauling demolition materials are expected to travel to and from the project site daily. In addition, soils import will require up to 50 hauling trucks per day during the first two months (April - May 2019) and up to 25 trucks per day during December 2019 and	Potentially significant	**TRA-2:** To reduce construction traffic at the San Fernando Road and Doran Street intersection during the PM peak hours, a construction traffic control plan shall be developed by the contractor, reviewed and approved by the City, and implemented for the duration of the construction phase. The plan shall include measures to limit vehicle trips to a total of 24 trips or less during the hours of 4 to 6 PM for the San Fernando Road and Doran Street intersection. Measures may include scheduling of construction activities or trip routing to minimized travel during peak PM traffic times, ride sharing, closing the parking lot, and/or other effective and verifiable measure. **TRA-3:** The applicant shall ensure that traffic control is implemented for the duration of demolition and	Less than significant

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
January 2020. Concrete delivery for foundation pilings will require an average of up to 12 trucks per day, with a maximum of 36 trucks for two days per month during four months (total of eight days during the life of the Project). During the commissioning phase (January 2021 – June 2021) the Project will require between 25 and 85 construction personnel daily. The number of hauling/delivery trucks will be reduced to an average of two trucks per day. Construction worker parking will be provided on the Caltrans/City of Glendale storage yard between the Verdugo Wash and Doran Street. Maximum construction related traffic levels are anticipated to occur from January to May 2020. The Project is expected to result in a short-term addition of 214 ADT, 27 AM peak hour trips and 40 PM peak hour trips during the demolition period. During the construction period, a short-term addition of 513 ADT, 65 AM peak hour trips and 104 PM peak hour trips would be generated. During the commissioning period, a short-term addition of 71 ADT, 9 AM peak hour trips and 17 PM peak hour trips would be generated. The project peak is during the construction phase (January 2020). The Project would generate a short-term impact at the San Fernando Road/Doran Street intersection by adding V/C 0.05 during the PM peak hour, which would exceed the City of Glendale's threshold of V/C 0.02 for signalized intersections operating at LOS D, E, or F. Project personnel expected during the construction phase is 180 persons. Project personnel trips during the demolition and commissioning phases are not expected to exceed 60 and 35 persons; respectively. This short-term significant impact is expected to be for a maximum 21-month time period (construction duration).		construction phases. Traffic control shall include construction warning signs on Fairmont Avenue (Trucks Entering Exiting), and monitoring (flag person) on public roadways as needed during large transports. **TRA-4**: A construction traffic control plan shall include provisions for days when high truck traffic is generated (soil delivery days, peak concrete delivery days). The plan will include considerations for truck staging to ensure that truck parking/staging can be accommodated off the City streets. **TRA-5**: Traffic control monitors shall direct traffic whenever heavy construction equipment is entering and exiting the plant as warranted to ensure public safety. The traffic monitor shall be posted throughout the demolition and construction periods, as necessary. The applicant shall coordinate with the Glendale Fire Department to ensure that traffic control routes and procedures would allow for adequate emergency access. **TRA-6**: All construction-related vehicles, equipment staging and storage areas shall be located in approved pre-determined areas that are outside of adjacent road right of ways. The applicant shall provide all construction personnel with a written notice of this requirement and a description of approved parking, staging and storage areas. The notice shall also include the name and phone number of the applicant's designee responsible for enforcement of this restriction. **TRA-7**: Construction traffic shall comply with the California Vehicle Code sections related to vehicle weight and width. Any extra-legal loads needed for specialized deliveries shall be subject to special permit requirements from the City of Glendale. Should roadway damage occur along the haul route that is	

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
		directly attributable to the demolition and construction of the Project, repairs will be assessed by the City and completed accordingly.	
Roadway segments in the local transportation network could potentially be damaged by truck traffic. There is also the potential for tracking dust, soils, and other materials from the construction sites onto public and private roads. The potential for damage to public and private roadways from construction traffic is considered significant.	Potentially significant	**TRA-8**: Fugitive dust control shall be implemented according to SCAQMD Rule 402, 403 and 1186, and California Vehicle Code Section 23114, and Building & Safety requirements. Dust control mitigation measures shall include: • Soil stabilizers and dust suppressants to control fugitive dust levels from exposed soils. • On-site water trucks to provide control of fugitive dust while soil is moved or disturbed. • Off-site vacuum and broom sweepers to remove any fugitive materials from the public roadways. • Track-out control to prevent dirt and mud from being spread to public roadways: o Sweeping or spray cleaning trucks prior to leaving project site. o Adequate truck load covering. Limit on-site vehicle speeds to 15 mph.	Less than significant
The existing storage length of each off-ramp in the study-area is sufficient to accommodate the expected peak hour queues of 270 feet or less under existing plus project conditions. Therefore, no impacts are anticipated. Caltrans District 7 has established LOS F0 as the minimum acceptable level of service on the freeway system (Caltrans, 1996). Segment 7 along I-5 has an existing LOS below the minimum acceptable level. The AADT for segment 7 is 294,000 vehicles. The Project would add an ADT average of 513 vehicles during the peak period (construction, January 2020). The construction trip distribution calculates that 65% of the 513 vehicles will utilize I-5. Therefore, approximately 334 vehicles may travel along segment 7 of I-5 consisting of 0.11% of the AADT along this freeway. The Project contribution of 0.11% is not	Less than significant	No mitigation is required.	Less than significant

Project Impacts	Impact without Mitigation	Mitigation Measures	Impact with Mitigation
expected to degrade the existing MOE along segment 7. Based on the foregoing analysis, and therefore will not conflict with the CMP LOS.			
Tribal Cultural Resources			
The Project would have no significant impacts.	No impact	No mitigation is required.	No impact

REVIEW PROCESS AND AVAILABILITY OF THE PR-DEIR

CEQA requires lead agencies to solicit and consider input from other interested agencies, citizen groups, and individual members of the public. CEQA Guidelines Section 15087 specifies that EIRs be circulated for a 45-day public comment period. This PR-DEIR will be reviewed for a 60-day period, which exceeds the 45-day circulation requirement for an EIR, in order to provide the public ample time to read, evaluate and if desired, submit written comments on the PR-DEIR. A Notice of Completion/Notice of Availability of this PR-DEIR for review will be provided with copies of the PR-DEIR to regional and local public agencies, interested groups and persons, the State Clearinghouse and Los Angeles County Clerk. In addition, the Notice of Completion/Notice of Availability and Final 2018 EIR will be made available on the City of Glendale's Project website at Graysonrepowering.com.

This PR-DEIR and supporting studies, are additionally available for review during business hours, by appointment, between 7:30 a.m. and 5:30 p.m. Monday through Thursday, and 8:00 a.m. to 5:00 p.m. on Fridays, at the City of Glendale Community Development Department, Planning Division (Planning Counter) and at the Glendale Water and Power Department. To make an appointment, please contact Erik Krause, Deputy Planning Director, at (818) 937-8156 and Catalina Lee, GWP Administration, at (818) 548-2107. Interested individuals, organizations, and public agencies can also provide written comments on this PR-DEIR to the address listed below.

City of Glendale
Community Development Department, Planning Division
633 East Broadway, Room 103
Glendale, California 91206
Attention: Erik Krause, Deputy Director

Comments may also be sent by facsimile to (818) 240-0392 or by email to ekrause@glendaleca.gov with "Grayson Repowering Project PR-DEIR" in the subject line. Agency responses should include the name of a contact person within the commenting agency.

SCOPE OF COMMENTS – REQUEST TO LIMIT COMMENTS TO RECIRCULATED INFORMATION

Because the 2018 Final EIR is revised only in part, and the City is recirculating only the revised sections of the 2018 Final EIR, the City is requesting that reviewers limit comments to the content of this PR-DEIR. The Final EIR will include the City's previously prepared responses to comments on the original 2018

Draft EIR during the initial public review period. During the preparation of the Final EIR, the City will respond to comments received during the recirculation period related to this PR-DEIR, consistent with the requirements of CEQA Guidelines Section 15988.5. The City will consider new comments by reviewers that are submitted on the content of the PR-DEIR, as the comment period on the original Draft EIR has expired.

Abbreviations

A	amps
AEGL	Acute Exposure Guideline Levels
ALOHA	Areal Locations of Hazardous Atmospheres
APE	area of potential effect
ASHRAE	American Society of Heating and Air-Conditioning Engineers
BA	Balancing Area
BERD	Built Environment Resource Directory
BESS	battery energy storage system
CAFE	Corporate Average Fuel Economy
CAISO	California Independent System Operator
CAL FIRE	California Department of Forestry and Fire Protection
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
City	City of Glendale
CO	carbon monoxide
CPUC	California Public Utilities Commission
CRHR	California Register of Historical Resources
Db	decibel
dBA	A-weighted decibels
EIR	Environmental Impact Report
EPRI	Electric Power Research Institute
GE	General Electric
GHG	Greenhouse Gas
GPA	GPA Consulting
Grayson	Grayson Power Plant
GWP	Glendale Water and Power
HAER	Historic American Engineering Record
HASR	Historic Architectural Survey Report
HI	hazard index
IDLH	Immediately Dangerous to Life and Health
IPP	Intermountain Power Project
IRP	Integrated Resource Plan
KPO	Key observation points
Kv	kilovolt
kWH	kilowatt-hour
LACM	Natural History Museum of Los Angeles County
LADWP	Los Angeles Department of Water & Power
LORS	Laws Ordinances Regulations, and Standards
LOS	Level of Service
MICR	Maximum individual cancer risk
MMRP	Mitigation Monitoring and Reporting Plan

MPO	Metropolitan Planning Organization
MPR	Miles per hour
MVA	megavolt-amps
MW	megawatt
MWH	megawatt hour
NERC	North American Electric Reliability Corporation
NHPA	National Historic Preservation Act
NHTSA	National Highway Traffic Safety Administration
NOAA	National Oceanic and Atmospheric Administration
NOP	Notice of Preparation
Nox	nitrogen oxides
NRHP	National Register of Historic Places
OHP	California Office of Historic Preservation
OSHA	Occupational Safety and Health Administration’s
PM10	particulate matter less than 10 microns
PM2.5	particulate matter less than 2.5 microns
PMMP	Paleontological Monitoring and Mitigation Plan
PPV	peak particle velocity
PRC	Public Code Resources Code
PV	photovoltaic
PR-DEIR	Partially Recirculated Draft Environmental Impact Report
RFP	Request for Proposals
RPS	Renewable Portfolio Standard
rpm	revolutions per minute
RTP	Regional Transportation Plan
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SCAG	Southern California Association of Governments’
SCAQMD	South Coast Air Quality Management District
SCS	sustainable communities strategy
SOx	sulfur oxides
STS	Southern Transmission System
SVP	Society of Vertebrate Paleontology
SWPPP	Stormwater Protection Plan
TGHS	The Glendale Historical Society
USEPA	U.S. Environmental Protection Agency
VAR	reactive power
VDC	volts direct current
VHFHSZ	Very High Fire Hazard Severity Zones
VMT	Vehicle Miles Traveled
VOC	volatile organic compounds
WECC	Western Electricity Coordinating Council
WMP	Wildfire Mitigation Plan
WOIS	Wartsila Operator Information System

Glossary

ENGINEERING TERMS

RICE	Reciprocating Internal Combustion Engine, similar to the engine in an automobile but on a larger scale.
OTB	Once Through Boiler, a variant of a heat recovery steam generator (HRSG) that transfers the heat from the gas turbine exhaust into water producing steam to be used in a steam turbine to produce additional electricity. Unlike a conventional HRSG, a OTB can be operated with no water in the tubes allowing the gas turbine to start and quickly reach the needed power level. Water can then be added, and steam production started. This system provides additional resiliency in that if the steam cycle becomes unavailable, the gas turbine can continue to operate and produce power.
Mothballed	placing equipment into long-term storage.
Glendale Rack	the switch rack that connects the existing Grayson units to the GWP electric system.

ENVIRONMENTAL TERMS

2018 Final EIR	The 2018 Final Environmental Impact Report for the Grayson Power Plant (“Repowering Project” or “Project”), which was submitted to the Glendale City Council for certification.
Partially Recirculated Draft EIR	Only in part; to a limited extent to circulate again.

4.0 ENVIRONMENTAL IMPACT ANALYSIS

4.1 Categories of Environmental Factors

The purpose of this section is to inform decision makers and the public of the type and magnitude of the change to the existing environment that would result from the Project. This section provides a detailed discussion of the environmental and regulatory setting for each topic addressed in this EIR, the analysis of the potential impacts of the Project, potential cumulative impacts, and measures identified to mitigate these impacts, if necessary.

This Project is evaluated based upon its effect on the follow nine categories of environmental factors. These environmental factors listed below were identified during the Initial Study to potentially be affected by the proposed Project, and therefore were carried forward for analysis in this EIR.

☐ Aesthetics (Section 4.2)
☐ Air Quality (Section 4.3)
☐ Geology and Soils (Section 4.4)
☐ Greenhouse Gas (Section 4.5)
☐ Hazards and Hazardous Materials (Section 4.6)
☐ Hydrology and Water Quality (Section 4.7)
☐ Noise (Section 4.8)
☐ Transportation and Traffic (Section 4.9)
☐ Tribal Cultural Resources (Section 4.10)
☐ Cumulative (Section 4.11)

The original nine categories of environmental factors can be found in the 2018 Final EIR. This PR-DEIR evaluates the following additional three categories of environmental factors:

☐ Cultural and Paleontological Resources (Section 4.12)

☐ Energy (Section 4.13)

☐ Wildfire (Section 4.14)

A detailed analysis of environmental impacts will be presented for each resource area (listed above) utilizing the model Environmental Checklist Form found in Appendix G of the CEQA Guidelines Section 15063(f). Impacts to the environment for construction and operation of the Project will be assessed and described, and the level of significance of impacts will be measured against criteria that have been established by regulation, accepted standards, or other definable criteria.

Each environmental resource area is reviewed by analyzing a series of questions (i.e., Initial Study Checklist) regarding level of impact posed by the Project. Substantiation is provided to justify each determination. One of four following conclusions is then provided as a determination of the analysis for each of the major environmental factors.

- **No Impact.** A finding of no impact is made when it is clear from the analysis that the project would not affect the environment.
- **Less than Significant Impact.** A finding of a less than significant impact is made when it is clear from the analysis that a project would cause no substantial adverse change in the environment and no mitigation is required.
- **Less than Significant Impact with Mitigation Incorporated.** A finding of a less than significant impact with mitigation incorporated is made when it is clear from the analysis that a project would cause no substantial adverse change in the environment when mitigation measures are successfully implemented by the project proponent. In this case, the project proponent would be responsible for implementing measures identified in a Mitigation Monitoring Program.
- **Potentially Significant Impact.** A finding of a potentially significant impact is made when the analysis concludes that the proposed project could have a substantially adverse change in the environment for one or more of the environmental resources assessed in the checklist. In this case, overriding consideration would be required for the project to advance.

4.11 Cumulative Impact Analysis

The section below, sets forth the list of projects that is the basis for the cumulative impact analysis that appears in Sections 4.2 through 4.10 ~~above~~ from the 2018 Final EIR as well as Sections 4.12 through 4.14 included within this PR-DEIR. Sections 4.2 through 4.~~10~~14 then set forth the analysis of potentially significant environmental impacts, both Project-specific and Section 4.11 for cumulative, for each resource area evaluated in this EIR. Readers should note that a number of potential impacts were determined to be less than significant in the first instance or were determined not to be potential impacts of the project at all, and those determinations are set forth in Section 6.3 (effects Found Not to be significant) found in the 2018 Final EIR.

4.11.1 Overview

The technical analysis contained in Sections 4.2 through 4.14~~10~~ examines both Project-specific impacts and the potential environmental effects associated with related cumulative development. CEQA requires that EIRs discuss cumulative impacts, in addition to Project-specific impacts. In accordance with CEQA, the discussion of cumulative impacts must reflect the severity of the impacts and the likelihood of their occurrence; however, the discussion need not be as detailed as the discussion of environmental impacts attributable to the Project alone. According to Section 15355 of the CEQA Guidelines:

> *“Cumulative impacts” refer to two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts. (a) The individual effects may be changes resulting from a single project or a number of separate projects. (b) The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time.*

More specifically, Section 15130(a) of the CEQA Guidelines requires that EIRs discuss the cumulative impacts of a project when the project’s incremental effect is “cumulatively considerable.” Where a Lead Agency is examining a project with an incremental effect that is not cumulatively considerable, it need not consider the effect significant but must briefly describe the basis for its conclusion. Section 15130(a)(l) of the CEQA Guidelines further states, “a cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts.”

If the combined cumulative impact associated with the project’s incremental effect and the effects of other projects is not significant, Section 15130(a)(2) of the CEQA Guidelines requires a brief discussion in the EIR of why the cumulative impact is not significant and why it is not discussed in further detail. Section 15130(a)(3) of the CEQA Guidelines requires supporting analysis in the EIR if a determination is made that a project’s contribution to a significant cumulative impact is rendered less than cumulatively considerable and, therefore, is not significant.

The fact that a cumulative impact is significant does not necessarily mean that the contribution of an individual project to the cumulative impact is significant as well. Instead, under CEQA, a project's contribution to a significant cumulative impact is only significant if the contribution is "cumulatively considerable." CEQA Guidelines 15130(a).

Section 15130(b) of the CEQA Guidelines recognizes that the analysis of cumulative impacts need not be as detailed as the analysis of project-related impacts, but instead should "be guided by the standards of practicality and reasonableness." Pursuant to this section, the following two elements should be considered as necessary to provide an adequate discussion of cumulative impacts: "(a) a list of past, present, and reasonably anticipated future projects producing related or cumulative impacts, including those projects outside the control of the Agency, or (b) a summary of projections contained in an adopted general plan or related planning document that is designed to evaluate regional or areawide conditions."

The discussion of cumulative impacts in this Draft EIR focuses on past, present, and reasonably anticipated future projects producing related or cumulative impacts, including those projects outside the control of the City of Glendale.

4.11.2 Projects Considered

The incremental effects of the Grayson Repowering Project, in connection with effects from past, current, and probable future projects that may result in similar impacts were assessed to determine potential cumulative impacts. The types of projects considered include other power generating projects in the area and projects at the Scholl Canyon Landfill ~~where landfill gas currently being combusted at the Grayson Power Plant is collected~~. Projects of a similar nature within Glendale and neighboring areas identified through correspondence with water and power department representatives in the nearby Cities of Los Angeles, Burbank, and Pasadena were reviewed. Based on this review, the following projects were identified for consideration within the cumulative impact analysis for the Project:

- Scholl Canyon Landfill Expansion Project – ~~The City of Glendale is proposing to increase the life of the Scholl Canyon Landfill and is evaluating two alternative development scenarios to increase capacity of the landfill with construction occurring from 2020 through 2040. A Draft EIR was circulated for public review in March 2014. As this EIR was being prepared, the City of Glendale announced during July 2017 that the City now has no immediate plans to proceed with any expansion of the landfill, and possibly may not proceed with such an expansion for some time, if ever, depending on the success of the City's waste management alternatives. The landfill expansion continues to be included in the list of projects to be considered, given that it had been proposed during the preparation of this EIR, and that it could be proposed again in the future. This inclusion, however, is not intended to alter in any way the City's July announcement that it has no immediate plans to proceed with any expansion, and that it may not ever propose such an expansion. This project site is located approximately five-miles southeast of the Project.~~ The City of Glendale previously proposed to expand the Scholl Canyon Landfill. The Landfill Expansion is no longer proposed, is no longer reasonably foreseeable and, as such, no longer carried forward to the cumulative impacts analyses included in Section 4.0 of this PR-DEIR.

- Green Waste Digester Project – ~~The City of Glendale is evaluating approaches to comply with California Assembly Bill 1594, Chapter 719, Sections 40507 and 41781.3, which precludes accounting of green waste used as alternative daily cover in the 50 percent waste diversion by recycling requirements of State law. Use of green waste digesters which would produce methane for use as fuel in vehicles or for power production is being evaluated to meet the requirements of this law by 2020. The location of digesters, if used, has not been determined.~~ The City of Glendale previously considered constructing and operating an Anaerobic Digester Project at the Scholl Canyon Landfill. The Anaerobic Digester Project would anaerobically digest organic waste and would combust the produced gas in electrical generating equipment to produce renewable electricity. The Anaerobic Digester Project is no longer proposed, is no longer reasonably foreseeable and, as such, is no longer carried forward to the cumulative impacts analyses included in Section 4.0 of this PR-DEIR.

- Biogas Renewable Generation Project - The project would include construction and operation of an approximately 12-megawatt power generation facility on approximately three-acres of land at the Scholl Canyon Landfill. The purpose of the project is to beneficially utilize methane-rich renewable landfill gas as fuel to generate electricity at the landfill where the landfill gas is generated and collected. Construction of the project will occur over a course of approximately 15 to 18 months through implementation of approximately three phases of development: demolition and removal of existing equipment, site grading and construction, and system startup. ~~Construction is expected to be initiated in the second half of 2018.~~ This project site is located approximately five- miles southeast of the Project. The City previously prepared an IS/MND for the proposed Project (City of Glendale and Stantec, 2018). The Final Initial Study/ Mitigated Negative Declaration (IS/MND) for the proposed Project concluded that the proposed Project would not result in potentially significant and unavoidable environmental impacts; however, City of Glendale Planning Commission elected not to adopt the Final IS/MND and requested preparation of an Environmental Impact Report (EIR) to evaluate a reasonable range of alternatives to the Project. A Draft EIR was prepared and circulated for public comment. That Draft EIR provided updated the analysis in response to comments received during the public hearing considering adoption of the previous IS/MND and the public scoping meetings for the Biogas Renewable Generation Project EIR. The Final EIR has been released and it is anticipated to be considered for certification and project adoption before the end of 2021.

- Silver Lake Reservoir Complex Storage Replacement Project – The Los Angeles Department of Water and Power is constructing the Headworks Reservoir to replace the existing Silver Lake Reservoir Complex in order to comply with State and Federal water quality regulations. The project includes the construction of two buried reservoirs (Headworks East and Headworks West), a 2-MW hydroelectric power plant, and a flow regulating station, as well as ecosystem restoration at the Headworks Spreading Grounds site. The project is scheduled to be completed within four phases. Phase One, the construction on Headworks East, was completed in 2014; Phase Two, construction on Headworks West, is scheduled to be complete in 2022; Phase Three, began in 2019, will include construction of a bypass pipeline, the hydroelectric power plant and the regulating station and is scheduled to complete in 2023; Phase Four, will involve ecosystem restoration of the project site and is scheduled to be complete in 2024. This project site is located approximately two miles northwest of the Project.

There are no additional related projects to added to the cumulative impact analysis since the 2018 Final EIR was completed. Cumulative impacts for the initial nine impact areas can be found in the 2018 Final EIR, Cumulative impacts for Cultural and Paleontological Resources, Energy, and Wildfire are presented below.

4.11.12 Cultural and Paleontological Resources Cumulative Impacts

Development of related projects can affect historical resources if such projects adversely alter and/or demolish historical resources that may be interrelated, such as historical resources that are part of a historic district or examples of the same property type as those within the Project site.

Neither the Boiler Building nor Grayson Power Plant were identified as contributors to a historic district; however, there are other extant properties within Glendale associated with the same property type. The Boiler Building represents a property type associated with municipal power generation within the City of Glendale. Research conducted as part of this analysis identified three properties that were previously identified as historical resources and are examples of the municipal power property type.

Table 4-1 Previously Identified Historical Resources of the Same Property Type

Name	Address	OHP Status Code(s)
Municipal Light & Power Building	620 E. Wilson Street (formerly 145 N. Howard Street)	3S; 5S1
Municipal Light & Power Building	6135 San Fernando Road	2S2
Water Power Light Building/ Municipal Services Building	119 N. Glendale Avenue/ 633 E. Broadway	3S; 5S1

There are no known related projects that impact other previously identified historical resources which are examples of the municipal power property type in Glendale. The three properties listed in Table 4-1 would remain. While the Project would have a direct impact on a discretionary historical resource, it would not contribute a cumulatively considerable impact, and cumulative impacts on historical resources as a whole would be less than significant.

Level of Significance before Mitigation:

Less than Significant Impact

Mitigation Measures:

No mitigation is required.

Level of Significance after Mitigation:

Less than significant Impact

4.11.13 Energy Cumulative Impacts

The proposed Project would consume energy resources primarily including petroleum hydrocarbons during demolition and construction to fuel construction equipment and natural gas during operation to generate electricity. The Project involves replacing less energy efficient electrical generation equipment with more energy efficient electrical generation equipment. As a result, the Project would result in an improvement in long-term energy efficiency compared to existing power generation occurring at Grayson Power Plant.

The City is proposing to construct a Biogas Renewable Generation Project at Scholl Canyon Landfill to capture land fill gas and burn that gas in reciprocating internal combustion engines to destroy methane and other harmful landfill gas byproducts from the landfill and to produce electricity from that combustion. The Biogas Renewable Generation Project is a separate, independently permitted and implemented project.   Implementation of the Biogas Renewable Generation Project would assist the City in meeting its renewable portfolio standards requirements compared to receiving no beneficial use from flaring the landfill gas under existing conditions. As a result, the Biogas Renewable Generation Project would result in an improvement in energy efficiency compared to baseline conditions. Considering this improvement as well as the energy benefits of the proposed Project, the proposed Project would not result in a substantial contribution to a significant energy-related cumulative environmental impact and potential impacts would therefore be less than significant.

Level of Significance before Mitigation:

Less than significant impact.

Mitigation Measures:

No mitigation is required.

Level of Significance after Mitigation:

Less than Significant Impact

4.11.14 Wildfire Cumulative Impacts

The proposed Project would not result in a cumulatively considerable wildfire impact because the proposed Project is not located in proximity to any high fire hazard zones and is in a built out urban setting. The proposed Project is located approximately five miles from the Biogas Renewable Generation Project with a significant amount of urban development separating the two projects. The proposed Project is also located approximately three miles from the Silver Lake Reservoir Complex Project. The Silver Lake Reservoir Complex Project is not located in proximity to any high fire hazard zones and a significant amount of urban development separates it from the proposed Project.

Level of Significance before Mitigation:

No impact.

Mitigation Measures:

No mitigation is required.

Level of Significance after Mitigation:

No Impact.

4.12 CULTURAL AND PALEONTOLOGICAL RESOURCES

This section addresses potential impacts to historical resources that could result from the Project and has been updated to provide additional analysis of new alternatives and mitigation measures pertaining to treatment of the existing Grayson Boiler Building as a discretionary historical resource under CEQA. The analysis of potential impacts to historical resources is based on the Historic Resource Inventory and Evaluation Report prepared for the Project by Stantec Consulting Services Inc. (Stantec) in 2015–2016 and revised in November 2018 and August 2020, as well as on discussions and site visits with The Glendale Historical Society.

While the City's research and analysis concluded that the Boiler Building is not an historical resource, after consultations with the Glendale Historical Society concerning the demolition of the Boiler Building or the proposed Project, the City has decided to use its discretion to treat the Boiler Building as an historic resource and has agreed to include feasible mitigation connected with demolition of the Boiler Building. However, even with mitigation, the demolition of the Boiler Building will result in a significant and unavoidable impact on an historic resource. (Demolition of the Boiler Building would be required for Alternatives 2 (Energy Storage Project Alternative), 4 (150 MW Project Alternative), 5 (200 MW Project Alternative), 7 (Tesla/Wartsila Repowering Project Alternative), and 8 (Unit 8 Refurbishment Project Alternative). Alternatives 1 (No Project) and 3 (Alternative Energy Project Alternative) do not involve re-development at Grayson Power Plant and the Boiler Building would not be demolished.) Accordingly, the City will prepare a statement of overriding considerations to consider in connection with the certification of the final EIR based on the selection of either the Project or Alternatives 2, 4 through 8.

This section also addresses potential adverse impacts to paleontological resources that might result from the Project. This impact analysis is based on the Initial Study (IS) prepared for the project by Stantec (Stantec, 2016a) records search (Appendix A of this PR-DEIR), and a paleontological resources assessment conducted by Stantec Senior Paleontologist Alyssa Bell, Ph.D. The IS found that paleontological resources would not be impacted by the Project, assuming ground disturbance does not exceed depths of previous disturbance in the project area. Project plans now indicate excavations may exceed previous disturbance by as much as 8 feet below the current grade, indicating a paleontological resources assessment is needed.

Paleontological resources, or fossils, are any evidence of ancient life. This includes the remains of the body of an organism, such as bones, skin impressions, shell, or leaves, as well as traces of an organism's activity, such as footprints or burrows, called trace fossils. In addition to the fossils themselves, geologic context is an important component of paleontological resources, and includes the stratigraphic placement of the fossil as well as the lithology of the rock in order to assess palaeoecological (the ecology of fossils animals and plants) setting, depositional environment, and taphonomy (study of the process of fossilization). Fossils are protected by federal, state, and local regulations as nonrenewable natural resources.

The Society of Vertebrate Paleontology (SVP) defines significant paleontological resources as "identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than recorded human history and/or older than middle Holocene (i. e., older than about 5,000 radiocarbon years)" [SVP, 2010]. It should be noted that the threshold for significance varies with factors such as geologic unit, geographic area, and the current state of scientific research, and may also vary between different agencies (Murphey et al., 2019).

Based on the findings of the Initial Study and further discussions with The Glendale Historical Society, the Project would not cause a substantial adverse change to the significance of archaeological resources as defined in 14 California Code of Regulations (CCR) Section 15064.5, nor would the Project have impacts on significant local archaeological resources as defined in Chapter 15.20 of the City of Glendale Municipal Code; however, demolition of the Boiler Building will cause a significant and unavoidable impact to a discretionary historical resource. While there is always a possibility that buried historic or cultural deposits could be found during construction and earth disturbing activities, regulatory compliance with State Health and Safety Code Section 7050.5 and Public Code Resources Code ("PRC") Section 5097.98 would be implemented in the event archeological or historic resources are discovered. Therefore, this would be a less than significant impact.

Tribal cultural resources, as that term is defined in CEQA Section 21074, are addressed in Section 4.10 of this report.

4.12.1 Environmental Setting

The Project site comprises the Grayson Power Plant, which consists of the boiler building, cooling towers, and a few other minor ancillary structures used for municipal electric power generation for the City of Glendale. This section includes contextual information for understanding the history and potential significance of the Plant and describes its existing conditions. This section also discusses the identification aspects of CEQA compliance for historical resources.

Historic Context

Electricity in California

California's growth in the first half of the twentieth century was due in part to the development of ambitious hydroelectric systems. Long-distance transmission lines linked the power generating mountainous regions with valley farms, coastal centers, and distant cities, allowing a pace and scale of development that was previously unimaginable. By the 1920s, this intricate system of hydroelectric facilities, coupled with a growing number of fuel-fired steam plants, fed into long distance transmission lines and a series of substations that transferred and distributed power to locations throughout the state for widespread public use.

In the 1880s, hydroelectric plants provided small-scale electrical development to only isolated companies, such as Standard Consolidated Mining Company in Bodie, CA and other localized concerns. However, by the early 1890s AC technological advancement allowed for a more effective means of transmitting electricity over ever-increasing distances. At the outset of this development, the San Antonio Light and

Power Company constructed a 13 mile, 5,000-volt, transmission line in 1892, with PG&E constructing the Folsom Hydroelectric Plant’s 22 mile, 11,000-volt transmission line in 1895. These distances soon gave way to ever larger transmission capability, with Pacific Light and Power Company’s Big Creek Hydroelectric Project running at 150 kV by 1913. Several small companies began constructing independent and local power plants as well as transmission systems. Post-World War II California residential and industrial development increased, and power companies responded with hydroelectric and steam power electrical generation. Steam power generation, however, proved to be more cost effective and municipalities and other companies began to build power generation plants close to population centers utilizing steam turbines to generate power to meet the increased demands for electricity.

California Steam and Electricity in Los Angeles County

As the City of Los Angeles and Los Angeles County experienced rapid growth during the early decades of the twentieth century, the demands for electricity increased dramatically. Prior to 1916, privately owned companies including Southern California Edison and Pacific Power & Light among others generated most of the electrical power in Los Angeles. British designer Sir Charles Parsons built the first steam turbine-generator in 1884. At the beginning of the twentieth century, engineers designed steam turbines to replace the aging steam engine power plants. Aegidius Elling of Norway is credited in 1903-1904 as being the first to apply the method of injecting steam into the combustion chambers of a gas turbine engine. The greater Los Angeles region had multiple examples of early fuel fired steam plants including the Banning Street Electrical Plant in Los Angles completed in 1883, Los Angeles Steam Plant No. 1 constructed in 1896, Pacific Light and Power Company’s steam plant in Redondo Beach was completed in 1902 and the Glenarm Power Plant constructed in Pasadena in 1906. Within a relatively short time, the technology and capacity of these engines to supply power and electricity grew exponentially. These advances brought electricity to a wide range of industrial and domestic applications; however, the materials needed to withstand the high temperatures of modern turbines were not yet available. Improvements in steam turbines advanced throughout the 1920s and 1930s, leading to a generation of more efficient turbine power plants in the 1950s. During this time, utilities closed or replaced many of the older steam-electric plant generators and constructed more modern units.

Steam power generation was part of California’s power production throughout the twentieth century, though it declined considerably in the period leading up to World War II as large hydroelectric generating plants came online throughout the state. As early as 1920, hydroelectric power accounted for 69% of all electrical power generated. In 1930, that figure had risen to 76%, and by 1940, hydroelectric sources provided 89% of California’s electricity. After World War II this trend reversed and construction of steam-powered electric generating units grew, accounting for most of the new construction. By 1950, hydroelectricity accounted for only 59% of the total power generated, falling to 27% in 1960. Some new hydroelectric plants were built during the 1960s, chiefly associated with federal and state water projects, but by 1970, hydroelectric plants accounted for only 31% of all electricity generated in California. A combination of drought, discovery and tapping of natural gas, and lack of new hydroelectric sites led to its decline.

A persistent drought in California caused the major utilities to question the reliability of systems dependent on abundant water flows, like hydroelectricity. This drought began in 1924 and continued, on and off, for a decade. Concurrently, in the 1920s new natural gas discoveries were made and provided both Northern and Southern California with ample fuel for steam electric power generation. The confluence of these various factors – drought, new steam generator technologies, and new supplies of natural gas – prompted California utilities to begin constructing large steam plants. Steam plants built across the state shared design characteristics including locations close to load centers to reduce transmission costs, easy and efficient access to fuel supplies, near a water supply, on inexpensive land, and on geological formations that could provide a good foundation. By 1930, oil and gas-fired steam power plants accounted for more than half of all new plants under construction in California. The oil and gas-fired steam generation capacity jumped from 1924 at 407,000 kW to over 1 million kW in a mere six years later.

In 1916, the City of Los Angeles' Bureau of Power and Light provided the first municipal power distribution. The Bureau's first power generation plant, San Francisquito 1, was energized the following year. Originally some of Los Angeles' power was supplied by nearby Pasadena, but with the construction of San Francisquito 1, the City of Los Angeles was able to provide Pasadena with electrical power over 34 kV lines. By 1920, the Cities of Burbank, Pasadena, Glendale, and Los Angeles restructured their original charters in order to allow the cities to own power generation facilities and distribute electricity to their residents. After this time, municipalities began to construct larger power generation facilities. The City of Pasadena extended their electrical power distribution system by constructing the Santa Anita and Maryland power substations during the 1930s and the Glenham substation in the early 1950s. In 1941, the City of Burbank added the Magnolia Power Station, the same year as the City of Glendale's Grayson Power Plant. These factors prompted many municipalities, like Glendale to construct power plants of their own.

Early Glendale History

By the turn of the twentieth century, the town of Glendale had already experienced rapid growth resulting, in part, to the promotional efforts of Edgar D. Goode and Dr. D. W. Hunt and their Glendale Improvement Society in 1902. The growth continued with the opening of the Pacific Electric Railroad in 1904, connecting Glendale to Los Angeles. Glendale incorporated as a city in 1906 with a city limits at approximately 1,480 acres and by 1910 the population was 2,742 residents. Power generation in the City of Glendale began in earnest when the citizens voted in favor of a $60,000 bond to create the Glendale Public Service Division that purchased the Glendale Light & Power Company in 1909. By 1910 the system was already strained as energy output was a mere 107,000 kilowatts. To supplement, the city purchased additional electricity from Pacific Power & Light, now part of the Southern California Edison Company.

By 1920, Glendale began annexing neighboring communities boosting the city's population to over 13,000 residents. From 1930 to 1952, Glendale added Whiting Woods and Verdugo Mountains to their city limits a total of 23.6 square miles; two major annexations included New York Avenue (in the La Crescenta area) and Upper Chevy Chase Canyon, and several smaller annexations, which enlarged the city to 29.2 square miles by 1952. By 1950 the population was over 95,700 residents and was considered at the time to be "the fastest growing city in America." However, by the late 1930s the Glendale Public Service Commission, Electric Division could not keep pace with the population increases.

Prior to 1937, Glendale purchased their power from Southern California Edison Company. This supply was supplemented with the completion of Hoover Dam hydroelectric power plant; however, continued growth indicated another plant would be necessary to supplement demand.

History of Grayson Power Plant

Building off the success of the 1920s and early 1930s and seeing the impending probability of an outbreak of hostilities in Europe, utilities and municipalities began constructing a series of oil-fired steam plants across California in the late 1930s. Northern California’s PG&E began construction of three, oil-fired steam-plants located adjacent to oil refineries, in 1939. Southern California municipalities in Burbank and San Diego each completed power plants in 1941.

The City of Glendale began planning for the construction of a new power plant in 1937. However, the city’s plans were met with immediate opposition by Los Angeles Bureau of Power and Light and the Southern California Edison Company, both which supplied the city with electricity. Despite this opposition, the City, led by industrial entities, pushed forward with its plan for construction of a $1.8 million-dollar plant. The City secured the services of Architect Daniel A. Elliott to design the Grayson Power Plant, referred to then as the “Glendale Power & Light” or “Steam Electric Generating Plant.” Elliott designed the steam plant building (Boiler Building) in the Streamline Moderne style. It housed two boilers (Boilers 1A and 1B, and 2), which were manufactured by Combustion Engineering Company Inc. in New York. Located outside on a full-length turbine deck were the two steam turbine-generators, manufactured by General Electric.

Elliott was born in Las Vegas, New Mexico in 1898. He attended University of California at Berkley, earning an architecture degree in 1925. From 1925 through 1932 he served as a designer at the Los Angeles architecture firm of Gilbert Stanley Underwood before getting his architecture license and becoming an architect at the Metropolitan Water District of Southern California. He remained at the water district from 1932 through 1939. During World War II, he worked at Hoover and Montgomery, a firm that specialized in water-related construction projects. Following the end of the war he formed his own architecture practice, one he maintained until his retirement in 1962. Principal examples of his work are water infrastructure, most notably the Colorado River Aqueduct Pumping Plants and F.E. Weymouth Memorial Water Softening and Filtration Plant completed in 1939 and the Burbank Water & Power administrative building in 1949.

Elliott’s original design laid claim to reportedly being the world’s first earthquake-proof power plant, with an approximate 22-foot-deep concrete basement, turbo-generator on an uncovered open deck with a metal covering over the generator to protect from inclement weather, and a building shell built of light steel and stucco filler walls. At its start-up in 1941, the plant was capable of producing 20 megawatts of power. The City had already secured funding for a second unit set to be added in 1945. To meet increasing demands for electricity, a second unit was added in 1947, which included an additional 20-megawatt generator and single boiler increasing the plant’s combined kilowatt capacity of 40 megawatts.

As demand continued to increase, a third unit was constructed in 1953 that included a new addition to the Boiler Building on its north end. The third unit at the plant was completed at a cost of over $3 million. The new integral furnace and superheater steam boiler unit was manufactured by the Babcock & Wilcox Company and the turbine-generator by General Electric. The company of Foster & Wheeler constructed the cooling tower and provided the condenser for Unit 3. Unit 3 also utilized advances in engineering and technology, which allowed for greater steam pressure than Units 1 and 2, which in turn allowed for greater operating efficiency. The steam turbine for Unit 3 is located outside the main building under a removable housing.

Between 1953 and 1954, the Grayson plant generated a total of 122,649 megawatt-hours, supplying most of the power needed for the city with the exception of supplemental power supplied by the Hoover Dam. Five more units were constructed after 1953 and included Unit 4 (1959), Unit 5 (1964), Unit 6 (1972), and Unit 7 (1974). Units 4 and 5 were housed within a new multi-story northern addition to the main Boiler Building, while Units 6 and 7, both simple cycle units, were located to the north of the Boiler Building in separate stand-alone enclosures. The boilers and turbine-generators for Units 4 and 5 were manufactured by Riley Stoker Corporation and General Electric, respectively; Unit 6 gas turbine was manufactured by General Electric; and the Unit 7 gas turbine by the Curtiss-Wright Company.

The portions of the Boiler Building that house Units 1 through 3 maintain Elliott’s original design, however the structure’s shape and detailing shifted with the addition of Units 4 and 5, to a significantly taller, less detailed utilitarian structure located north of the original 1941 boiler structure. As the building was expanded north, lower-level fenestration of the first three phases was repeated but without the vertical glass block panels. Little significant architectural detail was included in Unit 4 & Unit 5’s building expansion. In 1972, the Plant was renamed the “L.W. Grayson Steam-Electric Generating Station” after the City of Glendale General Manager and Chief Engineer, Lauren W. (L.W.) Grayson who at the time was the longest serving employee. Grayson accepted a position at the City of Glendale in 1951. His most notable achievement was in bringing power to Southern California through the Pacific Northwest Intertie.

Unit 8 (Unit 8A and 8BC) was constructed in 1977 and, until the addition of Unit 9 in 2004, was one of the last to be installed at the power plant. These combined cycle units produced more energy more efficiently and with fewer emissions than conventional units as they generated electricity not only from the gas turbine-generators, but also used the exhaust energy to produce steam that generated electricity via the Unit 1 and 2 steam turbine-generators. The new system cost $20 million dollars and at the time, lessened air pollution.

Further environmental improvements to the Plant included the construction of a phosphate removal and treatment plant in 1978. The treatment plant was connected to the Los Angeles-Glendale Water Reclamation Plant by a pipeline, which directly pumped raw reclaimed (recycled) water to the treatment plant for phosphate removal before it was pumped to the Grayson Power Plant as water for the cooling towers. In addition, in the mid-1990’s the Units 3, 4, and 5 boilers were retrofitted with landfill gas burners and from 1994 to 2018, the Plant combined landfill gas containing approximately thirty percent methane gas from the Scholl Canyon Landfill with natural gas to generate power from Units 3, 4, and 5. In the mid-1990’s, these units were also retrofitted with emission control systems and continuous emissions monitoring systems to meet South Coast Air Quality Management District requirements. And in the early 2000’s, Unit 8 was also retrofitted with emission control systems and continuous emissions monitoring systems. The Units 1A and 1B, and 2 boilers were mothballed in the 1990's and are no longer used, however their steam turbines are still utilized with steam supplied from Units 8A and 8BC.

Continuous improvements in efficiency and power generation capacity have been one of the priorities at the Grayson Power Plant throughout its history including the construction of Unit 9, a new 48-megawatt net power generator that was completed in 2004 at a cost of $33.5 million. It replaced Units 6 and 7, two of the older, outdated units, which were subsequently removed. Unit 9 consists of a gas turbine generator, fuel gas compressors, other balance of plant equipment, and an emissions control system to treat the exhaust gas to reduce emissions. The unit is fueled with natural gas and operates during peak hours.

In July 2010, a fire at Cooling Tower 3 caused severe damage to the structure rendering the cooling tower beyond repair and necessitating its replacement. Repairs to other portions of the Plant included the replacement of the superheater tubes in Boiler No. 4 in 2001, among other updates.

In 2020, the power plant generated approximately 7% of the energy needed for the City of Glendale with the remaining power coming from a combination of both local and remote generation (owned and leased), coupled with spot market purchases from a variety of suppliers throughout the Western United States.

Grayson Power Plant Construction Chronology

The earliest known aerial photograph of the Grayson Power Plant site dates to 1952. The 1952 aerial photograph of the site includes the original 1941 Boiler Building and the 1952–1953 addition to the northeast. The photograph shows the Glendale Switchyard located to the northeast of the Boiler Building, and Cooling Tower 1 and Cooling Tower 2 located southwest of the Boiler Building. In the aerial photograph, Cooling Towers 1 and 2 are rectangular structures. Between the Boiler Building and Cooling Tower 1, the photograph shows several auxiliary structures. No other structures were located on the site besides these four resources.

The Plant site expanded between 1952 and 1964. According to the 1964 aerial, the Boiler Building's multi-story addition was constructed, and Unit 5 was completed on its northwest end. The Glendale Switchyard was expanded to the northwest. Several new structures were constructed to the northwest by 1964, including Cooling Tower 3, Cooling Tower 4, and Cooling Tower 5. In addition to these three cooling towers, the 1964 aerial photograph shows a rectangular-shed building, a rectangular garage with two add-ons, and an L- shaped warehouse are located north of the towers as gabled buildings. These additional buildings, however, were not part of the Plant. Instead, they were built for the operations of other sections of the Public Service Department. No changes are evident in Cooling Tower 1 and Cooling Tower 2.

The Plant site between 1964 and 1977 changed significantly. Based on 1977 aerial photograph, Cooling Tower 1 was demolished and replaced with a utility structure addition to the northwest. A chemical storage tank was added between the Unit 1 and 2 cooling towers and an existing one demolished to make room for the addition of Unit 8. A second water treatment (demineralizer) unit was also added to the northwest corner of the Boiler Building. Unit 6 was constructed adjacent to the new demineralizer and the

Boiler Building at its northwest corner. Unit 7 was constructed to the northwest of Unit 6. In addition, Units 8A and 8BC were constructed by 1977 in the middle of the site, between Cooling Towers 1, 2, 3, and 4. A 120-feet diameter fuel tank was constructed south of the Boiler Building.

The open-air Kellogg Switchyard, which was constructed in the mid-1970’s, was expanded to the northwest by 1977 with the removal of half of the oval- shaped parking lot. In addition, three parking sheds, again for use by other sections of the Public Service Department, are constructed between three existing buildings at the northwest end of the site. Based on the 1977 aerial photograph, no visual changes are apparent on Cooling Tower 2, Cooling Tower 3, Cooling Tower 4, and Cooling Tower 5, as well as the superintendents building, garage, and warehouse.

The Plant site changed very little, if at all, between 1977 and 1979.

The Plant site between 1979 and 1981 had one significant change completed, which was the demolition and replacement of Cooling Tower 2.

The Plant site between 1981 and 1989 was little changed. A 1989 aerial photograph shows a new switchyard (Air Way) was added north of the warehouse. The Plant site between 1989 and 1994 had no changes. The Plant site between 1994 and 2002 had one change to the site, which was the removal of the 1972 120’ diameter fuel tank to make room for the future Unit 9 site.

The Plant site between 2002 and 2005 evolved with additional changes. Unit 9 was constructed on the 1972 fuel tank site, which was completed in 2003. In addition, the open-air Kellogg Switchyard continued to expand again to the north, replacing a parking lot. A building to the north of this switchyard was demolished and replaced with a parking lot.

The Plant site between 2005 and 2009 underwent a few changes that included the removal of Units 6 and 7, the addition of office trailers where Units 6 and 7 were, the replacement of the open-air Kellogg switchyard with a new gas insulated switchgear type switchyard (Kellogg GIS), and the demolition of another building north of the Kellogg switchyard. The most significant change in these years is the construction of the Fairmont Avenue—the on-ramp visibly started off the south corner of the plant’s site. Off Fairmont Avenue, the front entrance to the plant site was added off this avenue, fronting the riverside of the property.

The Plant site between 2009 and 2011 was little changed; the most significant change was the relocation of the main entrance from Air Way to Fairmont Avenue. With the entrance changed, a parking lot was constructed, and an on-site parking shed was removed.

The Plant site between 2011 and 2012 included a new structure (office trailer), located northwest of the Boiler Building, to replace an existing smaller office trailer that was previously located on the former site of Unit 6 as well as the construction of a training center, at the northeast corner of the facility, on an existing parking lot.

In conclusion, the only pre-1970 structures that appear to retain their original footprint at the Plant are the Boiler Building, Glendale Switchyard, Cooling Tower 4, Cooling Tower 5, warehouse, superintendents building, garage and two parking sheds. The only pre-1970 structure that remains intact with no modification or alteration is Cooling Tower 5.

Existing Conditions

The Grayson Power Plant site is situated on a 11-acre parcel with its main entrance off Fairmont Avenue. The property is bounded by Flower Street on the north, the railroad right-of-way and San Fernando Road to the east, Fairmont Avenue and the Los Angeles River to the west, and the Verdugo Wash to the south. The site is composed of several buildings and structures that include a Boiler Building, five large cooling towers, five boiler units, four gas turbines, two switchyards, balance of plant equipment, and miscellaneous buildings.

Boiler Building

The Boiler Building is a Streamline Moderne-style steam power generation plant building, initially built in 1941, and expanded in 1953, 1959, and 1964. Facing southeast, the Boiler Building is set on a northwest-southeast axis on the Grayson Power Plant site. Its massing is predominantly rectangular divided into three levels and each elevation is asymmetrical. The older part of the Boiler Building, i.e. that which was originally built in 1941 and later expanded in 1953, is 2 to 3-stories high and constructed with structural steel frame set on a poured concrete pier foundation. The 1959 and 1964 additions rise up to a maximum height of 6 stories. Streamline Moderne details are evident as linear lines in the cementitious paneling, illuminating stringcourses on the building’s upper southeast corner addition, added during a 1959 expansion of the building for Unit 4.

The building has a flat roof topped by metal coping. The exterior of the building is clad with multiple building materials that include horizontal cementitious siding and horizontal metal sheathing that is bolted to the steel framing. The cementitious siding is visible on the interior of the building as well. A Streamline Moderne style-rolling directional crane, which services the turbines and generators, is located on the northeast elevation. Each of the five steam turbines is covered with a Streamline Moderne enclosure. Copper box lettering in the same style is located on the corner and states: “CITY OF GLENDALE/PUBLIC SERVICE DEPARTMENT/STEAM ELECTRIC GENERATING PLANT”. The northeast elevation of the building has a turbine deck with five steam turbine-generators, and the crane. The northwest elevation is where all the other mechanical equipment and boiler stacks are located.

Multiple openings punctuate the elevations of the Boiler Building on all elevations. The Boiler Building retains its original windows, which include structural glass blocks on the northeast elevation and metal-framed industrial awning windows on the southeast elevation.

Currently, the building houses six boilers (1A, 1B, 2,3,4, and 5) and a centrally located control room. A second control room is located at the northwest corner of the building. The interior of the building is open with a catwalk or mezzanine floor of metal grating constructed on the west wall used in operating the power equipment that include the boilers and steam turbines, which are attached to the concrete floor platforms. The corresponding boiler stacks are located on the exterior of building along the west wall.

Generating Units

The Grayson Power Plant has six generating Units in total comprising of six boilers, three of which have been mothballed (i.e. Units 1A, 1B, and 2) (meaning they have been put in storage), five steam turbines, two of which are part of the combined cycled units (i.e. 8A and 8BC), and four gas turbines, two of which drive a single generator (i.e. 8BC), that range in construction dates. Units 8A and 8BC, the two combined cycle units, utilize gas turbines similar to what was used on a Boeing 707 aircraft, to drive two heat recovery generators. The unit's exhaust heat is used to power the first two steam turbines (i.e. Units 1 and 2) constructed at the plant.

Tables 4-2 through 4-5 below note the construction and alteration dates of components and structures on the Plant site. The "Architectural Integrity" column notes whether or not components/structures over 45 years of age have been substantially altered. If a component or structure is noted as retaining architectural integrity, it has not been substantially altered from its date of construction.

Table 4-2 Construction and Alteration Dates of Boiler Units

Unit No.	**Built Date[1]**	**Alteration Dates[2]**	**Architectural Integrity Yes/No?**
Unit 1[3]	1941	Intact; Mothballed	No
Unit 2	1947	Intact; Mothballed	No
Unit 3	1953	Modified 1994	No
Unit 4	1959	Modified 1994	No
Unit 5	1964	Modified 1994	No
Unit 6	1972	Demolished	N/A
Unit 7	1974	Demolished	N/A
Unit 8A and 8BC	1977	Intact	N/A (less than 45 years old)
Unit 9	2003	Intact	N/A (less than 45 years old)

[1] Built Dates from the City of Glendale Department of Water & Power.

[2] Aerial analysis from 1952-2005 at the Nationwide Environmental Tile Research, LLC (NETR), www.historicaerials.com.

[3] Unit 1 includes boilers 1A and 1B.

As utilitarian structures, the exterior surfaces of the boiler units are constructed of metal with various pipes and venting systems throughout. Units 1A, 1B, 2, 3, 4 and 5 boilers are located within the Boiler Building. Boilers 1A, 1B, and 2 have been mothballed. Units 3, 4 and 5 were retrofitted in 1994 with landfill gas burners and emissions control and monitoring systems. Oil tanks, adjacent and connected to the units have been removed or retired. Units 6 and 7 were demolished in 2003. Units 8A and 8BC, were constructed in 1977, and are not 45-years old or older, and therefore were not considered for the purposes of this evaluation. The last unit added to the plant was Unit 9, built in 2003.

Cooling Towers

The Grayson Power Plant has five large cooling towers consisting of Units 1-5 and two smaller cooling towers (an auxiliary tower and a Unit 9 cooling tower) located on the property, which were initially constructed between 1941 and 2003.

Table 4-3 Construction and Alteration Dates of Cooling Towers

Cooling Tower No.	Built Date[1]	Alteration Dates[2]	Architectural Integrity Yes/No?
Auxiliary Cooling Tower	1941	Intact	Yes
Cooling Tower 1	1941	Altered 1977	No
Cooling Tower 2	1947	Altered 1977	No
Cooling Tower 3	1953	Burned & rebuilt in 2010	No
Cooling Tower 4	1959	Intact	No
Cooling Tower 5	1964	Intact	No
Unit 9 Cooling Tower	2003	Intact	NA (less than 45 years)

1 Built Dates from the City of Glendale Department of Water & Power.

2 Aerial analysis from 1952-2005 at the Nationwide Environmental Tile Research, LLC (NETR), www.historicaerials.com.

Each large cooling tower is associated with one steam turbine, such as Cooling Tower 1 is associated with the Unit 1 steam turbine, and, with the exception of the Unit 5 cooling tower, is set on a reinforced poured concrete fuel oil tank that is located belowground. The towers' walls are between 2-3-feet thick and are poured concrete walls that enclose the tanks. Each large cooling tower has a unique number of fans that vary from 4 to 8 on top. Cooling Towers 1 and 2 are designed with four fans, which has splayed fiberglass or plastic sidewalls, while Cooling Tower 3 is constructed with six fans, Cooling Tower 4 has eight fans, and Cooling Tower 5 has five fans. Additional features of the cooling towers include a louvered wall for Units 2 and 5, which provides cross-flow air circulation to cool the water from the steam turbine condensers and wooden roof decks.

All the large cooling towers, with exception of Cooling Towers 4 and 5, have been either rebuilt or significantly altered. Cooling Tower 1 was altered in 1977 when it was demolished and rebuilt for the Unit 8 project with the construction of a maintenance shop east of the tower. Cooling Tower 2 was altered in 1977 when it was demolished and rebuilt for the Unit 8 project with a reduced number of fans (from twelve fans to four fans). Cooling Tower 3 caught fire and was significantly damaged in 2010; as a result, it was demolished and rebuilt. Cooling Tower 5 is the only tower that appears to have not been altered. Of the five large cooling towers located on the Plant site, only one tower has architectural integrity, meaning it has not been substantially altered or rebuilt in any way since its original construction over 45 years ago.

Switchyards

There are two switchyards on the Grayson Power Plant property east of the Boiler Building. They are labeled as the Kellogg GIS and the Glendale switchyards and are located adjacent to the railroad right-of-way as well as parallel with San Fernando Road.

Table 4-4 Construction and Alteration Dates of Switchyards

Switchyard	Built Date[1]	Alteration Dates[2]	Architectural Integrity Yes/No?
Glendale	1941	1953-1972	No
Kellogg (open-air)	1974	1977; demolished 2009	No
Kellogg GIS	2005	N/A	N/A (less than 45 years old)

[1] Built Dates from the City of Glendale Department of Water & Power.

[2] Aerial analysis from 1952-2005 at the Nationwide Environmental Tile Research, LLC (NETR), www.historicaerials.com

The switchyards are used as part of the power grid in transferring power into lines; the switchyards are not 45 years old or older and were constructed between 2005 to the present, which included new equipment. One switchyard, Kellogg GIS, is not 45 years old or older, whereas the Glendale switchyard has been altered and expanded over time.

Grayson Power Plant, Miscellaneous Buildings

Five miscellaneous utilitarian buildings are located on the Grayson Power Plant site northwest of the Boiler Building. These five buildings are typical gable or flat-roof buildings with roll-up doors and aluminum sliding glass windows. The parking sheds are flat-roof open structures where vehicles are housed. None of these buildings will be impacted by the proposed project.

Table 4-5 Construction and Alteration Dates of Miscellaneous Buildings at Plant

Building	Built Date[1]	Alteration Dates[2]	Architectural Integrity Yes/No?
Superintendents building	c.1964	Intact	Yes
Warehouse	c.1964	Intact	Yes
Garage	c.1964	Intact	Yes
Parking sheds (2)	1977	Not Historic	N/A (less than 45 years old)

[1] Built Dates from the City of Glendale Department of Water & Power.

[2] Aerial analysis from 1952-2005 at the Nationwide Environmental Tile Research, LLC (NETR), www.historicaerials.com

Identified Historical Resources on the Project Site

Generally, a lead agency must consider a property a historical resource under CEQA if it is eligible for listing in the California Register of Historical Resources (CRHR) (PRC Section 5024.1 and 14 California Code or Regulations [CCR] Section 4850 & Section 15064.5[a][2]). The CRHR is modeled after the National Register of Historic Places (NRHP). Properties listed in, or determined to be eligible for listing in, the NRHP or CRHR are mandatory historical resources, and the lead agency must treat such properties as historical resources under CEQA.

A property is presumed to be historically significant if it is listed in a local register of historical resources or has been identified as historically significant in a historic resources survey (provided certain statutory criteria and requirements are satisfied) unless a preponderance of evidence demonstrates that the property is not historically or culturally significant (PRC Section 5024.1 and 14 CCR Section 4850 & Section 15064.5[a][2]). The City of Glendale maintains the Glendale Register of Historic Resources. Properties included in a local register or identified in a historic resources survey are commonly considered by the lead agency to be presumptive historical resources under CEQA.

Finally, a lead agency may use its discretion to treat a resource as if it meets statutory requirements for the purposes of CEQA (PRC Section 5024.1 and 14 CCR Section 4850 & Section 15064.5[a][2]). These are discretionary resources and may be deemed significant if substantial evidence supports the conclusion regardless of any official listing in a historical register.

Refer to the Laws Ordinances Regulations, and Standards (LORS) section below for more information regarding the NRHP, CRHR, and City of Glendale Register of Historic Resources.

As part of the Historic Resource Inventory and Evaluation Report prepared by Stantec in 2015 and revised in 2018 and 2020, Stantec conducted archival research on the Grayson Power Plant and documented the site taking digital photographs of building exteriors and select building interiors. As many of the existing buildings and structures at the site are over 45 years of age, the Grayson Power Plant was evaluated for national, state, and local listing. The boundary of the potential historical resource was the property boundary associated with the Grayson Power Plant site.

After careful inspection, investigation, and evaluation, Stantec concluded that the Grayson Power Plant is ineligible for listing in the NRHP, CRHR, and City of Glendale Historic Register due to a lack of integrity. Stantec determined that the Plant is not associated with important events and does not exemplify significant contributions to the broad cultural, political, economic, social, or historic heritage of the nation, state, or city; therefore, it is ineligible under Criterion A/1/1. Stantec found no evidence that the property has any important associations with any person or persons who made significant contributions to history at the local, state, or national level; therefore, it is ineligible under Criterion B/2/2. While it is reportedly an early example of a power plant with an earthquake resistant design, Stantec concluded that the Plant has been substantially altered since its construction in 1941 and no longer retains integrity. For this reason, it is ineligible under Criterion C/3/3. Stantec determined that the property does not appear likely to yield significant informational associations under Criterion D/4/4 as the Plant does not appear to yield information important to archaeological pre-history or history of the nation, state, region, or city. Finally, the property’s integrity of design, materials, workmanship, and feeling has been diminished due to the cumulative impact of alterations over time described within the Grayson Power Plant Construction Chronology section above.

After Stantec completed its initial evaluation in 2015, the Project site was evaluated for listing in the NRHP and CRHR by GPA Consulting (GPA) in 2016 as part of the preparation of a Historic Architectural Survey Report (HASR) for the California High-Speed Rail (HSR) Authority Burbank to Los Angeles Project Section. GPA concluded that while the Grayson Power Plant is ineligible for listing in the NRHP and CRHR as a whole, the Boiler Building individually meets the criteria for listing in the NRHP and CRHR as a locally significant example of a property associated with the developmental history of power generation in Glendale under Criterion A/1. The State Historic Preservation Officer (SHPO) concurred with GPA's findings in the HASR in a letter to the HSR Authority dated May 2, 2019, including the determination that the Boiler Building was eligible for listing in the NRHP.

In their study, GPA refers to the Boiler Building as the "Grayson Steam-Electric Generating Station" and notes that the City of Glendale constructed the steam-electric generating plant in 1941 in order to provide sufficient power to a growing population after World War II. The period of significance was identified as 1941 to 1955, which encompasses the date of construction for the Boiler Building through the year the Grand Central Air Terminal was redeveloped into the Grand Central Industrial Center. GPA determined the Boiler Building eligible under Criterion A/1 as noted above, and ineligible under Criteria B/2, C/3, and D/4. Lastly, the 2016 study concluded that the Boiler Building retains integrity of location, materials, design, workmanship, feeling, and association. However, GPA concluded that the integrity of setting has been diminished by ongoing development on the site and in the area since the property's construction.

The Glendale Historical Society (TGHS) sent a letter to the City of Glendale Community Development Department dated November 19, 2017 with comments on the Grayson Repowering Project Draft Environmental Impact Report (Draft EIR). TGHS determined that the Boiler Building, referred to in their letter as the Grayson Steam Electric Power Plant, may be eligible for listing in the NRHP, CRHR, and City of Glendale Historic Register for its important association with the history of local development as well as for the significance of its design. TGHS wrote that the power generated by the Boiler Building following its completion in 1941 helped fuel Glendale's post-war growth, and therefore is significant under CRHR Criterion 1 for its important association with the history of Glendale's development. TGHS asserted that the Boiler Building is significant for its association with Chief Engineer and General Manager Lauren W. Grayson under CRHR Criterion 2. TGHS wrote that the Boiler Building is an excellent example of Stripped Classicism and the work of master architect Daniel Anthony Elliot under CRHR Criterion 3, as well as notable for its engineering and construction methods as an early example of an earthquake proof power plant. Additionally, TGHS concluded that although diminished by subsequent alterations, the Boiler Building retained integrity of location, design, workmanship, materials, association, and feeling.

The 2016 Initial Study found Cultural Resources to be a less than significant impact and was therefore not carried forward for further evaluation into the Draft EIR. The 2016 Resource Study evaluated the Project per the CRHR and GRHR and found the structures not eligible for listing on the State or local registers under CRHR Criterions 1, 2, 3, 4, and GRHR Criterion 5. Based on previous studies and the 2016 Resource Study, the Project would not cause a substantial adverse change to the significance of historical resources as defined in Section 15064.5, nor would the Project have impacts on significant local resources as defined in Chapter 15.20 of the City of Glendale Municipal Code.

Based upon comments received during the public review of the DEIR for the Project, Stantec revised the Historic Resources Inventory and Evaluation Report and DPR-523 form for the Grayson Power Plant in 2018. Comments include several clarifications, which support the conclusion that the Grayson Power Plant is not an historic resource eligible for listing in the National Register of Historic Places, the California

Registry of Historical Resources or the Glendale Register. Where noted, revisions were made to the Architectural Resource Evaluation. The Architectural Resource Evaluation was re-titled “Historic Resource Inventory and Evaluation” to make it consistent with information provided. The revised Architectural Resource Evaluation was included as Appendix A to the 2018 Final EIR. It was also established that the Project is not considered an “undertaking” subject to Section 106 of the National Historic Preservation Act and is not subject to compliance with the National Environmental Policy Act.

Additionally, the 2018 revised report included an introduction with the project location and description, identified the area of potential effect (APE) for the redevelopment project, noted team qualifications, described research and field methods, and included an in-depth historic context which covers the history of electricity in California, steam generation in Los Angeles County, Glendale history, and the history and evolution of the power plant.

As part of the California HSR Authority’s public comment process for their DEIR, the City of Glendale submitted a public comment letter to the California HSR Authority dated August 31, 2020, providing comments on the California High-Speed Rail Project, Burbank to Los Angeles Project Section Draft EIR. In the letter, the City asked the HSR Authority to reconsider GPA’s 2016 determination of eligibility for the Boiler Building based on information outlined in Stantec’s revised 2018 report. The City disagreed with GPA’s assessment that the Boiler Building retained integrity. The City reported that the Boiler Building has undergone numerous alterations since the end of the period of significance identified by GPA (1941–1955). Most notably a multi-story addition on the north end of the building was added between 1959 and 1964. Furthermore, the City noted that the GPA study does not address why the year 1955 is significant to the history of the Boiler Building. By choosing 1955, the GPA study suggests that the Power Plant’s significance is derived to its association with the Grand Central Air Terminal. However, the City noted that there is no historic context to support this assertion; the airfield was developed in 1928, whereas the Power Plant was constructed 13 years later.

On November 3, 2020, the HSR Authority forwarded the City of Glendale’s August 31, 2020 letter to the California SHPO as part of their continuing consultation regarding the Burbank to Los Angeles Project Section of the California HSR. In their letter, the HSR Authority requested SHPO concurrence with the City’s determination that Grayson Power Plant is ineligible for listing in the NRHP. Julianne Polanco, SHPO, responded to the HSR Authority on December 3, 2020. After reviewing the November 3, 2020 submittal, the SHPO concurred that the Grayson Power Plant is ineligible for listing on the NRHP under all criteria for the reasons outlined in Stantec’s revised DPR 523 form.

Since 2020, the City has been consulting with TGHS regarding the Project. This consultation has included a visit to the Project site and multiple meetings and conference calls between City staff, Project consultants, and representatives from TGHS. As a result of this consultation, the City has elected to exercise its discretion to consider the Boiler Building a discretionary historical resource for the Project as defined by CEQA (PRC Section 5024.1 and 14 CCR Section 4850 & Section 15064.5[a][2]), and to adopt feasible mitigation measures to compensate for demolition of the Boiler Building. These mitigation measures will include recordation to Historic American Engineering Record standards, display of photography of the Boiler Building, provision of identifying signage and informational plaque located on

Flower Street near the Grayson Power Plant entrance, provision of identifying signage and informational plaque located on Flower Street and the display and interpretation of an original piece of Boiler Building equipment in a public location.

Previously Identified Historical Resources in the Vicinity of the Project Site

As the Project involves new construction, adjacent parcels within a 100-foot radius from the center of the Project site were surveyed to account for potential impacts on historical resources in the vicinity. Parcels beyond the 100-foot radius were not included because the Project would have no potential to directly or indirectly impact the buildings on these distant parcels or their surrounding setting. The buildings, and streets immediately surrounding the Project site as well as the Los Angeles River to the west, the Verdugo Wash to the south, and railroad right-of-way to the east create a geographic and visual separation between the parcels beyond the 100-foot radius and the Project site. The Project site therefore cannot be reasonably considered part of the environmental setting of historical resources beyond the 100-foot due to this intervening space.

To identify historical resources in the Project's vicinity for this analysis, the following resources were consulted:

Consulted the California Office of Historic Preservation (OHP) Built Environment Resource Directory (BERD) to determine if the 100-foot radius contains any properties listed and determined eligible for listing in the National Register, listed and determined eligible for listing in the California Register, or that had been evaluated in historic resource surveys and other planning activities.

Consulted the Glendale Register of Historic Resources to determine if the 100-foot radius contains any properties listed in the local register.

The results of this research are that there are no previously identified historical resources in the vicinity of the Project site.

4.12.2 Laws, Ordinances, Regulations, and Standards (LORS)

Table 4-6 Applicable Federal, State, Local LORS for Cultural Resources

LORS	Administering Agency
Federal	
National Historic Preservation Act	National Park Service
State	
California Public Resource Code	State Historical Resources Commission
Local	
City of Glendale Municipal Code	City of Glendale

Table 4-7 Applicable Federal, State, Local LORS for Paleontological Resources

LORS	Administering Agency
State	State of California
California Environmental Quality Act	State of California
California Public Resource Code	State of California
California Code of Regulations	
Local	
City of Glendale General Plan	City of Glendale
Professional Standards	
Society of Vertebrate Paleontology	Society of Vertebrate Paleontology

Cultural Resources

Federal LORS

The National Historic Preservation Act (NHPA) of 1966, as amended, authorized the creation of the NRHP. The NRHP is "an authoritative guide to be used by federal, state, and local governments, private groups, and citizens to identify the nation's cultural resources and to indicate what properties should be considered for protection from destruction or impairment" (Title 36 Code of Federal Regulations [CFR] Part 60.2). For a property to be considered for inclusion in the NRHP, it must typically be at least 50 years old and meet one or more of the four criteria for evaluation set forth in 36 CFR Part 60.4, as follows:

> *The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of design, setting, materials, workmanship, feeling, and association and:*

> *A) That are associated with events that have made a significant contribution to the broad patterns of our history; or*
>
> *B) That are associated with the lives of persons significant in our past; or*
>
> *C) That embody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master or that possess high artistic values or that represent a significant and distinguishable entity whose components may lack individual distinction; or*
>
> *D) That have yielded, or may be likely to yield, information important in prehistory or history.*

A property must also be significant within a historic context under one or more of the criteria listed above. "National Register Bulletin: How to Apply the National Register Criteria for Evaluation" states that the significance of a historic property can be judged only when it is evaluated within its historic context. Historic contexts are "those patterns, themes, or trends in history by which a specific...property or site is understood and its meaning...is made clear" (National Park Service [NPS] 2002). A property must therefore represent an important aspect of the area's history or prehistory.

In addition to possessing significance, a property must possess integrity, defined by seven aspects as follows:

> *Location: the place where the historic property was constructed or the place where the historic event took place.*
>
> *Design: the composition of elements that constitute the form, plan, space, structure, and style of a property.*
>
> *Setting: the physical environment of a historic property that illustrates the character of the place.*
>
> *Materials: the physical elements combined in a particular pattern or configuration.*
>
> *Workmanship: the physical evidence of the crafts of a particular culture or people during any given period of history.*
>
> *Feeling: the quality that a historic property has in evoking the aesthetic or historic sense of a past period of time.*
>
> *Association: the direct link between a property and the event or person for which the property is significant.*

State LORS

The CRHR was established in 1992 by Assembly Bill 2881. It is an authoritative guide used by state and local agencies, private groups, and citizens to identify historical resources and to indicate what properties are to be protected, to the extent prudent and feasible, from substantial adverse impacts (PRC Section 5024.1[a]). The criteria for eligibility of listing in the CRHR are based upon NRHP criteria, but are identified as 1-4 instead of A-D. To be eligible for listing in the CRHR, a property generally must be at least 50 years of age and must possess significance at the local, state, or national level, under one or more of the following four criteria:

1. It is associated with events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States; or
2. It is associated with the lives of persons important to local, California, or national history; or
3. It embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values; or
4. It has yielded, or has the potential to yield, information important in the prehistory or history of the local area, California, or the nation.

Like the NRHP, properties eligible for listing in the CRHR may include buildings, sites, structures, objects, and historic districts. While the enabling legislation for the CRHR is less rigorous with regard to the issue of integrity, there is the expectation that properties retain enough of their historic character or appearance to be recognizable as historical resources and to convey the reasons for their significance (California OHP 2001).

Evaluations for the CRHR are based upon the evaluation instructions and classification system prescribed by the California OHP in its “Instructions for Recording Historical Resources,” which include Status Codes for use in classifying potential historical resources. These Status Codes are used statewide in the preparation of historical resource surveys and evaluation reports. The specific Status Codes referred to in this analysis are as follows:

2S2	Individual property determined eligible for the NRHP by a consensus through the Section 106 process. Listed in the CRHR.
3S	Appears eligible for NRHP as an individual property through survey evaluation.
5S1	Individual property that is listed or designated locally.
6Z	Ineligible for the NRHP, CRHR, and local designation through survey evaluation.

The CRHR may also include properties identified during historic resource surveys. However, the survey must meet all of the following criteria:

1. The survey has been or will be included in the State Historic Resources Inventory;
2. The survey and the survey documentation were prepared in accordance with office [SOHP] procedures and requirements;
3. The resource is evaluated and determined by the office [SOHP] to have a significance rating of Category 1 to 5 on a DPR Form 523; and
4. If the survey is five or more years old at the time of its nomination for inclusion in the California Register, the survey is updated to identify historical resources that have become eligible or ineligible due to changed circumstances or further documentation and those that have been demolished or altered in a manner (PRC Section 5024.1).

Local LORS

The City of Glendale adopted the Historic Preservation Ordinance in 1985 (Glendale Municipal Code Section 15.20) and amended it in 2020. The Historic Preservation Ordinance created the Glendale Register of Historic Resources and established the criteria for listing. The four criteria for listing in the Glendale Register of Historic Resources are listed below:

A. The resource is identified with important events in national, state, or city history, or exemplifies significant contributions to the broad cultural, political, economic, social, tribal, or historic heritage of the nation, state, or city, and retains historic integrity.

B. The resource is associated with a person, persons, or groups who significantly contributed to the history of the nation, state, region, or city, and retains historic integrity.

C. The resource embodies the distinctive and exemplary characteristics of an architectural style, architectural type, period, or method of construction; or represents a notable work of a master designer, builder, or architect whose genius influenced his or her profession; or possesses high artistic values and retains historic integrity.

D. The resource has yielded, or has the potential to yield, information important to archaeological pre-history or history of the nation, state, region, or city, and retains historic integrity.

The 2020 amended Ordinance defines historic integrity as:

> The authenticity of a resource's historic identity, evidenced by the survival of physical characteristics that existed during the resource's prehistoric or historic period and which allow it to continue to convey its significance. Historic integrity is the composite of seven aspects or qualities: location; design; setting; materials; workmanship; feeling; and association (as defined by the National Park Service). All seven aspects or qualities do not need to be present for eligibility for designation as a historic resource as long as the overall sense of past time and place is evident (Glendale Municipal Code Section 15.20.050).

Unlike the NRHP, properties do not have to reach a minimum age requirement, such as 50 years, to be listed in the Glendale Register of Historic Resources.

4.12.3 Paleontological Resources

State LORs

California Environmental Quality Act

The California Environmental Quality Act (CEQA) requires that before approving most discretionary projects, the Lead Agency must identify and examine any significant adverse environmental effects that may result from activities associated with such projects. The Appendix G checklist (Title 14, Division 6, Chapter 3, California Code of Regulations [CCR] 15000 et seq.) includes the following threshold of significance: "Will the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?"

California Public Resources Code

The California Public Resources Code (PRC) (Chapter 1.7, Sections 5097 and 30244) includes additional state-level requirements for the assessment and management of paleontological resources. These statutes require reasonable mitigation of adverse impacts to paleontological resources resulting from development on state lands, define the removal of paleontological sites or features from state lands as a misdemeanor, and prohibit the removal of any paleontological site or feature from state land without permission of the applicable jurisdictional agency.

California Code of Regulations

The California Code of Regulations (CCR) 14 Section 4307, Geological Resources, recognizes paleontological resources for preservation, establishing that paleontological resources cannot be destroyed, disturbed, mutilated, or removed. Furthermore, CCR 20 Appendix B establishes the environmental information necessary for permit applications, including a discussion of geologic and paleontological setting, paleontological sensitivity assessment, museum records searches and relevant locality information, and a discussion of necessary mitigation measures for the protection of resources.

Local LORs

City of Glendale General Plan

The Open Space and Conservation Element of the City of Glendale General Plan (City of Glendale, 1998) recognizes paleontological resources in the Open Space and Conservation Plan under Policy 3: Cultural, historical, archaeological and paleontological structures and sites are essential to community life and identity and should be recognized and maintained (1998, Chapter 3).

Professional Standards

The Society of Vertebrate Paleontology (2010), the Bureau of Land Management (BLM) (2016) and a number of scientific studies (Eisentraut and Cooper, 2002; Murphey et al., 2019; Scott and Springer, 2003) have developed guidelines for professional qualifications, conducting paleontological assessments, and developing mitigation measures for the protection of paleontological resources. These guidelines are broadly similar, and include the use of museum records searches, scientific literature reviews, and, in some cases, field surveys to assess the potential of an area to preserve paleontological resources. Should that potential be high, accepted mitigation measures include paleontological monitoring, data recordation of all fossils encountered, collection and curation of significant fossils and associated data, and in some cases screening of sediment for microfossils.

The Society of Vertebrate Paleontology has developed a paleontological potential ranking system. These rankings are designed to inform the development of appropriate mitigation measures for the protection of paleontological resources and are widely accepted as industry standards in paleontological mitigation (Murphey et al. 2019; Scott and Springer 2003). These rankings are as follows:

> **High Potential**. Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources. Rock units classified as having high potential for producing paleontological resources include, but are not limited to, sedimentary formations that are temporally or lithologically suitable for the preservation of fossils (e. g., middle Holocene and older, fine-grained fluvial sandstones, argillaceous and carbonate-rich paleosols, cross-bedded point bar sandstones, fine-grained marine sandstones, etc.), some volcaniclastic formations (e. g., ashes or tephras), and some low-grade metamorphic rocks.

> **Low Potential**. Rock units that are poorly represented by fossil specimens in institutional collections or, based on general scientific consensus, only preserve fossils in rare circumstances (e. g., basalt flows or recent colluvium) have low paleontological potential.
>
> **No Potential**. Some rock units have no potential to contain significant paleontological resources, for instance high-grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites).
>
> **Undetermined Potential**. Rock units for which little information is available in the literature or museum records concerning their paleontological content, geologic age, and depositional environment are considered to have undetermined potential. Further study and field work is necessary to determine if these rock units have high or low potential to contain significant paleontological resources.

4.12.4 Environmental Impacts

4.12.5 Cultural Resources

Methodology

Under CEQA, the evaluation of impacts to historical resources consists of a two-part inquiry: (1) a determination of whether the Project Site contains or is adjacent to a historically significant resource or resources and, if so, (2) a determination of whether the proposed project will result in a “substantial adverse change” in the significance of the resource or resources. A discussion of the identification aspects of CEQA compliance for this Project are described above under the Environmental Setting section.

The State CEQA Guidelines set the standard for determining whether a proposed project will result in a “substantial adverse change” in the significance of historical resources in Title 14 CCR Section 15064.5(b), which states:

> A project with an effect that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment.

Title 14 CCR Section 15064.5(b)(1) further clarifies “substantial adverse change” as follows:

> Substantial adverse change in the significance of an historical resource means physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired.

Title 14 CCR Section 15064.5(b)(2) in turn explains that a historical resource is “materially impaired” when a project:

> Demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by a lead agency for purposes of CEQA.

As such, the test for determining whether or not a proposed project will have a significant impact on an identified historical resource is whether or not the project will alter in an adverse manner the physical integrity of the historical resource such that it would no longer be eligible for listing in the NRHP or CRHR or other landmark programs such as the Glendale Register of Historic Resources.

This analysis considers direct and indirect impacts to historical resources using the following definitions of each:

- Direct or primary impacts are caused by the project and occur at the same time and place (14 CCR Section 15358 [a][1]).
- Indirect impacts, or secondary effects, are reasonably foreseeable and caused by a project but occur at a different time or place (14 CCR Section 15358 [a][2]).

4.12.6 Paleontological Resources

Methodology

Under CEQA, a paleontological assessment must answer the following question in the Appendix G checklist: “Will the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?” The destruction of paleontological resources would thus constitute an adverse impact under CEQA.

The paleontological assessment and this section evaluate 1) if paleontological resources may be present in the Project area and, if so, 2) would the proposed Project activities risk damaging those resources. In order to address this, background research was conducted consisting of a review of the scientific literature, the most recent geologic mapping, and geotechnical investigations that have been conducted in the Project area (Stantec, 2016b), and a paleontological records search from the Natural History Museum of Los Angeles County (LACM, 2021). The results of this background research were then used to rank the geologic units present at the Project area, either at the surface or in the subsurface, on the paleontological potential scale of the Society of Vertebrate Paleontology (2010).

Results

Paleontological Setting

The Grayson Power Plant is located in the Los Angeles Basin, at the northern end of the Peninsular Ranges and bounded to the north by the Transverse Ranges and to the east by the Mojave Desert (Norris and Webb 1990). The Los Angeles Basin developed as a result of tectonic forces and the San

Andreas fault zone, with subsidence occurring 18 – 3 million years ago (Mya) (Critelli et al. 1995). While sediments dating back to the Cretaceous (66 Mya) are preserved in the basin, continuous sedimentation began in the middle Miocene (around 13 million years ago) (Yerkes et al., 1965). Since that time, sediments have been eroded into the basin from the surrounding highlands, resulting in thousands of feet of accumulation (Yerkes et al., 1965). Most of these sediments are marine, until sea level dropped in the Pleistocene and deposition of the approximately 1,000 feet of alluvial sediments that compose the uppermost units in the Los Angeles Basin began.

Paleontological Potential of the Project Area

Geologic mapping of the Project Area indicates the surficial geology at and around the Grayson Power Plant is alluvium that dates from 1000-10,000 years ago (Holocene) (Yerkes, 1996). These sediments consist of unconsolidated silt, sand, and gravel. Geotechnical borings conducted in the Project area evaluated 16 borings that extended to depths of 11-50 feet below ground surface (bgs). These borings indicate the subsurface of the Project area is predominantly sands, with lenses of silt, clay, and clayey sands beginning at around 15 feet bgs (Stantec, 2016b). The increase of fine sediments and absence of coarse materials in the subsurface indicate a lower energy depositional setting, which is conducive to the preservation of fossil resources.

At the surface these sediments are too young to preserve fossil resources (i.e., under 5,000 years in age, as per the Society of Vertebrate Paleontology [2010]), these sediments increase in age with depth, and therefore fossil resources may be encountered in the deeper levels of this unit. While the exact depth at which the transition to older sediments in which fossils might be preserved is not known, fossils have been discovered in the Los Angeles Basin as shallowly as 5-10 feet below ground surface (Jefferson, 1991a and b; Miller, 1941). Alluvial sediments that date to the middle Holocene or beyond have a rich fossil history in southern California. The most common fossils include the bones of mammoth, bison, horse, lion, cheetah, wolf, camel, antelope, peccary, mastodon, capybara, and giant ground sloth, as well as small animals such as rodents and lizards (Hudson and Brattstrom, 1977; Jefferson, 1991a and b; McDonald and Jefferson, 2008; Miller, 1941, 1971; Roth, 1984; Scott, 2010; Springer et al. 2009).

The Los Angeles County Museum of Natural History has records of numerous Pleistocene-aged fossil localities in the Los Angeles Basin. The closest of these to the Project area are shown in Table 4-8 below (LACM, 2021). While the depths of discovery are not documented for all sites, the recorded depths begin as shallowly as 11 feet below ground surface. Fossils found at these sites include the remains of iconic Ice Age animals including sabertooth cat, mammoth, mastodon, and giant ground sloth, as well as bison, horse, and camel (LACM, 2021).

Table 4-8 Results of the Paleontological Records Search from the LACM

Locality Number	Proximity to Project Area	Location	Fossil Materials	Depth
LACM VP CIT342	2 miles	Sparkletts property near 45th St and Highland Park near 45th & Lincoln in Highland Park	Mammoth (*Mammuthus*), Bison (*Bison*)	14 ft bgs

Locality Number	**Proximity to Project Area**	**Location**	**Fossil Materials**	**Depth**
LACM VP 6297-6299	3.4 miles	Metro Rail Red Line Hollywood Blvd. subway tunnel, from St. Andrews Place to Western Ave.	Horse (*Equus*), Bison (*Bison*), Mastodon (*Mammut americanum*)	47 ft bgs
LACM VP 1023	3.8 miles	Workman St. and Alhambra St.	Sabertooth cat (*Smilodon*), horse (*Equus*), deer (*Odocoileus*), Turkey (*Meleagris*)	Unknown
LACM VP 6970	7 miles	Lankershim Blvd. and Bloomfield St.	Ground Sloth (*Glossotherium*), Camel (*Camelops*); Bison (*Bison*)	60-80 ft bgs
LACM VP 6208	12.5 miles	Burbank Blvd. and Kester Ave.	Bison (*Bison*)	20 ft bgs
LACM VP 3263	12.5 miles	5112 Kester Ave.	Horse family (Equidae)	11-20 ft bgs

The review of paleontological literature and geologic mapping presented above indicates that while the alluvium present at the surface of the Project area is too young to preserve fossil resources, deeper sediments have a demonstrated record of preserving significant fossil resources in the Los Angeles Basin beginning at around 10 feet in depth. Therefore, the Project area is assessed as having Low-to-High paleontological potential, increasing with depth, following the guidelines of the Society of Vertebrate Paleontology (2010).

Should the Project involve excavations into previously undisturbed sediments at depths of greater than approximately 10 feet bgs, the Project would risk damage or destruction of paleontological resources.

4.12.7 Cultural Resources Project Impacts

Threshold: Would the Project cause a substantial adverse change in the significance of a historical resource pursuant to § 15064.5?

As discussed above, the lead agency has elected to consider the Boiler Building a discretionary historical resource pursuant to CEQA and thus potential direct and indirect Project impacts were analyzed based on this determination.

Demolition

The Boiler Building is a discretionary historical resource and is located on the Project site. It would be demolished as part of the Project. The Project would therefore have a direct impact on the Boiler Building and would cause a substantial adverse change in the significance of a historical resource as defined in 14 CCR Section 15064.5. Mitigation Measures CR-1, CR-2, and CR-3 would be implemented to reduce this potentially significant impact but would not reduce this impact to less than significance.

As noted in the Environmental Setting section, there are no previously identified historical resources in the vicinity of the Project site. Therefore, the demolition of existing buildings and structures on the Project site would have no indirect impact on identified historical resources in the vicinity.

Construction

After the demolition phase, the Project would have no potential to impact historical resources from new construction either directly or indirectly. The discretionary historical resource on the Project site, the Boiler Building, would be demolished prior to construction, and there are no other previously identified historical resources on the Project site or in the vicinity of the Project site.

Operation

The Project would have no potential to impact historical resources from operation either directly or indirectly. The discretionary historical resource on the Project site, the Boiler Building, would be demolished prior to new construction and operation, and there are no previously identified historical resources in the vicinity of the Project site.

Level of Significance before Mitigation:

Potentially significant impact.

Mitigation Measure(s):

CR-1: Prior to demolition of the Boiler Building, the City shall prepare Historic American Engineering Record (HAER) documentation for the Boiler Building. That documentation shall include preparation of a written narrative, photography, and drawings that meet the latest requirements in HAER History, Photography, and Drawing Guidelines. Archival and electronic full copies of that completed documentation shall be submitted to the HAER program in accordance with the most recent edition of "Preparing HABS/HAER/HALS Documentation For Transmittal." The City shall maintain the HAER documentation at the Glendale Central Public Library and information about accessing that information shall be available on the City's website. HAER documentation, as described, shall be complete and accepted by the HAER program before any demolition or dismantling of the Boiler Building. The City shall also display up to four (4) archival quality photographs of the historic Boiler Building in a publicly accessible location within the City's Perkins Building,

CR-2: City shall provide permanent plaque to be located at the Flower Street entrance to the Grayson Power Plant that identifies the location of the former historic Boiler Building and provides a narrative statement about the Boiler Building that provides historic context

CR-3: City shall salvage and preserve a piece of equipment from the Boiler Building and display the piece of equipment along with an historic context statement in a publicly accessible location in the City.

Level of Significance after Mitigation:

The Boiler Building would be materially impaired by the demolition component of the Project; therefore, the Project would cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5. Implementation of Mitigation Measures CUL-1 through CUL-3 would not reduce the impact to a level of less than significant. Therefore, the demolition of the Boiler Building would result in a significant and unavoidable impact to historical resources.

4.12.8 Paleontological Project Impacts

Threshold: Would the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

The Initial Study prepared for the Project determined that paleontological resources might be present in the subsurface, and the literature review performed for the Project has confirmed that sediments in the Project area over 10 feet in depth have high paleontological potential. Potential direct and indirect Project impacts to paleontological resources were analyzed based on this determination, as described below.

Demolition

Demolition to implement the proposed Project may involve ground disturbance into previously undisturbed sediments in order to remove existing piles or soils that may have been contaminated. Therefore, demolition associated with this Project may have either direct or indirect impacts on paleontological resources.

Construction

Construction plans include excavations across the Project area, including areas with up to 20 feet beyond current depths of development, placing the total depths of excavation into high potential sediments that are expected to begin at around 10 feet bgs. Where ground disturbance extends beyond 10 feet bgs into previously undisturbed sediments, either in entirely undisturbed areas or beneath the depth of previous disturbance, sediments with high paleontological potential will be encountered. Such ground disturbance may damage or destroy paleontological resources, a direct adverse impact. As noted in the Initial Study, the implementation of an appropriate mitigation program can avoid these adverse impacts to resources. It should also be noted that should fossils be encountered and safely salvaged, this would constitute a beneficial indirect impact to paleontological resources, as once discovered they may be used for research or education purposes to further our understanding of the ancient history of the Los Angeles area.

Operation

Operation plans do not involve ground disturbance into previously undisturbed sediments. Therefore, the Project would have no potential to directly or indirectly impact paleontological resources from operation.

Level of Significance before Mitigation:

Potentially significant impact.

Mitigation Measures:

PAL-1: Worker training. A paleontologist who meets professional paleontological standards as defined by Murphey et al. (2019) shall design a Worker's Environmental Awareness Program reviewed and approved by a qualified consultant retained by the City that will provide training that communicates requirements and procedures for the inadvertent discovery of paleontological resources during construction, to be delivered by the paleontologist or their designee to the construction crew prior to the onset of ground disturbance. The training will be provided by a qualified paleontologist.

PAL-2: Paleontological Monitoring. A paleontologist meeting professional standards as defined by Murphey et al. (2019) shall be retained to oversee all aspects of paleontological mitigation, including the development and implementation of a Paleontological Monitoring and Mitigation Plan (PMMP) tailored to the Project that provides for paleontological monitoring of earthwork and ground disturbing activities into undisturbed geologic units with high paleontological potential (undisturbed sediments over 10 feet in depth), to be conducted by a paleontological monitor meeting professional standards (Murphey et al. 2019).

PAL-3: Inadvertent Discoveries. In the event that paleontological resources are encountered during construction activities, all work must stop in the immediate vicinity of the finds while the paleontological monitor documents the find and the designated project paleontologist assesses the find. Should the qualified paleontologist assess the find as significant, it should be collected and curated in an accredited repository along with all necessary associated data.

Level of Significance after Mitigation:

Implementation of Mitigation Measures PAL-1 through PAL-3 would reduce adverse impacts to paleontological resources to a level of less than significant.

4.13 ENERGY

Since the circulation of the Draft EIR, the CEQA Guidelines were amended to require mitigation for significant effects due to wasteful, inefficient, or unnecessary use of energy (CEQA Guidelines Section 15126.2(b)). In addition, CEQA Guidelines Appendix G was amended to add new thresholds of significance related to energy use. Appendix F of the CEQA Guidelines specifies that energy conservation may be achieved by reducing overall energy consumption, reducing reliance on fossil fuels, and increasing reliance on renewable energy sources. The cost effectiveness of a Project may be evaluated in terms of energy requirements or efficiency, rather than by a traditional dollar basis. Mitigation for energy use is required if a Project "may result in significant environmental effects due to wasteful, inefficient, or unnecessary use of energy, or wasteful use of energy resources".

This section describes and evaluates the energy conservation impacts from the Project. The energy use for all phases and components of the Project as it relates to greenhouse gas emissions, utilities, transportation (during construction and operation), equipment use, renewable energy features, land use characteristics, and Project design features, are included in the analysis. This section incorporates information from the air quality, greenhouse gas emissions, transportation and traffic, and utilities and service systems sections for analysis.

4.13.1 Environmental Setting

Existing Conditions

Electricity

Electricity, a consumptive utility, is a man-made resource. The generation of electricity requires the consumption or conversion of energy resources, including water, wind, oil, gas, coal, solar, geothermal, and nuclear resources, into energy. The delivery of electricity involves a number of system components, including substations and transformers that lower transmission line power (voltage) to a level appropriate for on-site distribution and use. The electricity generated is distributed through a network of transmission and distribution lines commonly called a power grid. Conveyance of electricity through transmission lines is typically responsive to market demands.

Electrical power is generally measured in watts (W) while energy use is measured in watt-hours (WH). For example, if a light bulb has a capacity rating of 100 W, the energy required to keep the bulb on for one hour (1 H) would be 100 WH. If ten 100 W bulbs were on for one hour, the energy required would be 1,000 WH or one kilowatt-hour (kWH). On a utility scale, a generator's capacity is typically rated in megawatts (MW), which is one million watts, while energy usage is measured in megawatt-hours (MWH), which is one million watt-hours, or gigawatt-hours (GWH), which is one billion watt-hours.

GWP provides electrical service throughout the City of Glendale, including the proposed Project site, serving approximately 201,361 residents across an approximately 31-square mile area in 2018. GWP serves nearly 90,300 electrical customers and provides service to the homes, businesses and institutions within its service area. GWP's annual retail electrical load obligation is approximately 1,400,000 MWH.

As provided in GWP’s 2019 Integrated Resources Plan, the City currently relies on the Grayson Power Plant to provide electricity. However, all but one of the existing generation units (Unit 9) at the Grayson Power Plant are beyond their expected retirement age. Due to normal degradation of the existing Grayson Power Plant equipment, over time, the reliability, efficiency, and cost effectiveness of the facility has continuously declined.

By January 1, 2024, the units at the existing Grayson Power Plant must meet current SCAQMD emissions standards, take a low-use exemption, or be shutdown. The combination of the age of the units and new regulatory requirements is expected to result in GWP facing a potential electricity shortage in the early 2020’s. GWP’s 2019 Integrated Resource Plan proposes to meet power reliability requirements, which includes a mix of energy efficiency and demand response programs, locally generated and imported renewable resources (such as solar and wind), a battery energy storage system, and conventional internal combustion generation.

It is not economically viable to upgrade the boiler Units 1-5 to meet the new SCAQMD Rule 1135 requirement, and if upgraded, the units would not meet the Project objectives due to their lengthy startup times and lower efficiency as compared to Units 8A, 8BC, or 9. Additionally, these units are old, operationally not very flexible, and well past the end of their normal operating lives. Units 8A and 8BC, while more than 40 years old, could be upgraded to meet SCAQMD Rule 1135, and Unit 9 already is capable of meeting SCAQMD Rule 1135 with minor tuning changes to the emissions control system.

Natural Gas

Natural gas is a combustible mixture of simple hydrocarbon compounds (primarily methane) that is used as a fuel source. Natural gas consumed in California is obtained from naturally occurring reservoirs, mainly located outside the State, and delivered through high-pressure transmission pipelines. The natural gas transportation system is a nationwide network, and, therefore, resource availability is typically not an issue. Natural gas provides almost one-third of the state’s total energy requirements and is used in electricity generation, space heating, cooking, water heating, industrial processes, and as a transportation fuel. Natural gas is measured in terms of cubic feet (cf).

SoCalGas is the principal distributor of natural gas in Southern California, serving residential, commercial, and industrial markets. SoCalGas serves approximately 21.8 million customers in more than 500 communities encompassing approximately 24,000 square miles throughout Central and Southern California, from the City of Visalia to the Mexican border.

SoCalGas receives gas supplies from several sedimentary basins in the western United States and Canada, including supply basins located in New Mexico (San Juan Basin), West Texas (Permian Basin), the Rocky Mountains, and Western Canada as well as local California supplies. The traditional, southwestern United States sources of natural gas will continue to supply most of SoCalGas’s natural gas demand. The Rocky Mountain supply is available but is used as an alternative supplementary supply source, and the use of Canadian sources provide only a small share of SoCalGas supplies due to the high cost of transport. Gas supply available to SoCalGas from California sources averaged 97 million cf per day in 2019 (the most recent year for which data are available).

Transportation Energy

According to the California Energy Commission (CEC), transportation accounted for nearly 40 percent of California’s total energy consumption in 2018. In 2020, California consumed 14.0 billion gallons of gasoline and 3.0 billion gallons of diesel fuel. Petroleum-based fuels currently account for 89 percent of California’s transportation fuel use. However, the state is now working on developing flexible strategies to reduce petroleum use. Over the last decade, California has implemented several policies, rules, and regulations to improve vehicle efficiency, increase the development and use of alternative fuels, reduce air pollutants and greenhouse gas (GHG) from the transportation sector, and reduce vehicle miles travelled (VMT). Accordingly, gasoline consumption in California has declined. The CEC predicts that the demand for gasoline will continue to decline over the next ten years, and there will be an increase in the use of alternative fuels, such as natural gas (NG), biofuels and electricity. In January of 2018, Executive Order B-48-18 was signed to “boost the supply of zero-emission vehicles and charging and refueling stations in California.” The Executive Order directs state government to meet a series of milestones toward a long-term target of 1.5 million zero-emission vehicles on California’s roadways by 2025 and 5 million by 2030.

4.13.2 Laws, Ordinances, Regulations, and Standards (LORS)

Local LORS

Greener Glendale Plan for Community Activities

The Greener Glendale Plan for Community Activities, adopted by the City Council on March 27, 2012, is the City’s plan for helping its residents achieve better sustainability. The Greener Glendale Plan for Community Activities provides objectives and strategies for increased sustainability within the City, assesses what actions the City and community have already taken to be more sustainable, and recommends how to build on these efforts, such as using biogas to create clean, renewable energy. The Greener Glendale Plan for Community Activities includes focus areas addressing environmental issues including, but not limited to, energy use, water supplies, solid waste and recycling, transportation, urban design, urban nature, environmental health and economic development. Based on the City’s forecasts and reduction targets, the City was on track to meet Southern California Association of Governments’ (“SCAG”) regional GHG reduction targets of eight percent by 2020 and is on track to meet the 13 percent GHG reduction target by 2023. The City’s goal was to achieve a 25 percent reduction in transportation related GHGs by 2020, and an additional 10 percent by 2035, in order to meet RPS goals and AB 1493 standards.

Greener Glendale Plan for Municipal Operations

The Greener Glendale Plan for Municipal Operations, adopted by the City Council on November 1, 2011, is the City’s plan for achieving better sustainability in municipal operations. The Greener Glendale Plan for Municipal Operations indicated that the City of Glendale has already completed or initiated many sustainability programs, achieving overall energy and water consumption reductions in its buildings, even though there was an increase in public services, including a 30 percent growth in the municipal vehicle fleet and the opening of a new Glendale Police Department building. The Greener Glendale Plan for Municipal Operations includes the same focus areas as the Greener Glendale Plan for Community Activities, with an additional focus on climate change adaptation and adherence to climate change policies.

Glendale Green Building Standards

The City adopted 12 measures, in addition to the mandatory CALGreen Code, for new projects, which went into effect on July 7, 2011. These measures include requirements to reduce consumption of electricity and NG by 15 percent more than the California Energy Code standards, among others.

Glendale Solid Waste and Construction Waste Diversion Programs

The recycling of solid waste materials also contributes to reduced energy consumption. Specifically, when products are manufactured using recycled materials, the amount of energy that would have otherwise been consumed to extract and process virgin source materials is reduced. For example, in 2015, 3.61 million tons of aluminum were produced by recycling in the United States, saving enough energy to provide electricity to 7.5 million homes. In 1989, California enacted AB 939, the California Integrated Waste Management Act which establishes a hierarchy for waste management practices such as source reduction, recycling, and environmentally safe land disposal. Importantly, the City requires the diversion of at least 65 percent of construction and demolition debris from a landfill, through recycling, salvage or deconstruction. Compliance with this requirement must be documented.

Regional LORS

Southern California Gas

SoCalGas, along with five other utility providers released the 2020 California Gas Report, presenting a comprehensive outlook for natural gas supplies and requirements for California through the year 2035. The report predicts gas demand for all sectors and presents best estimates, as well as hot and cold year scenarios. Overall, SoCalGas predicts a decrease in natural gas demand in future years, due to a decrease in per capita usage, energy efficiency policies, and California’s transition to renewable energy displacing fossil fuel use, including natural gas.

State LORS

California Building Standards Code (Title 24)

California Building Energy Efficiency Standards (Title 24, Part 6)

The California Building Energy Efficiency Standards for Residential and Nonresidential Buildings (CCR, Title 24, Part 6) were adopted to ensure that building construction and system design and installation achieve energy efficiency and preserve outdoor and indoor environmental quality. The current California Building Energy Efficiency Standards (Title 24 standards) are the 2019 Title 24 standards, which became effective on January 1, 2020. The 2019 Title 24 standards include efficiency improvements to the residential standards for attics, walls, water heating, and lighting, and efficiency improvements to the non-residential standards include alignment with the American Society of Heating and Air-Conditioning Engineers (ASHRAE) 90.1-2013 national standards.

California Green Building Standards (Title 24, Part 11)

The California Green Building Standards Code (CCR, Title 24, Part 11), commonly referred to as the CALGreen Code, most recently went into effect on January 1, 2020. The 2019 CALGreen Code includes mandatory measures for non-residential development related to site development; energy efficiency; water efficiency and conservation; material conservation and resource efficiency; and environmental quality.

California's Renewable Portfolio Standard

First established in 2002 under Senate Bill 1078, California Renewable Portfolio Standards (RPS) require retail sellers of electric services to increase procurement from eligible renewable energy resources to 33 percent by 2020 and 50 percent by 2030. Signed into law in 2018, Senate Bill 100 again increased the RPS to 60% by 2030 The California Public Utilities Commission (CPUC) and the CEC jointly implement the RPS program. The CPUC's responsibilities include: (1) determining annual procurement targets and enforcing compliance; (2) reviewing and approving each investor-owned utility's renewable energy procurement plan; (3) reviewing contracts for RPS-eligible energy; and (4) establishing the standard terms and conditions used in contracts for eligible renewable energy.

Assembly Bill 32 /California Global Warming Solutions Act

In 2006, the California State Legislature adopted Assembly Bill (AB) 32 (codified in the California Health and Safety Code [HSC], Division 25.5 – California Global Warming Solutions Act of 2006), which focuses on reducing GHG emissions in California to 1990 levels by 2020. Under HSC Division 25.5, the California Air Resources Board (CARB) has the primary responsibility for reducing the State's GHG emissions, however, it also tasked CEC and the CPUC with providing information, analysis, and recommendations to CARB regarding strategies to reduce GHG emissions in the energy sector.

In 2016, the California State Legislature adopted Senate Bill (SB) 32 and its companion bill AB 197; both were signed by Governor Brown. SB 32 and AB 197 amend HSC Division 25.5 and establishes a new climate pollution reduction target of 40 percent below 1990 levels by 2030 and includes provisions to ensure that the benefits of state climate policies reach into disadvantaged communities.

Senate Bill 350 /Clean Energy and Pollution Reduction Act of 2015

SB 350, signed October 7, 2015, is the Clean Energy and Pollution Reduction Act of 2015. SB 350 is the implementation of some of the goals of Executive Order B-30-15, issued in April 2015, which established a new statewide policy goal to reduce GHG emissions 40 percent below their 1990 levels by 2030. The objectives of SB 350 are 1) to increase the procurement of our electricity from renewable sources from 33 percent to 50 percent; and 2) to double the energy efficiency savings in electricity and natural gas final end uses of retail customers through energy efficiency and conservation by 2030.

Senate Bill 100 /100 Percent Clean Energy Act of 2018

SB 100, signed September 10, 2018, is the 100 Percent Clean Energy Act of 2018. SB 100 updates the goals of California's RPS and SB 350, discussed above, in the following ways: 1) achieve the 50 percent renewable resources target by December 31, 2026, and 2) achieve a 60 percent target by December 31, 2030. SB 100 also establishes a state policy that eligible renewable energy resources and zero-carbon resources supply 100 percent of electricity procured to serve all state agencies by December 31, 2045.

Assembly Bill 1493 (Pavley Regulations)

AB 1493 (commonly referred to as CARB's Pavley Regulations) was the first legislation to regulate GHG emissions from new passenger vehicles. Under this legislation, CARB adopted regulations to reduce GHG emissions from non-commercial passenger vehicles (cars and light-duty trucks) for model years 2009–2016 and model years 2017-2025.

California Air Resources Board

Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling

In 2004, the CARB adopted an Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling in order to reduce public exposure to diesel particulate matter emissions (CCR, Title 13, Section 2485). The measure applies to diesel-fueled commercial vehicles with gross vehicle weight ratings greater than 10,000 pounds that are licensed to operate on highways, regardless of where they are registered. This measure does not allow diesel-fueled commercial vehicles to idle for more than five minutes at any given location. While the goal of this measure is primarily to reduce public health impacts from diesel emissions, compliance with the regulation also results in energy savings in the form of reduced fuel consumption from unnecessary idling.

Regulation to Reduce Emissions of Diesel Particulate Matter, Oxides of Nitrogen and other Criteria Pollutants, from In-Use Heavy-Duty Diesel-Fueled Vehicles

In addition to limiting exhaust from idling trucks, CARB also promulgated emission standards for off-road diesel construction equipment of greater than 25 horsepower (hp) such as bulldozers, loaders, backhoes and forklifts, as well as many other self-propelled off-road diesel vehicles. The In-Use Off-Road Diesel-Fueled Fleets regulation adopted by CARB on July 26, 2007 aims to reduce emissions by installation of diesel soot filters and encouraging the retirement, replacement, or repower of older, dirtier engines with newer emission-controlled models (13 CCR Section 2449). The compliance schedule requires full implementation by 2023 in all equipment for large and medium fleets and by 2028 for small fleets. While the goal of this measure is primarily to reduce public health impacts from diesel emissions, compliance with the regulation has shown an increase in energy savings in the form of reduced fuel consumption from more fuel-efficient engines.

Senate Bill 375 /Sustainable Communities Strategy

SB 375, the Sustainable Communities and Climate Protection Act of 2008, coordinates land use planning, regional transportation plans, and funding priorities to help California meet the GHG reduction mandates of AB 32. SB 375 specifically requires the Metropolitan Planning Organization (MPO) to prepare a “sustainable communities strategy” (SCS) as a part of its Regional Transportation Plan (RTP) that will achieve GHG emission reduction targets set by CARB for the years 2020 and 2035 by reducing VMT from light-duty vehicles through the development of more compact, complete and efficient communities. The Project Site is located within the planning jurisdiction of the SCAG, which is the MPO responsible for the preparation of the SCS. SCAG’s has most recently adopted the 2020-2045 RTP/SCS, with a number of goals focusing on transportation and land use planning.

Senate Bill 1389 /Integrated Energy Policy Reporting

SB 1389 (Public Resources Code [PRC] Sections 25300–25323; SB 1389) requires CEC to prepare a biennial integrated energy policy report that assesses major energy trends and issues facing the state’s electricity, natural gas, and transportation fuel sectors and provides policy recommendations to conserve resources; protect the environment; ensure reliable, secure, and diverse energy supplies; enhance the state’s economy; and protect public health and safety (PRC Section 25301[a]). The 2015 Integrated Energy Policy Report provides the results of the CEC’s assessments of a variety of energy issues facing California including energy efficiency, strategies related to data for improved decisions in the Existing Buildings Energy Efficiency Action Plan, building energy efficiency standards, the impact of drought on California’s energy system, achieving 50 percent renewables by 2030, the California Energy Demand Forecast, the Natural Gas Outlook, the Transportation Energy Demand Forecast, Alternative and Renewable Fuel and Vehicle Technology Program benefits updates, update on electricity infrastructure in Southern California, an update on trends in California’s sources of crude oil, an update on California’s nuclear plants, and other energy issues.

California Environmental Quality Act

In accordance with the CEQA Guidelines, including Appendix F, *Energy Conservation*, in order to assure that energy implications are considered in project decisions, EIRs are required to include a discussion of the potential significant energy impacts of proposed projects, with particular emphasis on avoiding or reducing inefficient, wasteful, and unnecessary consumption of energy. Appendix F of the CEQA Guidelines provides a list of energy-related topics that should be analyzed in the EIR. In addition, while not described or required as significance thresholds for determining the significance of impacts related to energy, Appendix F provides the following topics that the lead agency may consider in the discussion of energy use in an EIR, where topics are applicable or relevant to the project:

- The project’s energy requirements and its energy use efficiencies by amount and fuel type for each stage of the project including construction, operation, maintenance, and/or removal. If appropriate, the energy intensiveness of materials may be discussed;

- The effects of the project on local and regional energy supplies and on requirements for additional capacity;
- The effects of the project on peak and base period demands for electricity and other forms of energy;
- The degree to which the project complies with existing energy standards;
- The effects of the project on energy resources;
- The project's projected transportation energy use requirements and its overall use of efficient transportation alternatives;
- The degree to which the project design and/or operations incorporate energy-conservation measures, particularly those that go beyond City requirements; and
- Whether the project conflicts with adopted energy conservation plans.

Federal LORS

Federal Corporate Average Fuel Economy Standards

First established by the U.S. Congress in 1975, the Corporate Average Fuel Economy (CAFE) standards reduce energy consumption by increasing the fuel economy of cars and light trucks. The National Highway Traffic Safety Administration (NHTSA) and U.S. Environmental Protection Agency (USEPA) jointly administer the CAFE standards. The U.S. Congress has specified that CAFE standards must be set at the "maximum feasible level" with consideration given for: (1) technological feasibility; (2) economic practicality; (3) effect of other standards on fuel economy; and (4) need for the nation to conserve energy.

Fuel efficiency standards for medium- and heavy-duty trucks have been jointly developed by USEPA and NHTSA. The Phase 1 heavy-duty truck standards apply to combination tractors, heavy-duty pickup trucks and vans, and vocational vehicles for model years 2014 through 2018 and result in a reduction in fuel consumption from six to 23 percent over the 2010 baseline, depending on the vehicle type. The USEPA and NHTSA also adopted the Phase 2 heavy-duty truck standards, which cover model years 2021 through 2027 and require the phase-in of a five to 25 percent reduction in fuel consumption over the 2017 baseline depending on the compliance year and vehicle type.

4.13.3 Environmental Impacts

Methodology

This analysis addressed the Project's potential energy usage, including electricity, natural gas, and transportation fuel, as well as solid waste generation associated with Project activities. Energy usage during both Project demolition, construction and operation are addressed.

4.13.4 Project Impacts

Threshold: Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

Demolition

Project demolition would occur over an approximately 12-month period, during which approximately 60 workers would be on-site and engaged in activities related to the demolition of generating units, cooling towers, some infrastructure, foundation and piles, and related ancillary facilities. A variety of heavy equipment, including cranes, excavators, loaders, dozers, and support vehicles and trucks would be actively engaged in demolition activities.

Electricity

Electrical power would be consumed to demolish the Project. The demand would be supplied from existing electrical services at the Project site. Initial site work would include installation of temporary construction power throughout the Project site, which may also be utilized for demolition activities. Overall, demolition would require minimal electricity consumption and would not be expected to have any adverse impact on available electricity supplies and infrastructure. Therefore, proposed Project impacts to the consumption of electricity during demolition activities would be less than significant.

Natural Gas

Natural gas is not expected to be consumed in any substantial quantities during demolition activities of the proposed Project. Therefore, Project impacts on natural gas associated with demolition activities would be less than significant.

Transportation Fuel

The proposed Project will result in GHG emissions due to consumption of fuels during demolition. GHG emissions would be generated primarily by the off-road construction equipment and on-road worker vehicles. As part of the proposed Project, all heavy vehicles operating on the Project site would be required to utilize ultra-low sulfur diesel fuel, utilizing fuel efficient equipment consistent with state and federal regulations. As such, these requirements would ensure that Project demolition activities comply with State measures to reduce the inefficient, wasteful, or unnecessary consumption of energy. While these regulations are intended to reduce construction emissions, compliance with anti-idling and emissions regulations would also result in energy savings from the use of more fuel-efficient engines.

While demolition of the proposed Project would result in a temporary fuel demand, according to the US Energy Information System's International Energy Outlook 2020, the global supply of crude oil, other liquid hydrocarbons, and biofuels is expected to be adequate to meet the world's demand for liquid fuels through 2050. Furthermore, as of December 31, 2020, California had approximately 2,213 million barrels (approximately 93.9 trillion gallons) of crude oil left in the state's reserves. Therefore, Project impacts on transportation fuel and related GHG emissions associated with demolition activities would be less than significant.

Solid Waste

As part of the proposed Project, all non-hazardous demolition materials would be reclaimed or recycled, ensuring that equipment and building materials comprised of steel, aluminum, copper and other metals would be recycled. Machinery and other equipment that can still be utilized by other companies could be refurbished and resold by others. Asphalt and concrete that is removed during demolition would be crushed and either reused on-site, properly disposed of if hazardous, or otherwise used as aggregate by the City. The proposed Project would be required to comply with applicable solid waste ordinances, and thus, would meet Glendale's and California's solid waste diversion regulations. Therefore, Project impacts related to wasteful practices associated with demolition would be less than significant.

Construction

Project construction is anticipated to occur over a period of approximately 27 months, during which 115 workers to a peak amount of 260 workers people would be engaged in construction activities on the Project site. As described in the Project Description, construction activities would include the installation of underground electrical ductbanks and vaults, underground piping for water, sewer, gas, air, and fire protection, engineered backfill up to finished grade, construction of concrete foundations to support the generation and ancillary equipment, driving of approximately 1,000 piles as part of the major equipment foundations, erection of all the equipment and ancillary equipment, above ground piping and electrical wiring, installation of storm drains piping and catch basins, finished paving, and startup and commissioning of the plant.

Electricity

Electrical power would be consumed to construct the proposed Project, and as with demolition activities, the demand would be supplied from existing electrical services at the Project site. Initial site work would include installation of temporary construction power throughout the Project.

With respect to electricity required for lighting, construction is not anticipated to routinely take place during darkness when lighting would be required. During those periods when concrete is poured, or during commissioning when nighttime activities cannot be avoided, concentrated area specific lighting in compliance with worker safety regulations would be utilized. During limited construction periods and during the commissioning/startup phase of the proposed Project, some activities would continue 24 hours per day, 7 days per week. Task-specific lighting would be used to the extent practical while complying with worker safety regulations.

Overall, construction activities would require minimal electricity consumption and would not be expected to have any adverse impact on available electricity supplies and infrastructure. As Project construction would entail energy demands largely associated with equipment and transportation fuels, construction of the Project would not increase demands on the electric power network during peak and base period demand periods. Therefore, Project impacts to the consumption of electricity during construction activities would be less than significant.

Natural Gas

Natural gas is not expected to be consumed in any substantial quantities during construction of the Project. Therefore, proposed Project impacts on energy and gas associated with construction activities would be less than significant.

Transportation Fuel

As with Project demolition activities, as part of the proposed Project, all heavy vehicles operating on the Project site would be required to utilize ultra-low sulfur diesel fuel, utilizing fuel efficient equipment consistent with state and federal regulations. Based on the available data, construction would utilize energy for necessary on-site activities and to transport construction materials and demolition debris to and from the Site. As discussed above, idling restrictions and the use of cleaner, energy-efficient equipment would result in less fuel combustion and energy consumption and thus minimize the Project's construction-related energy use. Therefore, construction of the proposed Project would not result in the wasteful, inefficient, or unnecessary consumption of energy.

Similar to demolition, construction of the proposed Project would also result in a temporary fuel demand. According to the US Energy Information System's International Energy Outlook 2020, the global supply of crude oil, other liquid hydrocarbons, and biofuels is expected to be adequate to meet the world's demand for liquid fuels through 2050. Furthermore, as of December 31, 2020, California had approximately 2,213 million barrels (approximately 93.9 trillion gallons) of crude oil left in the state's reserves.

Energy demands during the construction of the Project would not represent a substantial fraction of the available energy supply in terms of equipment and transportation fuels and would not substantially affect existing local and regional supply and capacity for the future. Furthermore, construction of the Project would use equipment that would be consistent with the energy standards applicable to construction equipment including limiting idling fuel consumption and using contractors that comply with applicable CARB regulatory standards that affect energy efficiency. As such, construction of the Project would not conflict with energy standards applicable to heavy-duty construction equipment and associated on-road trucks and vehicles. As a result, construction energy impacts on supplies and infrastructure related to construction activities would be less than significant.

Solid Waste

Similar to demolition activities, all non-hazardous demolition materials would be reclaimed or recycled, ensuring that equipment and building materials comprised of steel, aluminum, copper and other metals would be recycled. Furthermore, the Project would be required to comply with applicable solid waste ordinances, and thus, would meet Glendale's and California's solid waste diversion regulations.

Therefore, Project impacts related to wasteful practices associated with construction would be less than significant.

Operation

A primary objective of the proposed Project is to provide efficient operational flexibility with quick-start high ramp rate generation to facilitate increasing the contribution of renewable energy (such as wind and solar) into the City's electrical grid and to support California's Renewable Portfolio Standards. Project operation would facilitate the desired integration of renewables and would also replace less efficient generation equipment with cleaner and more sustainable technologies. The Project would also be designed to include numerous energy and waste saving features as well as waste reduction features that would allow the Project to comply with and exceed the Title 24 standards and achieve greater energy savings than required by State regulations.

After construction and commissioning of the Project, the facility would be capable of operating at any time as needed to support GWP needs 24 hours per day, seven days per week. Project operation would generate electricity for GWP requiring natural gas and water supply, as well as producing some wastewater requiring conveyance, treatment and disposal off-site and municipal solid waste requiring collection and transport off-site. The Project would meet or exceed the applicable provisions of Title 24 and the CALGreen Code in affect at the time of building permit issuance.

Importantly, the Project has integrated many energy saving features, including a recycled water-cooled condenser system, a heat recovery steam generator feed water system, and the elimination of the use of potable water in the generation process by increasing use of recycled water. The Project will rely on recycled water for generation process use and will result in a reduction of groundwater use compared to existing power plant operation. The volume of recycled water necessary for the Project's operation is well within the City's allocation from the Los Angeles-Glendale Water Reclamation Plant that maintains a connection infrastructure with the Grayson Power Plant. The Project will also incorporate on-site water treatment to convert recycled water into demineralized water that can then be used for process purposes.

Electricity

The proposed Project will utilize the existing infrastructure to deliver electrical power from the Project to the GWP electrical distribution system. No new offsite transmission lines will be constructed for the proposed Project. Existing transmission lines would be utilized to connect the electric generating equipment to the City's distribution grid. Therefore, Project impacts related to wasteful use of electricity associated with operation would be less than significant.

Natural Gas

The proposed Project would utilize only natural gas provided by SoCalGas. An existing SoCalGas high pressure pipeline serving the existing Grayson Power Plant would provide natural gas at pressures ranging from 250 pounds per square inch gauge to 550 pounds per square inch gauge. Maximum fuel demand during full load operations, including Unit 9, is less than the existing units use. The existing pipeline is capable of delivering this volume of natural gas to the Grayson Power Plant. SoCalGas has available and has the capabilities to provide up to 64 million cubic feet of natural gas per day through a single meter station to be located within the Utility Operations Center site. The Project design achieves a high level of thermal efficiency across a wide range of generating capacity. The Project will utilize the existing pipelines for natural gas supply, water supply, and sewer discharge; therefore, no new construction of offsite pipelines is anticipated. Therefore, Project impacts related to natural gas use associated with operation would be less than significant.

Transportation Fuel

The net increase of GHG emissions from the operation of the Project would exceed the significance threshold of 10,000 metric tons per year. The GHG emissions exceedance is solely contributed from operating the proposed combustion turbines and transformers. However, the Project is required comply with the State cap and trade program by reporting CO2e emissions from the Grayson Power Plant and acquiring allowances and offset credits to mitigate 100 percent of GHG emissions from the combustion equipment and transformers. Net emissions after mitigation will include only emissions related to facility occupants, which would be well below the 10,000-metric ton significance threshold.

The proposed Project includes installing and operating newer equipment that generates fewer GHG emissions on a pound per megawatt-hour basis than the existing equipment at Grayson Power Plant. In addition, the Project will allow the City to maximize the import of renewable energy sources through the limited existing transmission capacity into the City which will further assist the City in meeting the Renewable Portfolio Standards and GHG reductions specified in the Greener Glendale Plan, thereby demonstrating consistency with the Greener Glendale Plan. The use of transportation fuel by the 50 full-time employees would be similar to existing conditions, and Project operations would not cause a measurable increase in transportation fuel energy use in this regard. Therefore, Project impacts related to the use of transportation fuel associated with operation would be less than significant.

Solid Waste

Similar to existing conditions on the Project Site, waste generated by operation of existing power generating units and associated facilities would be properly managed and/or disposed of in compliance with federal, state, and local statutes and regulations related to solid and hazardous waste management. Because the Project involves the replacement of the existing generation units and would not increase the number of employees full-time on site, the Project would not result in increased waste disposal over existing conditions. The minimal hazardous waste that would be generated during project construction would be transported to a Class 1 landfill in California. The amount of waste disposed would remain similar to existing conditions and additional capacity would not be required. Project operation would require compliance with applicable solid waste ordinances, thereby meeting Glendale's and California's solid waste diversion regulations. Therefore, Project impacts related to wasteful practices associated with operation would be less than significant.

Level of Significance before Mitigation:

Less than Significant Impact.

Mitigation Measures:

No mitigation is required.

Level of Significance after Mitigation:

Less than Significant Impact.

Threshold: Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?

Demolition and Construction

Project related demolition and construction activities would utilize construction contractors who demonstrate compliance with CARB regulations restricting the idling of heavy-duty diesel motor vehicles and governing the accelerated retrofitting, repowering, or replacement of heavy-duty diesel on- and off-road equipment. These activities will be undertaken in accordance with all applicable regulations related to energy use and more fuel-efficient engines and would not conflict with or obstruct with a state or local plan for renewable energy or efficiency, and impacts would be less than significant.

Operation

Implementation of the proposed Project is intended to help lower the overall GHG emissions resulting from electrical generation for the City. The increased requirement for California's renewable energy portfolio requires a stable energy source to support the intermittent characteristics of photovoltaic and wind resources. The Project's ability to provide rapid startup, operate over a wide range of load, and the ability to quickly adjust load are necessary for the City to be able to integrate additional renewable electric energy sources to meet California's Renewable Portfolio Standards. By being able to deliver flexible operating characteristics across a wide range of efficient generating capacity, at a relatively consistent and superior heat rate, and replacing older, less efficient generation, the proposed Project would demonstrate its ability to achieve reduced GHG emissions.

The proposed Project includes installing and operating newer equipment that generates less GHG emissions on a pound per megawatt-hour basis than the existing equipment at Grayson Power Plant. This is consistent with the Greener Glendale Plan's objectives related to the increased use of renewable energy Citywide and achieving Renewable Energy Portfolio goals. In addition, the proposed Project will allow the City to maximize the import of renewable energy sources through the limited existing transmission capacity into the City which will further assist the City in meeting the Renewable Portfolio Standards and GHG reductions specified in the Greener Glendale Plan, thereby further demonstrating consistency with the Greener Glendale Plan.

While the proposed repowering of the Grayson Power Plant is considered necessary to meet current and future City energy needs and California Renewables Portfolio Standard requirements, the proposed Project represents a commitment to maintaining a portion of the City's energy portfolio from non-renewable resources over the long-term. In accordance with Senate Bill 100, the Renewables Portfolio Standard requires retail sellers and publicly owned utilities including GWP, to procure at least 60 percent of their electricity through renewable energy by 2030. The City currently serves its power system through a combination of renewable energy sources (both local and imports), non-renewable imports, and local generation. While the proposed Project does include the use of natural gas, the Project will facilitate increased reliance on renewable sources and the City remains committed to achieving or beating the SB 100 requirements, including the requirement to procure at least 60 percent of its electricity through renewable energy by 2030.

Construction and operation of the proposed Project would be consistent with State and federal energy standards and would be designed to include numerous energy and waste saving features as well as waste reduction features that would achieve greater energy savings than required. Therefore, operation of the proposed Project would not conflict with or obstruct with a state or local plan for renewable energy or efficiency, and impacts would be less than significant.

Level of Significance before Mitigation:

Less than Significant Impact.

Mitigation Measures:

No mitigation is required.

Level of Significance after Mitigation

Less than Significant Impact.

4.14 Wildfire

Since the circulation of the 2018 Final EIR, CEQA Appendix G was amended to add Wildfire as a new environmental factor to be evaluated within CEQA documents. This section evaluates the wildfire impacts of the Project in accordance with the new thresholds of significance set out in CEQA Appendix G.

4.14.1 Environmental Setting

Existing Conditions

The proposed Project is located within the City's Utility Operations Center and would utilize additional space within the Utility Operations Center and would temporarily use City-owned and CalTrans-owned area located underneath the adjacent Highway 134 partially owned by the City and partially leased by the City from the State Caltrans division for parking.

The Project site is within an urban area and is not within a State Responsibility Area or within a Very High Fire Hazard Severity Zone. The existing site is predominantly paved (concrete and asphalt) around existing electrical generating equipment and ancillary buildings and equipment to support the generation of electricity for the City.

Topography

The site topography is relatively flat with a slight upward slope to the north and west. The elevation is approximately 465 feet above mean sea level.

Climate

The Project area has a semi-arid climate characterized as having long, hot summers and moderately cooler winters, which is a typical Mediterranean climate. Mild, wet winters have led to an annual growth of plants and grasses. This vegetation dries out during the hot summer months and becomes exposed to Santa Ana wind occurrences during the fall. In general, much of southern California is at baseline risk of wildfires due to regional weather conditions, topography, and native vegetation. Southern California, including the proposed Project site, is periodically affected by Santa Ana wind occurrences, where hot and dry winds blow from the interior regions towards the Pacific Ocean coastline. The hot and dry nature of these winds, combined with their gusting potential, can create hazardous wildfire conditions. During Santa Ana wind occurrences, winds in excess of 40 miles per hour (mph) are common, and gusts may exceed 100 mph locally (Glendale 2003).

The average annual precipitation is approximately 17 to 18 inches, with over 74 percent of precipitation occurring between December and March and over 94 percent occurring between November and April (Glendale 2003). However, during dry years, precipitation could be less. Little precipitation occurs during summer, because a high-pressure cell blocks migrating storm systems over the eastern Pacific Ocean.

Winds across the proposed Project area are an important meteorological parameter, as they control both the potential for wildfire spread and the initial rate of dilution and direction of pollutant dispersion. When averaged over the whole day, the typical wind speeds and directions effecting the proposed Project area are generally south to southeasterly, ranging in speeds from between 4 to 13 mph. However, predominantly during the daytime hours, there is a strong onshore flow from the south through southwest, with higher wind speeds. The average wind speed between 1943 to 2019 was approximately 5.5 mph (aggregate average).

Vegetation and Fuel Load

“Fuels” are organic material (living or dead) in or on the ground or in the air that would ignite and burn. Fuel conditions are considered as one of two elements of wildfire behavior having anthropogenic (originating from human activities) and natural components. Anthropogenic influences on fuel conditions are a result of active vegetation management (i.e., prescribed burning, brush removal, or eradication of non-native species), which alters the regions vegetation mixture and structure. Moisture content, amount of fuel, and fuel structure and composition are natural components of fuel conditions. Since the proposed Project is located within a predominantly paved environment, little fuel is present.

Regional Fire Response

The proposed Project is located within the California Governor’s Office of Emergency Services, Southern Region, Region I, Area C. Area C covers approximately 126 square miles of Los Angeles County and includes 12 major cities, each with their own fire department. Each of these cities participates in the regional Unified Response, covered by the Verdugo Fire Communications Center dispatch. Unified Response is a regional borderless fire incident response system. The system covers 12 major cities including Alhambra, Arcadia, Burbank, Glendale, Monrovia, Montebello, Monterey Park, Pasadena, San Gabriel, San Marino, Sierra Madre, South Pasadena, and the Hollywood Burbank Airport. As part of Unified Response, there are 46 engines, 13 trucks, five water tenders, and other specialized units such as Hazmat and Urban Search and Rescue equipment. Within this established aid agreement, the Verdugo Fire Communications Center immediately dispatches the closest available units, regardless of city boundary (Glendale 2019a).

According to the City of Glendale Fire Department, in the past several years, only three fires have exceeded three-alarm status within Area C. Each of these were brush fires which reached a four-alarm level, requiring a 20-engine response. As part of Unified Response, even if 20 engines were required in order to fight a wildland fire, at least 20 engines would remain available for other Area C incidents. Many would be deployed at Key Stations (such as those described in the table below) to minimize response times regardless of where any additional incidents may occur (Glendale 2019a).

Local Fire Departments and Stations

As discussed above, the City of Glendale is responsible for providing fire protection to the proposed Project, though other nearby stations could respond as part of the Area C Unified Response system or other existing mutual aid agreements, such as those with County of Los Angeles Fire Department, City of

Los Angeles Fire Department, and the U.S. Forest Service. Table 4-9 lists the closest regional fire stations to the proposed Project site.

Table 4-9 Regional Fire Stations

Station	Address	Distance (miles)
Glendale Fire Department Station 27	1127 Western Ave, Glendale, CA 91201	1.23
Glendale Fire Department Station 21	405 Oak St, Glendale, CA 91204	1.34
Glendale Fire Department Station 26	1145 N Brand Blvd, Glendale, CA 91202	1.44
Glendale Fire Department Station 25	353 N Chevy Chase Dr, Glendale, CA 91206	2.43
Glendale Fire Department Station 24	1734 Canada Blvd., Glendale, CA 91208	3.13
Glendale Fire Department Station 23	3301 E. Chevy, Chase Dr. Glendale, CA 91206	4.69

Baseline Fire Risk

The proposed Project is solely located within the City, an area mapped by the California Department of Forestry and Fire Protection (CAL FIRE) as a Local Responsibility Area (CAL FIRE 2008a). Fire protection and response within the Local Responsibility Area is provided by Glendale Fire Department. The proposed Project site is not classified within the Very High Fire Hazard Severity Zone (CAL FIRE 2008b). The lands surrounding the Project are also mapped as within the Local Responsibility Area. Nearby land, located approximately 0.10 mile to the southwest of the proposed Project, on the other side of the Los Angeles River, is classified as Very High Fire Hazard Severity Zone. To the west, north, east, and south, immediate surrounding land is not classified within the Very High Fire Hazard Severity Zone.

In general, the fire hazard of an area is based on a combination of several variables. Some of these include:

- Fuel Load (vegetation type, density, moisture content)
- Topography (slope)
- Weather
- Building construction (considering combustible roof coverings)
- Wildfire history, and
- Whether there are local measures in place to help reduce the zone’s fire rating.

According to the City of Glendale General Plan Safety Element (Glendale 2003), the region has a history of fires, with the entire northern two-thirds of the City having burned since the 1800s. According to the Safety Element, some areas within the City experience a wildfire at least once a decade. In order to reduce the risk of fires, the City has adopted a stringent fuel modification ordinance and requires the use of fire-resistant building materials in accordance with the City’s Building and Safety Code (Glendale 2003). There is no record of a wildfire in close proximity to the Grayson Power Plant.

4.14.2 Laws, Ordinances, Regulations, and Standards (LORS)

This section contains a summary of the Laws, Ordinances, Regulations, and Standards which are applicable to the proposed Project.

Local LORS

City of Glendale

Wildfire Mitigation Plan

In accordance with SB 901 the City Council of the City of Glendale, on December 17, 2019 adopted the Glendale Water and Power Wildfire Mitigation Plan (WMP). The WMP has been reviewed and accepted by both the Glendale Fire Department and the City Council. The WMP considers and includes all required and necessary elements of SB 901 including, but not limited to, an accounting of the responsibilities of persons responsible for executing the WMP, a description of the preventive strategies and programs to minimize the risk of its electrical equipment causing catastrophic wildfires, protocols for de-energizing portions of the electrical distribution system, and its plans for vegetation management. The WMP can be accessed, in its entirety at https://www.glendaleca.gov/home/showdocument?id=54585.

General Plan Safety and Seismic Safety Element

The 2003 City of Glendale General Plan Safety Element describes the natural conditions that pose a hazard within the City of Glendale and presents goals, policies, and programs to reduce the risk to the City and its residents. The goals, policies, and programs outlined in the General Plan are implemented as a part of Project design, and include (but are not limited to) the following:

Policy 4-1: The City shall ensure to the extent possible that fire services, such as fire equipment, infrastructure, and response times, are adequate for all sections of the City.

- **Program 4-1.3**: The City shall ensure that road standards meet the needs for emergency access.

Policy 4-2: The City shall require all new development in areas with a high fire hazard incorporate fire resistant landscaping and other fire hazard reduction techniques into the project design in order to reduce fire hazard.

- **Program 4-2.1**: The City shall encourage residents to plant and maintain drought-resistant, fire-resistant landscape species to reduce the risk of brush fire and soil erosion in areas adjacent to canyons and develop stringent site design and maintenance standards for areas with high fire hazard or soil erosion potential.
- **Program 4-2.2**: The City shall enforce the Weed Abatement Program in high fire hazard areas.
- **Program 4-2.3**: Fuel management plans shall be required for all new development in areas subject to wildfire.
- **Program 4-2.4**: The City shall enforce the Uniform Fire Code and Municipal Fire Code Amendments for new construction in fire hazard areas, including the use of sprinklers in residential structures.
- **Program 4-2.8**: The City shall enforce a Class A Roofing ordinance or better for residential and commercial developments. Residents with existing wood-shingle or unrated roofing materials

shall be encouraged to upgrade to fire resistive building materials, including fire resistive eaves and awnings.

Glendale Fire Code Amendments

The Glendale Fire Code Amendments most recently updated in 2020, contain information regarding the implementation and enforcement of regulations and guidelines for fire safety within the City. These amendments have been adopted by the City as local changes to the California Fire Code and contain more site-specific guidance and requirements.

State LORS

Assembly Bill 337 – The Bates Bill

Assembly Bill (AB) 337 (September 29, 1992) known as The Bates Bill was a direct result of the great loss of lives and homes in the Oakland Hills Tunnel Fire of 1991. The Bates Bill requires CalFire, in cooperation with local fire authorities, to identify Very High Fire Hazard Severity Zones in Local Responsibility Areas throughout California. Local jurisdictions that do not follow the Bates system are required to follow, at a minimum the model ordinance developed by the State Fire Marshal for mitigation purposes. The City has developed its own fire hazard maps and has adopted stringent hazard mitigation programs which exceed the requirements established by state regulations.

Assembly Bill 3819 – The Brown Bill

AB 3819 (September 25, 1994) known as The Brown Bill expands the roof covering requirements of The Bates Bill. The Brown Bill requires a Class A roof for all new buildings, all roof repairs, and replacements, and for existing buildings where 50 percent or more of the roof area is re-roofed, for buildings located within Very High Fire Hazard Severity Zones. Class A roofs provide the highest resistance to fire, and include coverings such as concrete, metal, or clay roof tiles.

Senate Bill 1028

Senate Bill (SB) 1028 was signed into law in September 2016. It requires electric utilities to construct, maintain, and operate their electrical lines and equipment in a manner that will reduce the risk of catastrophic wildfire, and requires the governing bodies of publicly owned utilities (such as GWP) to determine whether any portion of the area where the electrical lines and equipment are located has a significant risk of catastrophic wildfire due to such electrical lines or equipment, and if so, for the utility to present to the governing board, at intervals to be established by the board, the mitigation measures that the utility will undertake to minimize the risk.

Senate Bill 901

SB 901 was signed into law in September 2018. It establishes the requirement for municipally owned electric utilities to have a wildfire mitigation plan and sets an independent review requirement for the plan.

It sets a deadline of January 1, 2020 for the adoption of a wildfire mitigation plan by the governing board of municipal/public utilities, with plans to be updated annually.

Assembly Bill 1054

AB 1054 was signed into law in July 2019. It enables the California Wildfire Safety Advisory Board to: make recommendations to the Wildfire Safety Division (now part of the Office of Energy Infrastructure Safety) related to wildfire safety and mitigation; make recommendations related to contents of wildfire mitigation plans; and provide other advice and recommendations related to wildfire safety as requested by the Wildfire Safety Division. Publicly owned electric utilities (POUs), including municipally owned utilities such as GWP, must submit their adopted WMP to the California Wildfire Safety Advisory Board no later than July 1, 2020 and annually thereafter, and must comprehensively revise such plan at least once every 3 years.

California Building Code

The California Building Code (CBC) contains applicable fire safety standards and the California Fire Code. The CBC follows standards recommended by the California Building Standards Commission and the latest International Fire Code. The CBC sets buildings standards ensuring all structures are designed to provide the required emergency access. Additionally, the CBC contains guidance on design features, including fire sprinklers, fire flow standards, emergency access roads standards, and/or storage of flammable materials, which comply with fire department minimum requirements. The City has adopted the 2019 with 2020 local amendments version of the California Building Code with local amendments.

California Fire Code (California Code of Regulations Title 24, Part 9)

Based on the 2018 International Fire Code, and as published by the California Building Standards Commission, the California Fire Code regulates minimum fire safety requirements for new and existing buildings, facilities, storage, and processes. The Fire Code addresses fire prevention and protection, life safety, safe storage, and use of hazardous materials. The Fire Code is a design document which sets forth the minimum requirements for hazards and contains the requirements for maintaining life safety of building occupants, protection of emergency responders, and limits damage to a building and its contents as a result of a fire, explosion, or unauthorized hazardous materials discharge. The City has adopted the 2019 version of the California Fire Code with local amendments for site-specific guidance and requirements.

California Public Resources Codes

California Public Resources Code (PRC) sections are applicable to the proposed Project, including as listed below:

Code 4119: Authorizes agencies to inspect all properties, except a dwelling's interior, to ascertain compliance with state forest and fire laws, regulations, or use permits.

Code 4291: Requires 100 feet of defensible space around all structures.

Federal LORS

National Fire Protection Association

The National Fire Protection Association (NFPA) provides codes and standards (including the National Electrical Code [NEC]), research, trainings, and education for fire protection. The NFPA publishes more than 300 codes and standards intended to minimize the possibility and effects of fire and other risks.

4.14.3 Environmental Impacts

Methodology

The proposed Project includes the proposed replacement of the majority of the existing electrical generation equipment and infrastructure at the existing Grayson Power Plant. Baseline conditions within this area are defined as the existing physical environmental setting by which a lead agency determines whether an impact is significant. (State California Environmental Quality Act [CEQA] Guidelines, § 15125, subd. (a)). A significant environmental effect or impact is defined as a substantial or potentially substantial change in the environment. (Pub. Resources Code, §§ 21068, 21100, subd. (d); 20 State CEQA Guidelines, § 15358). The impact analysis in this section examines the changes in the environment, specifically related to wildfire risk, which may result from the construction and operation of the proposed Project.

The analysis in this section relies on numerous publicly available maps and datasets, including those published by the City of Glendale, County of Los Angeles, CalFire, aerial imagery and photographs, and site reconnaissance documenting the vegetative conditions. These sources were used to determine wildfire risk in the vicinity of the proposed Project site. Published literature on fire behavior and indirect impacts on natural resources were also reviewed to assess potential indirect impacts.

This analysis evaluates the wildfire impacts in accordance with the CEQA Appendix G thresholds, which evaluate whether a project located in or near State Responsibility Areas or lands classified as within a Very High Fire Hazard Severity Zone:

Thresholds of Significance

As determined in the Grayson Repowering Project Initial Study, the proposed Project would not substantially impair an adopted emergency response plan or emergency evacuation plan. The proposed Project is not located within the wildfire hazard zone as specified by the City of Glendale General Plan. Areas surrounding the Project site consist of urban development with minimal ground cover or vegetation.

In accordance with Appendix G of the State CEQA Guidelines, the proposed Project would have a significant impact related to wildfire if it is located in or near state responsibility areas or lands classified as very high fire hazard severity zones and the proposed Project would:

- Substantially impair an adopted emergency response plan or emergency evacuation plan.
- Substantially impair an adopted emergency response plan or emergency evacuation plan.
- Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose Project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of wildfire.
- Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment.
- Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.

4.14.4 Project Impacts

Threshold: Substantially impair an adopted emergency response plan or emergency evacuation plan?

<u>Demolition, Construction, and Operation</u>

The proposed Project is not listed within a Very High Fire Hazard Severity Zone; however, the land located to the southwest across the Los Angeles River is so classified. The Project site is already developed, and the Project will not block or hinder existing vehicular or pedestrian access along public roads. The Project would be designed, constructed, and maintained in accordance with applicable standards associated with vehicular access. By complying with applicable standards, the proposed Project would provide adequate vehicular access that would ensure adequate emergency access and evacuation as described in the City of Glendale Emergency Plan (Glendale 2008). In the event of a wildfire, traffic control points would be established that would ensure people will be safely evacuated from the Project area. Demolition and construction activities may temporarily restrict vehicular traffic on Fairmont Avenue and San Fernando Road; however, in the event of an emergency during construction, the Project would be required to facilitate the passage of persons and vehicles through/around any required road closures. Adherence to these standards would reduce potential impacts related to this issue to a less than significant level.

Level of Significance before Mitigation:

Less than Significant Impact.

Mitigation Measures:

No mitigation is required.

Level of Significance after Mitigation:

Less than Significant Impact.

Threshold: Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?

Demolition and Construction

The proposed Project is not located within a Very High Fire Hazard Severity Zone. The nearest Very High Fire Hazard Severity Zone is located approximately 0.10 miles from the Project across the concrete-lined channel of the Los Angeles River. The Project site is flat, and urban, and winds are generally not strong, with the strongest winds blowing south to southwest towards the land classified as Very High Fire Hazard Severity Zone. The probability of a wildfire to spread from the Project site to the Very High Fire Hazard Severity Zone as a result of Project demolition and construction would be low due to the divide created by the concrete-lined channel of the Los Angeles River. Moreover, the existing Grayson Power Plant is completely paved and flat, within an urban environment, and no vegetative fuel is present onsite.

All demolition and construction equipment are required to have fire suppression equipment (such as a fire extinguisher) on board or at the work site. As described in Section 3.2.5, the first demolition activity to occur would be to temporarily reroute existing fire protection water system to be available for fire protection during demolition and construction. There are two fire hydrants adjacent to the existing Unit 9 as well as two additional temporary fire hydrants to be located along the westerly boundary of the Project Site which would remain in place and operational during the demolition and construction phases.

While there are materials, equipment and fuels on-site that would burn if ignited, it is unlikely that fire would spread beyond the Project site for the reasons discussed above, including proximity of fire suppression equipment on-site and the concrete-lined river channel between the site and the Very High Fire Hazard Severity zone located nearby.

Operation

Operational impacts associated with exacerbated wildfire risks and increased potential exposures to pollutant concentrations from a wildfire or an uncontrolled spread of wildfire could occur if operation of the proposed Project would result in an increased baseline wildfire risk or generate increased sources of ignition.

All critical equipment would be separated by rated fire barriers, thereby reducing related ignition risks. The proposed Project would remain paved with low vegetative fuel present to reduce the potential for ignition and create a low risk of fire.

The fire protection system would be designed to protect personnel and limit property loss and plant downtime in the event of a fire and would be designed to meet all laws, ordinances, regulations, and standards (LORS) for the Project. The fire protection system design basis for the Project has been previously reviewed and approved by the Glendale Fire Department, as the Certified Unified Program Agency.

Additionally, fire protection water for the Project would be supplied via connection to the City's 8- and 12-inch potable water distribution system that is currently providing fire protection for the existing Grayson Power Plant. The layout of new equipment and systems would require replacement of most of the existing fire water distribution system within the Grayson Power Plant site. New on-site dedicated underground fire loop piping system with fire hydrants connected to the fire-water loop would be constructed for the Project in compliance with National Fire Protection Association guidelines and the City of Glendale Fire Department requirements. Compliance with existing rules and regulations would serve to ensure that wildfire related impacts during operation would be less than significant.

Level of Significance before Mitigation:

Less than Significant Impact.

Mitigation Measures:

No mitigation is required.

Level of Significance after Mitigation

Less than Significant Impact.

Threshold: Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?

Demolition

Primary access to the Project site would be provided via the main existing entrance off Fairmont Avenue. In addition, there is a secondary metal gate directly into the Grayson Power Plant site from Fairmont Avenue that would be used for truck hauling of demolition debris and truck delivery of equipment and material. The primary freeway access is the San Fernando Road exit from CA-134 or from the Western exit on Interstate 5. No additional roads would be required for access.

The existing site is predominantly paved (concrete and asphalt) with no vegetation. Fuel breaks would not be required.

As described above in Section 3.2.5 (Demolition Activities), initial demolition activities would include temporarily rerouting the existing fire protection water system to be available for fire protection during demolition and construction. Fire protection water for the Project would be supplied via connection to the City's 8- and 12-inch potable water distribution system that is currently providing fire protection for the existing Grayson Power Plant. Demolition activities would utilize existing power lines or other utilities as needed for completion. As a result, no additional infrastructure would be required, and impacts are expected to be less than significant.

Construction

As described above in Section 3.3.2 (Construction Plans), construction mobilization would require installation of temporary construction power throughout the Project. This would be provided by the City. A rock aggregate would be used for temporary roads, laydown, work areas, and on-site construction parking areas. All temporary construction power or rock aggregate infrastructure will be removed at completion of the Project. As a result, impacts are expected to be less than significant.

The proposed Project is an electrical generation facility located at and within the exiting Utility Operations Center. All electrical connections would be within the Utility Operations Center and no new external connections are required. During construction, the existing Utility Operations Center utilities would be used for the construction offices, laydown area, and the Project site. As a result, Project- related construction impacts related to the installation or maintenance of associated infrastructure that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment would be less than significant.

Operation

Operation of the proposed Project would be limited to activities related to energy generation within the enclosed Project site footprint. During operation of the proposed Project, the City's existing 8- and 12-inch potable water distribution system that is currently providing fire protection for the existing Grayson Power Plant would provide access to water for fire protection at all times. Therefore, the proposed Project would ensure adequate on-site water is available for firefighting and would not exacerbate fire risk. Additionally, the proposed Project would utilize the existing predominantly paved site requiring no additional fuel break. Operation-related impacts for this threshold would be less than significant, no mitigation measures are warranted.

Level of Significance before Mitigation:

Less than Significant Impact.

Mitigation Measures:

No mitigation is required.

Level of Significance after Mitigation

Less than Significant Impact.

Threshold: Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?

Demolition

Demolition activities would result in temporary exposure of on-site soils. As described further in Section 4.4 (Geology and Soils), an erosion control plan, which is subject to review and approval by the City Engineer, would be required prior to any demolition- and construction-related activities. Such plans must include procedures and equipment necessary to contain on-site soils and minimize potential for contaminated runoff from the Project site. In addition to the erosion control plan, preparation, and implementation of a Stormwater Prevention Plan, Dust Control Plan and (BMPs would also minimize erosion. The proposed Project topography is relatively flat resulting in low risk for landslides. The proposed Project would not increase the risk of flooding or landslides after a wildfire compared to existing conditions. As a result, Project-related impacts from demolition would be less than significant.

Construction

As discussed in Section 4.4 (Geology and Soils), due to minimal slopes at the Project Site, landslides are not considered a potential hazard. While grading would be performed as part of the proposed Project, the grading would be conducted in accordance with applicable codes/standards pursuant to a grading permit.

In the proposed condition, on-site stormwater runoff from the Project would flow via surface sheet flow and localized gutters to catch basins and on-site storm drain piping. The proposed Project would not substantially alter the existing drainage pattern of the site and surrounding area. Therefore, the proposed Project would not increase the risk of flooding or landslides after a wildfire compared to existing conditions. Construction impacts would be less than significant. As discussed above, construction of the proposed Project would not expose people or structures to increased or significant risks as a result of runoff, post-fire slope instability, or drainage changes.

Operation

The proposed Project would not require periodic earthmoving or drainage changes which could substantially alter the condition of the site during the operation phase. Impacts which could result from increased risks to downslope or downstream areas would be similar to those currently posed by the existing Grayson Power Plant and would not increase during operation of the proposed Project. As discussed above, operation of the proposed Project would not expose people or structures to increased or significant risks as a result of runoff, post-fire slope instability, or drainage changes. Operation of the proposed Project would be restricted to the proposed Project site and would not result in ongoing earthmoving or drainage changes which could substantially change the area. Operation of the proposed Project would not substantially alter the risk of landslides after a wildfire, as compared to other uses and risks in the area. As such, impacts would be less than significant, and no mitigation measures are warranted.

Level of Significance before Mitigation:

Less than Significant Impact.

Mitigation Measures:

No mitigation is required.

Level of Significance after Mitigation

Less than Significant Impact.

5.0 ALTERNATIVES

5.1 Introduction

A reasonable range of alternatives that could feasibly attain some of the basic objectives of the Proposed Grayson Repowering Project (Project) are identified and evaluated within this section.

5.1.1 Project Objectives

Pursuant to Section 15124(b) of the ~~California Environmental Quality Act (~~CEQA~~)~~ Guidelines, the description of the ~~Project~~ project must contain “a clearly written statement of objectives” that would aid the lead agency in developing a reasonable range of alternatives to evaluate in the ~~Environmental Impact Report (~~EIR~~)~~, and to aid decision makers in preparing findings~~,~~ and~~, if necessary, ~~a statement of overriding considerations.

Within the context of the City’s overarching need to ensure a reliable year round supply of power to its residents and customers under various planning contingencies[4], the primary objective of the Project is to replace the aged, less efficient, less flexible, and unreliable generation units at the Grayson Power Plant with approximately 262 megawatts (MW) net of modern power generation that is efficient, reliable, operationally flexible, and can easily integrate into the City of Glendale’s existing power system. This Project would ensure system reliability, facilitate and balance renewable imports, and supply the balance of the City’s power needs when transmission imports are insufficient, curtailed, or not available to serve its electrical load[5]. In addition, the Project will be able to integrate and accept increasingly available renewable energy resources.

The Project objectives are:

1. Integrate with local and remote distributed renewable energy resources to provide sufficient capacity and energy to ensure reliable service at all times for the City and to support the City’s compliance with California’s Renewable Portfolio Standards.

2. Utilize current and reliable technology and control systems to provide reliable, cost effective, and flexible generation capacity for the City to serve its customer load.

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[4] Required planning contingencies include a generating unit suddenly going off-line and no longer generating power, the loss of a transmission system (100 MW), or the loss of the source of power being imported over a transmission system. These types of planning contingencies have in fact occurred. Also, while not a required planning contingency, during the Sylmar earthquake the City lost its outside electricity supplies and was islanded (not connected to an off-site power supply through the transmission grid) with only internal generation available.

[5] The City’s ability to import power is limited by the capacity of two existing transmission systems, which combined are less than the full load demands of the City. The transmission lines are subject to curtailments (partial or full reductions in capacity). For example, the capacity of the Pacific DC Intertie (100 MW) was reduced for six months in 2004 and then was completely out of service for an additional three months.

3. Provide a local generation resource sufficient to meet resource adequacy requirements, and the City's obligations within the Balancing Area[6] (BA) to balance load and resource at the interconnection with the BA, in accordance with industry standards including North American Electric Reliability Corporation (NERC) and Western Electricity Coordinating Council (WECC) requirements; thus, providing local reliability and contributing to grid stability within the Los Angeles Basin.

4. Provide sufficient locally controlled generation to minimize the City's reliance on importing power from remote generation locations through a congested transmission grid system subject to planned and unplanned outages and de-rates, making the delivery of energy to serve load less reliable than local generation.

5. Replace the aged, unreliable, less efficient, high maintenance steam boilers with new, efficient, and less environmentally impactful generation technologies that meet South Coast Air Quality Management District's (SCAQMD) Rule 1304(a)(2).

6. Locate the proposed Project at existing City property already permitted and used for generation to minimize the need for major infrastructure improvements such as fuel supply, water, wastewater, recycled water and transmission facilities, or the need to purchase additional property.

7. Provide generation that is highly efficient to maintain reasonable cost of generation to minimize the impact on customer electric rates and help manage costs of delivering energy to the City's customers.

8. Support water conservation efforts by eliminating the use of potable water for generation purposes.

9. Reduce the per megawatt-hour (MWH) creation of emissions and consumption of water.

5.1.2 Significant Impacts of the Project

~~No unavoidable significant impacts from implementation of the proposed Project have been identified in this Draft EIR.~~ The Project would result in a significant and unavoidable impact to cultural resources due to the demolition of the Boiler Building, which the City has elected to consider a discretionary historic resource. Demolition of the Boiler Building would also be required for Alternatives 2 (Energy Storage Project Alternative), 4 (150 MW Project Alternative), 5 (200 MW Project Alternative), 7 (Tesla/Wartsila Repowering Project Alternative), and 8 (Unit 8 Refurbishment Project Alternative). Alternatives 1 (No Project) and 3 (Alternative Energy Project Alternative) would do not involve re-development at Grayson

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[6] A geographic area defined by the interconnected transmission/distribution systems. The boundaries of the Balancing Area are defined by the points of interconnection to other Balancing Areas. The generation within a Balancing Area must be constantly adjusted so that the sum of the power generated within the Balancing Area, plus power imported into the Balancing Area, less the power exported from the Balancing Area, less the load within the Balancing Area is maintained at zero, e.g., in balance. For the Grayson project, the Balancing Area is composed of Los Angeles Water and Power, Glendale Water & Power, and Burbank Water & Power.

Power Plant and the Boiler Building would not be demolished. Therefore, only Alternatives 1 (No Project) and 3 (Alternative Energy Project Alternative) would avoid the significant and unavoidable cultural resources impact associated with the proposed Project and five other alternatives evaluated. A statement of overriding considerations will be required should the City elect to certify the EIR.

5.1.3 Requirements for Alternatives Analysis

CEQA requires an evaluation of project alternatives based on the comparative merits of “a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project and evaluate the comparative merits of the alternatives” (Title 14, CCR, 15126.6(a)). Thus, the focus of the alternative’s analysis should be on alternatives that “could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more significant effects” (14 CCR 15126.6(c)). Feasible is defined to include the consideration of economic, environmental, social, legal, and technological factors and includes site suitability, economic viability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries, and whether the proponent can reasonably acquire, control, or otherwise have access to alternative sites.

The analysis must also address the “no project” alternative (Title 14, CCR, Section 15126.6(e)). The CEQA Guidelines further state that the range of alternatives is governed by the “rule of reason,” which requires consideration only of those alternatives necessary to permit a reasoned choice and to foster informed decision making and public participation (CCR, Title 14, Section 15126.6 (f) (3)).

There is no ironclad rule governing the nature or scope of the alternatives to be discussed other than the rule of reason. *Citizens of Goleta Valley v. Board of Supervisors (1990) 52 Cal.3d 553; Laurel Heights Improvement Association v. Regents of the University of California (1988) 47 Cal.3d 376*. Because the primary purpose of an EIR is to mitigate or avoid significant environmental effects, the alternatives discussion is focused on alternatives to the project that are capable of avoiding or substantially lessening any significant effects of the project, even if those alternatives would impede to some degree the attainment of the project objectives or would be more costly. CEQA Guidelines Section 15126.6(b).

Of the alternatives that fit the above criteria, the EIR need examine in detail only those alternatives that the Lead Agency determines could feasibly attain most of the basic objectives of the project. CEQA Guidelines Section 15126.6(f). An EIR need not present alternatives that are incompatible with the project’s fundamental purpose. *Bay-Delta Programmatic Envt’l Impact Report Coordinated Proceedings (2008) 43 Cal.4th 1143, 1164; Bay Area Citizens v. City of Oceanside (2004) 119 Cal.App.4th 477; Jones v. Regents of Univ. of Cal. (2010) 183 Cal.App.4th 818.*

No set number of alternatives is necessary to constitute a legally adequate range of alternatives. The scope will vary from case to case depending on the nature of the project and the Lead Agency has discretion to determine how many alternatives constitute a reasonable range. *Citizens of Goleta Valley v. Board of Supervisors (1990) 52 Cal.3d 553, 566.*

5.1.4 Selection of Alternatives to be Evaluated in EIR

5.1.4.1 Overview of Alternatives Selected for Further Analysis

In addition to a No Project Alterative, the following alternatives, which meet some of the project goals and objectives, are ~~analyzed~~ summarized in this section.

Alternatives 1 through 5 were evaluated in the Final 2018 EIR. Alternatives 7 and 8 were evaluated as new alternatives for consideration following the Clean Energy RFP process and City Council direction to study additional alternatives that would reduce natural-gas electricity generation compared to the proposed Project. All seven[7] alternatives evaluated in this PR-DEIR involve less natural gas-fueled electricity generation compared to the proposed Project. The proposed Project, as well as all alternatives with the exception of the No Project Alternative and Alternative 3, necessitate removal of the Boiler Building to provide sufficient space for the new facilities.

The potential environmental impacts of Alternatives 7 and 8 evaluated in Section 5.2.6 and 5.2.7 of this PR-DEIR include technical study for key environmental factors for direct comparison to the proposed Project. These studies include photo simulations, criteria air pollutant emissions estimates, air pollutant dispersion modeling, heath risk assessments, greenhouse gas emissions estimates, noise modeling, and offsite consequence analyses for reasonable worst-case accidental release scenarios involving hazardous materials.

- **No Project Alternative (Alternative 1)**: ~~Running the existing power plant to failure and not proceeding with repowering of the Grayson Power Plant~~ The old, less efficient, and existing electrical generation units built between 1941 and 1977 would continue to operate until the end of 2023 and then would be shut down as a result of SCAQMD regulations that would make it cost-prohibitive to retrofit the boiler units for continued maintenance and operation.

- **Energy Storage Project Alternative (Alternative 2)**: Replace Units 1 – 8 at the existing Grayson Power Plant site with a battery energy storage facility. Use of existing City Unit 9 electrical generation, the City's allotment from the Magnolia Power Plant, and transmission capacity to serve the City's electrical load and charge batteries when excess capacity is available. Energy stored in the batteries would then be discharged to serve the electrical load when demand exceeds available transmission and generation resources.

- **Alternative Energy Project Alternative (Alternative 3)**: A project with some combination of photovoltaic or wind power production with energy storage and new electrical transmission lines into the City.

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[7] Alternative 6, a reconfigured version of Alternative 7 was screened out from further review after the initial engineering phase of its development due to site constraints (see Section 5.3.6), but a decision was made to not renumber the remaining alternatives 7 and 8. Accordingly, in the final analysis there are a total of seven alternatives that received more in-depth review and consideration.

- **150 MW Project Alternative (Alternative 4)**: A reduced size natural gas-fueled power project (150 MW) located ~~on~~ at the existing ~~project~~ Grayson Power Plant site with a new off-site electrical transmission line ~~interconnection~~ into the City.
- **200 MW Project Alternative (Alternative 5)**: A reduced size natural gas-fueled power project (200 MW) ~~located on the existing project site~~ with a battery energy storage system (50 MW/200 MWH) located at the existing Grayson Power Plant site.
- **Tesla/Wartsila Repowering Project Alternative (Alternative 7):** A reduced size natural-gas fueled power project (92.5 MW) with a battery energy storage system (75 MW/300 MWH) located at the existing Grayson Power Plant site.
- **Unit 8 Refurbishment Project Alternative (Alternative 8):** A reduced size natural gas-fueled power project (101 MW) that would retain and refurbish existing Units 8A and 8BC gas turbines, converting Unit 8A to simple cycle, and converting Unit 8BC to a fast start combined cycle unit and add battery energy storage system (75 MW/300 MWH) located at the existing Grayson Power Plant site.

5.1.4.2 Overview of Alternatives Not Selected for Further Analysis

Section 15126.6, subdivision (c) of the CEQA Guidelines describes selection of a reasonable range of alternatives and the requirement to include those that could feasibly accomplish most of the basic project objectives while avoiding or substantially lessening one or more of the significant effects. The analysis should identify any alternatives that were considered by the lead agency but were rejected as infeasible. CEQA requires a brief explanation of the reasons underlying the lead agency's determination to eliminate alternatives from further analysis.

A number of alternatives were considered but eliminated from further consideration. The alternatives that were not evaluated further in the Final 2018 EIR and/or this PR-DEIR include alternative sites, and a variety of alternative technologies (generation technology, fuel technology, and alternative power plant cooling). These alternatives are more fully discussed in Section 5.3.

5.2 Analysis of Alternatives

5.2.1 Alternative 1 - No Project Alternative

5.2.1.1 Description

Under the No Project Alternative, the existing Grayson Power Plant would not be repowered. ~~Old, less efficient equipment built between 1941 and 1977 would continue to operate as long as maintenance is still feasible and economic. The feasibility of maintaining aging units is declining, and the cost of maintenance would continue to increase, as would the likelihood of future electrical power outages. At some point, when maintenance is no longer practical, the units would be shut down. This is referred to as the "run to fail" option~~ Aside from Unit 9, the boiler units and Units 8A and 8BC as currently configured with the old steam turbines, do not offer quick starting capability hampering their usefulness and effectiveness in the current energy environment. The old, less efficient equipment built between 1941 and 1977 would continue to operate until the end of 2023 and then would be shut down as a result of SCAQMD regulations that would make it cost-prohibitive to retrofit the boiler units for continued maintenance and operation.

As of December 2012 (Source – SNL Energy) the average retirement age of fossil fuel plants is forty-~~one (41)~~ three (3) years for combustion turbines and fifty-four (54) years for steam turbines. All the existing generating units, except for Unit 9 (a simple cycle combustion turbine-generator) which is not being replaced, were built between 1941 and 1977 and are at least 40 years old. ~~Except for~~ With exception of Unit 9, all the units are at or past the end of their design lives and are increasingly difficult to maintain feasibly and economically.

The No Project Alternative would result in a total Grayson Power Plant generating capacity of up to 48 MW (net) from Unit 9, with the remaining electrical energy to meet Glendale's customer load being supplied from the Magnolia Power Plant (35-39 MW[8]), and electricity imports over transmission systems from outside of the City (200 MW plus an additional 72 MW from the Southern Transmission System starting in 2027 as a result of the City's Intermountain Power Project entitlements). In addition, there is also an additional 50 MW expected from demand response programs and the proposed virtual power plant. This ~~would~~ could provide the City a maximum total supply of ~~287~~ 213 MW, which is less than the City's ~~summer time~~ summertime (June-September) peak loads[9], and only ~~187~~ 213 MW with the loss of the single largest contingency. This reduced capacity would come at a significantly increased risk to reliability potentially culminating in the inability to serve load at all times of the year without blackouts. Since 2009, the City's electric system load was more than ~~187~~ 213 MW an average of eight-one (81) days per year. Additionally, at these minimum levels of generation/supply, the City would not meet its NERC reliability obligations to the Balancing Authority. ~~Thus~~ Therefore, the No Project Alternative does not provide a viable means to serve the electric load of the City's residents and customers.

5.2.1.2 Potential Environmental Impacts – No Project Alternative

The No Project Alternative would result in no action if the City does not approve the proposed Project or a Project alternative. Following are the potential environmental impacts that would result from the No Project Alternative.

Potential Environmental Impacts Less than Those of the Project

Emissions, noise, and traffic associated with Project demolition and construction would be avoided with the No Project Alternative. The Boiler Building would not be demolished, and the significant and unavoidable impact on a discretionary historic resource would be avoided. As generation units are retired

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[8] Glendale's allocation of Magnolia is 46 MW; however, 7 MW of that amount is only available when Magnolia utilizes the supplementary gas-fired burners to increase the combustion turbine exhaust energy in order to produce more steam and hence increase the steam turbine output. However, the supplementary burners are typically not used, and thus 39 MW is a more realistic value.

[9] The all-time peak load was 346 MW.

and only Unit 9 remains operating, there would be a reduction in emissions, noise, and traffic from plant operation. Potential air quality, cultural resources, greenhouse gas emissions, noise, and traffic and transportation impacts of the No Project Alternative would be less than those of the Project.

Potential Environmental Impacts Similar to Those of the Project

The Grayson Power Plant would continue to operate, with older generation units being retired until only Unit 9 remains in operation. The existing power plant facility would remain to have a similar aesthetic impact to that of the Project's. The No Project Alternative would also have similar impacts as the Project to agriculture and forestry resources, biological resources, ~~cultural resources,~~ environmental justice, geology and soils, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, population and housing, public services, recreation, socioeconomics, tribal cultural resources, ~~and~~ utilities and service systems, and wildfire as the land use would be consistent and restricted to the same site.

Potential Environmental Impacts Greater than Those of the Project

~~The No Project Alternative would not have any potential environmental impacts greater than those of the Project.~~ While the No Project Alternative would avoid use of construction fuels that would be consumed during Project construction, the No Project Alternative includes existing power generation equipment that is old and less efficient than that of the proposed Project. As a result, the No Project Alternative requires more natural gas combustion per MW of electricity generated compared to the proposed Project. As a result, the No Project Alternative would be more wasteful of energy compared to the proposed Project in the short term. A primary objective of the Project is to provide efficient operational flexibility with quick-start high ramp rate generation to facilitate an increasing contribution of renewable energy (such as wind and solar) into the City's electrical grid and to support California's Renewable Portfolio Standards. The No Project Alternative would significantly challenge the City's ability to integrate renewable resources because only Unit 9 would remain available to balance the intermittency of renewable imports. The No Project Alternative would therefore have a greater potential to conflict with or obstruct a state or local plan for renewable energy or energy efficiency. The No Project Alternative would therefore have greater potential energy impacts than the proposed Project.

5.2.1.3 Objectives Consistency Evaluation

A primary objective of the Project is to provide efficient operational flexibility with quick-start high ramp rate generation to facilitate increasing the contribution of renewable energy (such as wind and solar) into the City's electrical grid and to support California's Renewable Portfolio Standards. The No Project Alternative would significantly challenge the City's ability to integrate renewable resources because only Unit 9 would remain available to balance the intermittency of renewable imports.

As a result of the continued challenges in maintaining reliable operation of old units as well as their less efficient operation, the unavailability of additional transmission capacity for increased electrical imports, the City's customers would not gain the reliability, financial, and environmental benefits a new efficient power plant would offer, and would be subjected to degraded system reliability, including likely rolling blackouts under peak load or contingency conditions.

One of the main objectives of the Project is to ensure continued reliability of the City's generation and transmission systems' ability to serve the City's full load for any given period of time. Due to transmission constraints, this requires that local generation be available to meet the City's load and reserve requirements in combination with the ability to optimize its transmission rights to import energy from external sources, including renewable energy to meet the Renewable Portfolio Standards.

Even if the City were able to construct new high voltage transmission lines, which is economically and environmentally challenging, local generation would still be required to ~~meet the Balancing Authority's needs to~~ provide reserve margins and regulation, and to serve the City's load when external sources are curtailed or not available. Thus, the No Project Alternative would not ~~provide the level of reliability mandated by~~ meet NERC/WECC reliability standards or meet the Project's objectives.

The No Project Alternative would fail to fulfill the City's objectives, the City would not be able to meet the State's Renewable Portfolio Standards, and the City would not ensure a reliable and continuous electric supply for the City.

The No Project Alternative does not feasibly meet many of the Project objectives or meet them as well as the Project. Specifically, the No Project Alternative:

1. Would only be able to integrate with local and remote distributed renewable energy resources to a limited and declining extent as units are shut down. This declining resource would not be sufficient to provide enough capacity and energy to ensure reliable service at all times for the City, and to support the City's compliance with California's Renewable Portfolio Standards.

2. Would not be using current and reliable technology and control systems to provide reliable, cost effective, and flexible generation capacity for the City to serve its customer load.

3. Would provide a local generation resource, but that source would diminish with time and would not be sufficient to meet resource adequacy requirements, and the City's obligation within the Balancing Area to balance load and resource at the interconnection with the BA, in accordance with industry standards including NERC/WECC requirements; thus, would not provide local reliability or contribute to grid stability within the Los Angeles Basin.

4. Would provide a locally controlled but declining source of generation. The No Project Alternative would not be sufficient to ~~minimize~~ back up the City's reliance on importing power from remote generation locations through a congested transmission grid system subject to planned and unplanned outages and de-rates, making the delivery of energy to serve load less reliable than local generation.

5. Would not replace the aged, unreliable, less efficient, high maintenance steam boilers with new efficient and less environmentally impactful generation technologies that meet SCAQMDs Rule 1304(a)(2).

6. Would be located at the existing City property already permitted and used for generation, and would, due to units eventually coming off-line, minimize the need for major infrastructure improvements such as fuel supply, water, wastewater, recycled water, and for the construction of transmission facilities, or need to purchase additional property.

7. Would not provide generation that is highly efficient to maintain reasonable cost of generation to minimize the impact on the rates and help manage costs of delivering energy to the City's customers.

8. Would not support water conservation efforts by eliminating the use of potable water for generation purposes, until most of the aging units are depowered.

9. Would not reduce the per megawatt-hour (MWH) creation of emissions and consumption of water.

5.2.1.4 Summary – No Project Alternative

The No Project Alternative would involve ~~running the existing power plant to failure and not proceeding with repowering of the Grayson Power Plant~~ continuing to operate the old, less efficient equipment built between 1941 and 1977 until the end of 2023 and then the equipment would be shut down as a result of SCAQMD regulations that would make it cost-prohibitive to retrofit the boiler units for continued maintenance and operation. The No Project Alternative would result in reduced environmental impacts over time as the units are shut down and would have less potential environmental impacts than those of the Project. The Boiler Building would not be demolished, and the significant and unavoidable discretionary historic resource impact of the proposed Project would be avoided. However, the City would need to replace that reduction in electrical capacity with additional sources of currently unknown electricity; the potential environmental impacts of which are not and cannot yet be evaluated as part of this Project EIR. ~~However, the~~ The No Project Alternative is not a viable alternative in that it would not serve the needs of the City as the City could no longer meet its obligations as a load serving entity for its residents and customers, placing them at significant risk for decreased electrical system reliability and availability. Moreover, the No Project Alternative would not satisfactorily meet the Project objectives and would fail to comply with Federal and State reliability standards.

5.2.2 Alternative 2 - Energy Storage Project Alternative

5.2.2.1 Description

If the City does not replace the existing generation facilities, the City would need to either build additional transmission capacity or build "time shifting" energy storage systems to provide the requisite capacity. Given the significant difficultly in locating suitable right-of-ways and permitting new large capacity transmission connections due to the dense urban development in the Los Angeles basin, as well as the potential for significant environmental impacts from the development of new transmission facilities, a Project alternative involving large capacity energy storage system at the Grayson site was deemed a reasonable Project alternative worthy of further evaluation.

The Energy Storage Project Alternative involves an energy storage system (i.e., batteries, typically lithium ion) that would be charged during times of the day when there is available transmission capacity not needed to serve the City's load. The available energy would be stored and "time shifted" to be used during high load periods when the available transmission capacity is inadequate to serve the City's load. On high load days, however, the ability to store sufficient energy and transmission capacity may need to be supplemented with additional transmission or local generation.

In this Alternative, which presumes all units but Unit 9 will ultimately be shut down, the City would use the available 48 MW (net) from Unit 9, 39 MW from the Magnolia Power Plant, and 200 MW imported over transmission lines from outside of the City. This would provide the City a total supply of 287 MW, which is less than the City's peak loads[10]. With the NERC required planning assumption that the single largest source of power will unexpectedly cease to be available (an event known in the power industry as "the loss of the single largest contingency") which would be losing the 100 MW delivered to Glendale over the Pacific DC Intertie transmission line), available capacity would fall to 187 MW increasing the shortfall in capacity. The 2019 IRP analysis concluded that a portfolio relying on large-scale energy storage would not provide sufficient power to serve the City's energy demands.

Figure 5.1 below illustrates the City's daily load profiles for Mondays through Fridays in August 2017 (each of the different colored curves is a different day). Each day, energy generated during the late night and early morning hours when ~~the system load~~ GWP's electrical load is less than the available electrical supply capacity is energy that would be available to be stored. Later in the day, when system load is greater than the available electrical supply, energy would be discharged from the energy storage system to serve GWP's load. The blue horizontal line represents maximum available capacity to the City without the Repowering Project and the single largest contingency remaining in service. The red horizontal line represents the maximum available capacity to the City without the Repowering Project and with the loss of the single largest contingency (the "N-1" condition).

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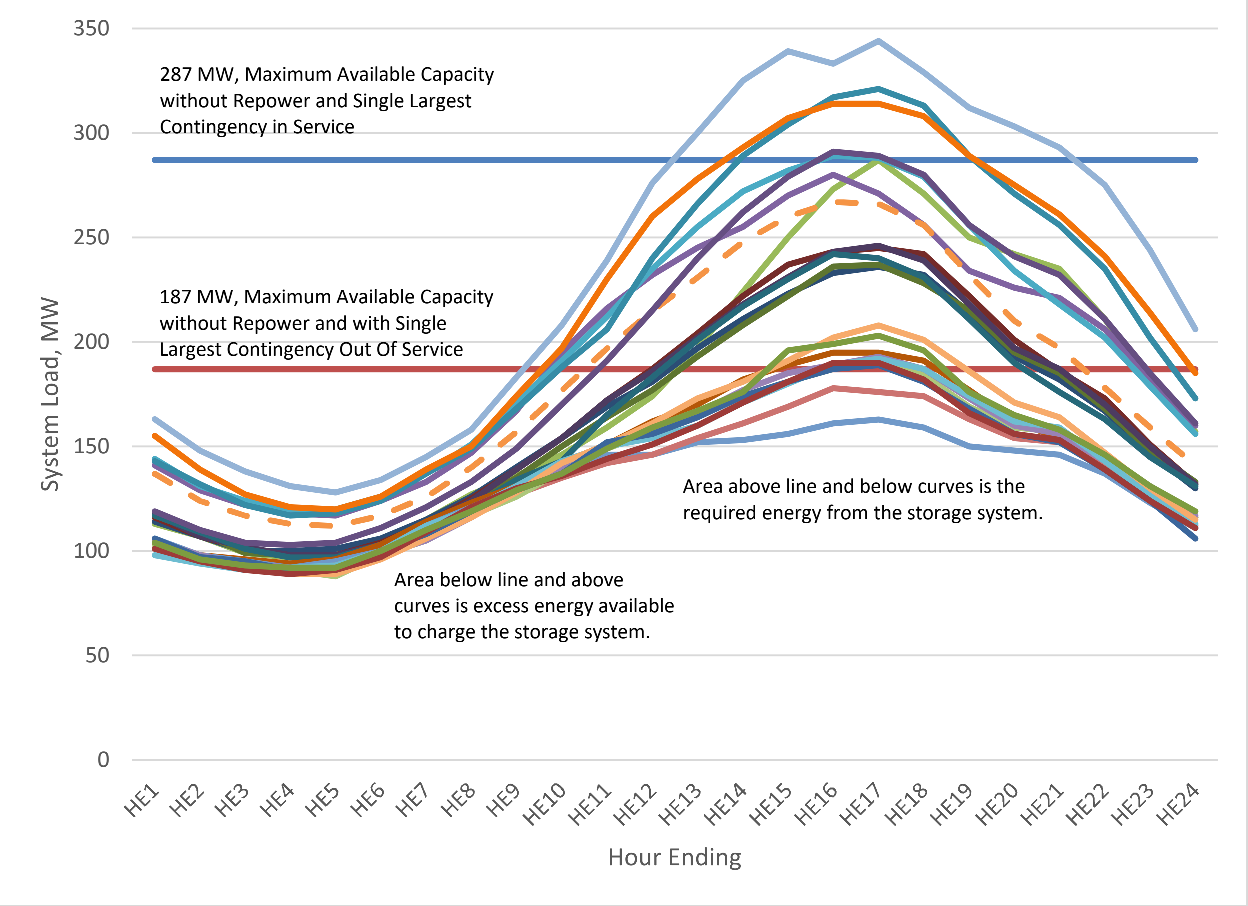
[10] The City had yearly peak loads of 329 MW, 329 MW, and 346 MW in 2015, 2016, and 2017 respectively. Prudent system planning would typically include some reserve above the peak load.

Figure 5-1 August 2017 Monday Through Friday Daily Load Profiles



With transmission imports, Unit 9's output, Glendale's share of the Magnolia Power Plant, ~~and transmission imports,~~ demand response, and the proposed virtual power plant, there would be sufficient excess energy available overnight to store and time shift to serve the daytime and early evening peak load hours. However, if one of these sources of power were to be ~~lost~~ unavailable, this is no longer possible for the higher load days as the amount of excess energy that could be supplied during late evening and early morning hours is less ~~that~~ than what would be consumed from mid-morning into the evening hours.

~~To serve peak load and accommodate the NERC required consideration that the single largest source of power could be lost unexpectedly, this Alternative would require a storage system with a minimum usable power capacity of 160 MW (346 MW peak load less 187 MW available capacity equals 159 MW). For the purposes of this evaluation the August 4th load curve was used (the dashed line) as it was the highest load day where energy available for storage exceeded demand. On that day, approximately 633 MWH would have been available for storage to supply a demand of 522 MWH for a surplus of 111 MWH. The next higher load curve day was August 28 and had a deficit of approximately 69 MWH, with the highest load curve (August 31) having a deficit of approximately 1,170 MWH (one-third of the load curves had~~

~~more demand than excess energy). Of necessity, since solar energy is not available during late evening early morning hours when excess energy was available, transmission imports would come from non-solar resources as well as energy from Unit 9 and Magnolia.~~

To serve peak load and accommodate the NERC required consideration that the single largest source of power could be lost unexpectedly and ignore the requirement to also cover the N-1-1 contingency, this Alternative would require an energy storage system to make up the difference[11]. From the above chart, there are two periods of subsequent days (August 2-3 and August 28-31) where there would be a shortfall between the energy that could be stored the previous night and what would be needed the following day of between 165 and 1,262 MWH daily[12]. Additionally, because this condition occurs on succeeding days, the shortfalls are cumulative. To meet load during the four-day period would have required stored energy of 2,940 MWH with a peak capacity of 161 MW with the loss of the single largest contingency, and no demand response or virtual power plant.

Of necessity, since solar energy is not available during late evening and early morning hours when excess transmission capacity was available, the energy stored overnight would come from non-solar resources as well as energy from Unit 9 and Magnolia. It should also be noted that the 2,940 MWH of additional energy needed would have to have been stored prior to the four high load days occurring.

Energy storage options currently available include battery systems, thermal energy storage, hydrogen production, and mechanical energy storage.

- Battery storage systems include several types of batteries and capacitors which meet specific needs and requirements in certain application.
- Thermal energy storage utilizes a source of heat, such as solar thermal or electrical heating, to generate steam for power production during evening hours. However, this technology is not feasible at Grayson or within the City because inadequate available space exists on site to develop a solar array facility for this purpose, and there are no feasible options in Glendale on property owned by the City, including rooftops.
- Hydrogen production involves “storing” energy by using surplus energy to generate hydrogen through hydrolysis, and then burning the hydrogen (in a turbine) to generate electricity. While small projects have been built, large scale electricity production solely fueled with hydrogen has not been commercially demonstrated. Additionally, lacking a pipeline supply of hydrogen, hydrogen would need to be generated and stored on or close to the Grayson site which may be

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[11] For this evaluation, demand response and the Virtual Power Plant were not included because they cannot contribute energy to be stored on a 24 hours per day and 7 days per week basis.

[12] 165, 256, 380, 688, 825, and 1,262 MWH. The four days of August 28-31 total 2,940 MWH.

problematic due to lack of on-site space to accommodate a hydrogen facility[13]. Thus, this option was not considered feasible for the Energy Storage Project Alternative.

- Compressed air technology also stores energy by using surplus electrical energy to operate compressors that store high-pressure air for later release through an air-powered turbine. Flywheel technology utilizes surplus energy to accelerate large rotors (flywheels) to very high speeds, and then uses that stored rotational energy to spin a generator when power is needed. While promising, compressed air and flywheel technology have not yet been demonstrated to be cost-effective methods for storing energy on a large scale, a scale sufficient to store enough energy to meet peak load. The site does not have any capability or capacity to store compressed air for the purpose of shifting load.
- Pumped-storage hydroelectricity entails storing surplus energy by pumping water from a lower reservoir to a higher reservoir, and then releasing it through a turbine-generator when additional generation is needed. These projects require two reservoirs at significantly different elevations, plus a pumping/generating station and connecting penstock, and therefore have very specific siting requirements not generally found in the population centers of the greater Los Angeles Basin (CEC, 2011), let alone in Glendale.

Based on the above, a Battery Energy Storage System (BESS) was considered the only feasible energy storage technology that can be sited at Grayson at this time and is therefore the energy storage system analyzed in this Alternative. The BESS could utilize either Lithium-ion rechargeable battery or reduction-oxidation flow battery technologies.

If adequate storage capacity could be achieved through a BESS, the Energy Storage Project Alternative using the BESS method would meet most of the Project objectives.

~~In sizing a BESS, several factors must be taken into consideration:~~

- ~~The full capacity of the battery is not available for use (the battery cannot be fully discharged each time without seriously compromising its lifetime).~~
- ~~The “round trip efficiency” is less than 100% (all of the energy sent into the battery is not available for use).~~
- ~~The capacity of a battery slowly degrades over time. The amount of degradation is dependent on how much energy is used during a discharge cycle, and how fast the battery is charged or discharged.~~
- ~~Batteries need to be in modular groups to avoid large scale cascade failures.~~

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[13] Space at Grayson, or elsewhere in the City, would need to be allocated for the construction of a hydrolysis facility and the storage of hydrogen. Recycled water could serve as a source of water for hydrolysis. Renewable energy imports in excess of what is needed to serve load could be used to power the facility primarily during the fall, winter, and spring seasons when imports are greater than demand.

~~To provide an additional 522 MWH of usable capacity over a reasonable battery life considering typical allowable depth of discharge (80%), a capacity degradation of 20% over its lifetime (2% per year for a ten-year lifetime), and assuming a round trip efficiency of 100% (no losses) would necessitate a BESS of approximately 815 MWH storage capacity. Note that if the highest load curve was used the storage requirement would escalate to over 1,800 MWH. A battery life of 10 years was assumed (this is the higher end of expected lifetimes) subject to reasonable cycling duty and specific battery technology and chemistry.~~

~~If adequate storage capacity could be achieved through a BESS, the Energy Storage Project Alternative using the BESS method would meet most of the Project objectives. However, the BESS presents some challenges that place its ultimate feasibility in question. For example:~~

- ~~While sufficient energy would be available during the winter months to charge the batteries over the transmission system, during the summer months, sufficient energy will not be available during all days because all transmission capacity will be needed most of the time to serve load. Consequently, this Alternative does not assure that the City will be able to reliably serve its customers at all times.~~
- ~~The scale of the required BESS is much larger than other BESS projects that have been built to date, with the largest existing BESS project being a 30 MW 120 MWH project[14]. A BESS system at Grayson would require five times the power delivery and seven to fifteen times the energy storage.~~
- ~~The initial installed cost of the BESS is estimated at approximately $500,000/MWH based on recently completed, albeit much smaller, projects (tens of MWH of storage). For 815 MWH of storage, this translates to more than $320,000,000 if we allow a twenty percent reduction in the estimated cost per MWH due to economy of scale (although this is not certain). Actual costs will be higher as these costs do not include the cost of demolition of the Grayson site, as well as security and fire protection improvements.~~
- ~~Additionally, the batteries have a finite life requiring periodic replacement every 5-10 years (depending on usage) with current battery replacement costs of $200,000/MWH for the batteries alone. While these costs have been declining, the rate of decline has slowed. For 815 MWH of storage the replacement cost could be over $160,000,000.~~
- ~~The above costs are for storage that would only have been adequate for two-thirds of the days in August and would provide for no reserve. Energy storage system costs could double to provide adequate storage for all days.~~
- ~~These costs do not include the cost to produce and transmit the energy to charge the batteries.~~

However, the BESS presents some challenges that place its ultimate feasibility in question. For example:

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[14] A project built for San Diego Gas and Electric by AES Energy Storage.

- 2,940 MWH of energy storage is about ten times more storage than is proposed under Alternatives 7 and 8 of this PR-DEIR (300 MWH). There is insufficient space to place a BESS of that size at Grayson. The general arrangement drawing for Alternative 7 illustrates the footprint of the 75/300 MWH of energy storage. 2,940 MWH would require approximately nine additional 300 MWH BESS facilities (energy storage capacity drives the required space; the requisite power is less of a driver).

- 2,940 MWH of storage represents a cost of approximately $588,000,000. This estimate is based on the Clean Energy proposals that GWP received (~$200,000/MWH and higher).

- Additionally, the batteries have a finite life requiring periodic augmentation (replacing degraded batteries with new or refurbished ones). Depending on use, the long-term annual capacity maintenance contract costs would likely be on the order of several millions of dollars per year.

- These costs do not include the cost to produce and transmit the energy to charge the batteries.

5.2.2.2 Potential Environmental Impacts

Following are the potential environmental impacts that would result from the Energy Storage Project Alternative.

Potential Environmental Impacts Less than Those of the Project

The Energy Storage Project Alternative would involve less construction and have a lower intensity of structures and heights on the site and would therefore contribute to less of a short-term and long-term aesthetic impact compared to the Project. Construction and operation air emissions, noise and traffic would be lower due to less construction activity and the sites long-term use for energy storage rather than generation (which has fewer sources of noise and requires fewer personnel to operate). The Energy Storage Project Alternative would consume less water than the Project and generally involve the use of fewer types and volumes of hazardous materials such as liquid petroleum hydrocarbons that could contribute to off-site stormwater pollution. Potential aesthetics, air quality, energy, greenhouse gas emissions, hydrology and water quality, noise, and traffic and transportation impacts of the Energy Storage Project Alternative would be less than those of the Project.

Potential Environmental Impacts Similar to Those of the Project

The Energy Storage Project Alternative would have similar impacts as the Project to agriculture and forestry resources, biological resources, cultural/tribal cultural resources, environmental justice, geology and soils, hazards and hazardous materials, land use and planning, mineral resources, population and housing, public services, recreation, socioeconomics, tribal cultural resources, ~~and~~ utilities and service systems, and wildfire as the land use would be consistent and restricted to the same site. The Boiler Building would be demolished and similar to the proposed Project, this Alternative, would result in a significant and unavoidable impact to a discretionary historic resource. While the Energy Storage Project

Alternative would not involve the use of hazardous materials common to the power plants, it would result in the need for battery replacement and battery disposal every five to ten years.

Potential Environmental Impacts Greater than Those of the Project

The Energy Storage Project Alternative would not have any potential environmental impacts greater than those of the Project.

5.2.2.3 Objectives Consistency Evaluation

The Energy Storage Project Alternative does not feasibly meet many of the Project objectives or meet them as well as the Project. Specifically, the Energy Storage Project Alternative:

1. Would integrate with local and remote distributed renewable energy resources, but based on the above discussion, and the 2019 IRP modeling, sufficient energy would not be available to charge the BESS during high load periods, and thus the BESS would not ~~to~~ provide sufficient energy to ensure reliable service at all times for the City and would therefore not support the City's compliance with California's Renewable Portfolio Standards.

2. Would utilize current technology and control systems, but the quantity and required integration would require a very significant upscaling compared to existing projects.

3. Would provide a local source of energy if sufficient excess energy is available to charge the batteries. However, sufficient excess energy is not available, particularly during high load periods, therefore the Energy Storage Project Alternative will not provide a local power resource sufficient to meet resource adequacy requirements, and the City's obligation within the Balancing Area to balance load and resources at the interconnection with the Balancing Authority in accordance with industry standards including NERC/WECC requirements. Thus, the Energy Storage Project Alternative would not provide local reliability that would also contribute to grid stability within the Los Angeles Basin.

4. Would provide sufficient locally controlled source of power as long as sufficient excess energy is available (this Alternative provides storage of excess Unit 9, Magnolia, and off-site generation). However, as the bulk of the energy needed to charge the battery system would be imported over the transmission systems, this Alternative would not minimize the City's reliance on importing power from remote generation locations through a congested transmission grid system subject to planned and unplanned outages and de-rates that make the delivery of energy to serve load less reliable than local generation.

5. Would replace the aged, unreliable, less efficient, high maintenance steam boilers with no local air emissions. To the extent that non-greenhouse gas free excess energy power is imported during low load times to charge the batteries (such as at night), air emissions would be created elsewhere.

6. Would be located at existing City property already permitted and used for generation and thus would minimize the need for major infrastructure improvements to the fuel supply, water, wastewater, recycled water and transmission facilities, or the need to purchase additional property.

7. Would not provide generation (only provides storage of Unit 9, Magnolia, and off-site generation) that is highly efficient to maintain reasonable cost of generation to minimize the impact on the rates and help manage costs of delivering energy to the City's customers.

8. Would support water conservation efforts by eliminating the use of potable water for generation purposes.

9. Would reduce the per megawatt-hour (MWH) creation of emissions and consumption of water because there would not be any new generation facilities on the site that create new emissions and which consume water.

5.2.2.4 Summary

The Energy Storage Project Alternative would involve replacing Units 1 – 8 at the existing Grayson Power Plant with a battery energy storage facility. Use of the City's existing Unit 9 electrical generation, the City's allotment from the Magnolia Power Plant, and transmission capacity to serve the City's electrical load and charge batteries when excess capacity is available. Energy stored in the batteries would then be discharged to serve the electrical load when demand exceeds available transmission and generation resources.

The Energy Storage Project Alternative's potential for local air quality, greenhouse gas emissions, hydrology and water quality, noise, and traffic and transportation impacts are less than those of the Project. More distant impacts due to the additional night-time generation needed to charge the batteries, when renewable solar energy will not be available, are potentially increased. Additionally, during the summer season because of high demands on the system, it is not possible to import enough electricity to charge the batteries to serve the daytime load. For these reasons, this Alternative was not selected because it does not feasibly meet the Project objectives to the same extent as the Project.

5.2.3 Alternative 3 - Alternative Energy Project Alternative

5.2.3.1 Description

~~The Alternative Energy Project Alternative evaluates the feasibility of both photovoltaic (PV) solar and wind powered production alternative energy options.~~

The Alternative Energy Project Alternative evaluates the feasibility of local and remote photovoltaic (PV) solar and wind powered production, in combination with transmission and geothermal alternative energy options.

Utility-Scale PV Solar.

~~PV power production requires~~ If the Project consisted entirely of PV power, this Alternative would require approximately 4 – 6 acres per MW of electricity depending on the specific PV technology used (e.g., crystalline vs thin film) and configuration of the solar array tracker system (single or dual axis). The Project site is approximately ~~10~~ ten acres in size~~,~~ and could only ~~would~~ support PV power production up to 2.5 MW. In order to generate power equivalent to the Project, the Alternative Energy Project Alternative would need to acquire an approximately 1,310-acre site that is capable of development as a remote (not on site) ~~utility-scale PV solar project.~~ Utility scale PV solar energy produced outside of Glendale and imported via transmission lines would require complementary storage and new transmission capacity to deliver energy to the City.

The City does not own or control 1,310 acres that are developable as a utility-scale PV solar project. Glendale is predominantly urbanized with open space reserved within its existing parks and mountainous areas, much of which is preserved open space, designated as significant ecological areas, in a high fire danger area, or too steep for any form of development. ~~Therefore, development of a utility-scale PV solar project to provide an equivalent power source as the Project within the City of Glendale is not feasible. Therefore, the only path to using an alternative energy in place of the Project is to construct a new transmission line to access solar, wind, and geothermal resources outside the Los Angeles basin. However, building such a transmission system is in its own right a significant undertaking that brings about its own potential environmental impacts stemming from such large-scale development.~~ The City is working with an engineering firm to investigate the feasibility of developing solar facilities on City-owned properties, and has preliminarily determined, subject to further analysis, that of the approximately 150 acres of City-owned property under consideration, approximately 40 acres may have some potential for PV development, however this acreage is far below the 1,310 acres necessary to locally power a PV project.

Based on the lack of access to sufficient local acreage to support a utility- scale PV Project, development of a utility-scale PV solar project as an equivalent power source as the Project within the City of Glendale is not feasible. Accordingly, the only path to using PV solar as an alternative energy source in place of the Project is to procure remote PV solar and construct a new transmission line to bring the energy to Glendale, and to provide complimentary battery storage. Similarly, access to wind, and geothermal resources outside the Los Angeles basin would also require the construction of new transmission facilities. Building additional transmission is a significant undertaking that has its own potential environmental impacts stemming from such large-scale development and includes potential property acquisition expense and third-party permitting issues.

~~Additionally~~ As noted, PV solar only generates power during daylight hours and can be substantially curtailed during cloudy days or rain events, and by itself would not provide a reliable source of power for the City of Glendale's power customers without additional transmission and complementary battery storage. ~~Therefore, solar PV by itself would not provide a reliable source of power for the City of Glendale's power customers.~~

Distributed Solar.

Distributed solar PV deployed on residential and commercial rooftops ~~is not considered a feasible alternative to the Project because the adoption and implementation of solar PV projects on privately owned property is voluntary and would not ensure a reliable power supply commensurate with the amount of power needed and with the reliability associated with utility-scale projects~~ was explored through the Clean Energy RFP and after evaluating and modeling the proposals, GWP is negotiating contracts with Sunrun, Inc. for a proposed a virtual power plant of approximately 28 MW of solar capacity and 25.25 MW/50.50 MWH of battery storage. GWP is also implementing other distributed energy programs. While this 25-year program, if approved by the City Council, will assist GWP, it would provide capacity and storage that will only meet a fraction of GWP's needs. The Clean Energy RFP proposals for commercial solar and storage were not viable. However, as noted above, the City is investigating solar and storage on City-owned properties and intends to install at least 50 MW of distributed energy resources per the 2019 IRP portfolio, including demand response, energy efficiency, and other distributed resources. Given the broad opportunity available to the Clean Energy bidders and the responses received, which did not yield enough clean energy capacity to meet the City's capacity and energy to meet the City's needs, and the analysis and modeling from the 2019 IRP and the 100% Clean by 2030 study, this approach was not considered a viable Alternative to the proposed project.

Wind Power.

For reasons, similar to those affecting the feasibility of developing solar resources, siting a wind farm within Glendale is not considered a feasible option because Glendale does not have the land needed for such a wind turbine project and does not have adequate wind resources. The existing site has room for a few wind turbines depending on their size. In the same way that solar resources are limited to day-time generation, Glendale does not have adequate wind resources to justify wind farm development as an alternative to the Project and would require remote wind production and transmission to complimentary battery storage facilities located on site.

Given the lack of an available wind farm site within Glendale, the only means to employ an alternative energy source is to locate it outside of Glendale and import the energy over a new transmission line. This creates impacts due to both the large site needed to build a project of sufficient generating capacity, and the additional transmission line or lines that would need to be built. As discussed within the PV option for an Energy Storage Project Alternative, building additional transmission capacity involves additional significant investment, land acquisition challenges and new environmental impacts stemming from project development.

Due to the intermittent nature of electrical generation from solar or wind resources, energy storage would need to be a component of the Alternative Energy Project Alternative. Storage is required to cover the "gaps" due to the intermittency of renewable generation as well as at night when solar resources are not available. A portion of this energy storage could be located at Grayson but would most likely require some form of energy storage located in and or outside the city of Glendale dependent on what type of energy storage is selected (See Section 5.2.2.1 for a description of various energy storage alternatives). Energy storage is not a generation source itself and relies upon excess available electricity that can be stored and then used to supply load over an extended period of time. The main function of energy storage is to provide various ancillary services and some load shifting. The Alternative Energy Project Alternative would need to include an energy storage component to be used to serve load during times of the day when the alternative energy source may not be available.

5.2.3.2 Potential Environmental Impacts – Alternative 3

Following are the potential environmental impacts that would result from the Alternative Energy Project Alternative.

Potential Environmental Impacts Less than Those of the Project

The Alternative Energy Project Alternative and Project would involve large construction efforts with short-term air emissions, noise and potential water quality impacts stemming therefrom. However, long-term operation phase emissions associated with the renewable energy facility and transmission system would be less than those of the Project. The Alternative Energy Project Alternative would also consume less water and energy operationally than the Project and generally involve the use of fewer types and volumes of hazardous materials such as liquid petroleum hydrocarbons that could contribute to off-site stormwater pollution. Renewable energy facilities such as PV solar, transmission lines, and energy storage systems do not contribute as much to community noise levels during operation compared to thermal generation power plants in an urbanized area such as the Project. Increased use of renewable energy would be more consistent with the State’s Renewable Portfolio Standard requirements than the natural gas combustion to generate electricity associated with the proposed Project. While this Alternative would involve a new transmission line that would have the potential to significantly impact cultural resources, it was assumed that the Boiler Building would not be demolished at Grayson Power Plant as part of this Alternative and it would therefore avoid the significant and unavoidable discretionary historic resource impact of the proposed Project. Potential air quality, cultural resources, energy, greenhouse gas emissions, hydrology and water quality, and noise impacts of the Alternative Energy Project Alternative would be less than those of the Project.

Potential Environmental Impacts Similar to Those of the Project

Similar to the Project, construction, operation and maintenance would involve the use of hazardous materials. These facilities would be required to be in conformance with applicable LORS related to the transport, handling, use, storage, and disposal of hazardous materials. Considering the Project has been issued will serve letters for public services (Appendix B of the 2018 Final EIR), would be limited to an existing 10-acre power plant site not used for mineral resource production, and does not require off-site utility extensions, potential impacts of the Alternative Energy Project Alternative to mineral resources, public services, recreation, socioeconomics, and utility and service systems would not be less than those of the Project. Construction traffic from the Alternative Energy Project Alternative would likely be similar or greater than that of the Project due to the size difference (1,300 acres plus a long, new transmission line vs. 10 acres). Operation and maintenance of the Alternative Energy Project Alternative would also involve a similar level of traffic as the Project. The Alternative Energy Project Alternative would have similar potential impacts as the Project to hazards and hazardous materials, mineral resources, public services, recreation, socioeconomics, transportation and traffic, and utilities and service systems.

Potential Environmental Impacts Greater than Those of the Project

The Alternative Energy Project Alternative would involve development of approximately 1,300 acres of off-site land for renewable energy generation and the construction of an extensive new transmission line to import the electricity into the City. While a specific location for this Alternative has not been identified, utility scale renewable energy and transmission line development projects would have the potential to create new impacts on agriculture and forestry resources, biological resources, ~~cultural/~~tribal cultural resources, environmental justice, geology and soils, land use and planning, and population and housing, and wildfire compared to the Project. The Project would be developed on the existing 10-acre industrial site that is already permitted as a power plant, is developed, and operated as a power plant, and which does not contain agriculture lands, sensitive biological resources, or cultural/tribal cultural resources. The installation of a new electrical transmission line associated with the Alternative Energy Project Alternative would represent a greater potential for wildfire compared to the proposed Project that would not include transmission and be restricted to an existing industrial site not located in a high fire hazard area. Project development would also involve less earthwork compared to this Alternative. The Alternative Energy Project Alternative would ~~also~~ have greater off-site aesthetic, agriculture and forestry resources, biological resources, ~~cultural/~~tribal cultural resources, environmental justice, geology and soils, land use and planning, ~~and~~ population and housing, and wildfire impacts than those of the Project.

5.2.3.3 Objectives Consistency Evaluation – Alternative 3

The Alternative Energy Project Alternative does not feasibly meet many of the Project objectives or meet them as well as the Project. Specifically, the Alternative Energy Project Alternative:

1. Would integrate with local and remote distributed renewable energy resources but would not provide sufficient capacity and energy to ensure reliable service at all times for the City ~~in order to support the City's compliance to California's Renewable Portfolio Standards~~ without the construction of additional transmission systems.

2. Would utilize current technology and control systems, but the technology and control systems would not provide reliable, cost effective, and flexible generation capacity for the City to serve its customer load and comply with California's Renewable Portfolio Standards without the construction of additional transmission systems.

3. Would not provide a local generation resource sufficient to meet resource adequacy requirements, and the City's obligation within the Balancing Area to balance load and resource at the interconnection with the Balancing Authority, in accordance with industry standards including NERC/WECC requirements. Thus, the Alternative Energy Project Alternative would not provide all the required local reliability needs and would not contribute to grid stability within the Los Angeles Basin.

4. Would not provide a sufficient locally controlled source of generation to ~~minimize~~ support the City's reliance on importing power from remote generation locations through a congested

transmission grid system subject to planned and unplanned outages and de-rates making the delivery of energy to serve load less reliable than local generation.

5. Would replace the aged, unreliable, less efficient, high maintenance steam boilers, with an energy source that does not create operational air emissions.
6. Would be able to locate only a small portion of the needed capacity at the existing site, which is already permitted and used for generation. It would require major infrastructure improvements such as new transmission facilities as well as additional property for solar or wind farms to meet existing power demands.
7. Would not provide generation that is ~~highly~~ efficient to maintain with a reasonable cost of generation to minimize the impact on the rates and help manage costs of delivering energy to the City's customers because of the need to acquire land for additional solar or wind generation facilities and associated transmission.
8. Would support water conservation efforts by eliminating the use of potable water for generation purposes.
9. Would reduce the per megawatt-hour (MWH) creation of emissions and consumption of water.

5.2.3.4 Summary – Alternative 3

The Alternative Energy Project Alternative would involve some combination of photovoltaic or wind power production with energy storage and transmission lines. While the Alternative Energy Project Alternative reduces local potential air quality, cultural resources, energy, greenhouse gas emissions, hydrology and water quality, and noise impacts local to the Grayson Power Plant site, it increases off-site impacts to aesthetics, agriculture and forestry resources, biological resources, cultural/tribal cultural resources, environmental justice, geology and soils, land use and planning, and population and housing impacts due to the need for increased transmission as well as the large area needed for a wind farm or solar field.

Because of the very limited ability to site solar or wind resources within the City and insufficient feasible local clean energy resources proposed in the Clean Energy RFP, combined with the energy storage considerations discussed in the preceding Energy Storage Project Alternative, as well as the results of the 2019 IRP modeling and 100% Clean Energy by 2030 analysis, and complications associated with building a new transmission line to import alternative energy, the Alternative Energy Project Alternative was not considered an adequate replacement for the power that would be generated by the Project. Additionally, the Alternative Energy Project Alternative does not feasibly meet the Project objectives to the same extent as the Project.

5.2.4 Alternative 4 - 150 MW Project Alternative

5.2.4.1 Description – Alternative 4

This Alternative would consist of three simple cycle combustion turbines at the Grayson Power Plant and a new transmission line to import additional electricity into the City. A 150 MW Project Alternative was selected because it was one of the alternatives studied within the 2015 Integrated Resource Plan study[15]. However, due to the reduction in generating capacity, this Alternative consequently also requires additional transmission and energy imports into Glendale to provide sufficient capacity. ~~An additional consideration is that being simple cycle units, the available operating hours would be much less than what is available from the combined cycle units that are a part of the Project.~~

Although feasible to develop, the 150 MW Project Alternative would not provide sufficient capacity or generate sufficient energy under all required planning scenarios necessary to meet load demands and reliability requirements. In addition, this Alternative would not be able to meet the spinning reserve[16] requirements set forth by NERC/WECC. Thus, the 150 MW Project Alternative would require additional import capacity (transmission capacity) for the City to meet load and reliability criteria.

The City has explored participating with LADWP in the development of new transmission; however, LADWP would not consider building new transmission to the Victorville area at this time, which is required for Glendale to access additional generation, particularly new generation from renewable resources.

Connection to the California Independent System Operator (CAISO) system through interconnection to Southern California Edison is also not a viable option because the City is within the LADWP Balancing Area and cannot connect to another Balancing Area other than as an emergency source. The other option would be for the City to become part of the CAISO balancing authority in place of being part of Los Angeles Department of Water and Power's balancing authority. There is no existing transmission corridor for Glendale to connect to the CAISO system without new development. The cost for a new interconnection – which is different than the much more significant new transmission line discussed in the Alternative Energy Project Alternative - is significant itself (estimated at $66 million in the 2015 Integrated Resource Plan). Such a new interconnection to CAISO and dropping out of the Los Angeles Department of Water and Power Balancing Authority will result in significant electric transmission system impacts exacerbating some existing issues (circulating currents) in the LADWP/CAISO electrical system design and if feasible, would require further mitigation and result in considerable financial impacts, and probable significant opposition from the current Balancing Authority.

Building and owning new transmission capacity carries several significant risks and uncertainties, costs, and potentially significant environmental impacts associated with transmission system development that may require mitigation and additional Project upgrade costs. There is also uncertainty with respect to the reliability of a new connection to the CAISO system, which would increase Glendale's single largest contingency because of expanded reliance on imported power transmission that a new large transmission interconnection presents. The City requires local generation because the available transmission into the City from the Pacific DC Interconnection transmission line and the Southwest A/C Transmission System

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[15] In addition to a 200 MW and a 250 MW option that were also studied.

[16] "Spinning reserve" refers to generators on-line and able to immediately respond to the loss of another generator or transmission import up to the single largest contingency. Simple cycle units, because they are less efficient than combined cycle units, are limited by their air permit in how many hours they can operate on an annual basis.

are congested, subject to curtailments, and would not be able to fully serve the City's load at all historical levels of load.

~~While the 150 MW Project Alternative offers local generation (all simple cycle units), and as discussed on 5.2.4.2 below, will reduce certain Project impacts, these units are less efficient than the combination of simple and combined cycle generating units offered by the Project.~~

Given the difficulty of financing, permitting, and constructing new transmission through limited rights-of-way in an existing urban environment and in high fire risk areas, the 2019 IRP concluded that construction of new transmission is not feasible.

5.2.4.2 Potential Environmental Impacts – Alternative 4

Following are the potential environmental impacts that would result from the 150 MW Project Alternative.

Potential Environmental Impacts Less than Those of the Project

The 150 MW Project Alternative and Project would involve large construction efforts with short-term air emissions and noise, however, long-term operation phase emissions and noise associated with this Alternative would be less than those of the Project due to the reduction in the number of generation units and capacity. Potential air quality, energy, greenhouse gas emissions, and noise impacts of the 150 MW Project Alternative would be ~~incrementally~~ less than those of the Project.

Potential Environmental Impacts Similar to Those of the Project

Similar to the Project, construction, operation and maintenance would involve the use of hazardous materials. These facilities would be required to be in conformance with applicable LORS related to the transport, handling, use, storage, and disposal of hazardous materials. Even with a reduction in generating capacity at the Grayson Power Plant, the 150 MW Project Alternative would have similar on-site impacts as the Project with respect to hydrology and water quality, mineral resources, public services, recreation, socioeconomics, and utility and service systems. The construction of an extensive new off-site transmission line only increases the potential for impacts to these resource categories and potential impacts would not be less than those of the Project. Construction traffic from the 150 MW Project Alternative would likely be similar or greater than that of the Project due to addition of the off-site transmission line component. Operation and maintenance of the 150 MW Project would also involve a similar level of traffic as the Project. The 150 MW Project Alternative would have similar impacts as the Project to hazards and hazardous materials, hydrology and water quality, mineral resources, public services, recreation, socioeconomics, transportation and traffic, and utilities and service systems.

Potential Environmental Impacts Greater than Those of the Project

Both the 150 MW Project Alternative involve comparable demolition, construction and operating electrical generation facilities at the at the Grayson Power Plant site. The 150 MW Project Alternative includes construction of an extensive new transmission line to import additional electricity into the City to serve the

City's load. Long transmission line development projects commonly have the potential to impact agriculture and forestry resources, biological resources, cultural/tribal cultural resources, environmental justice, geology and soils, land use and planning, and population and housing. Comparatively, the Project would be developed on the existing 10-acre industrial site that is already permitted, developed and operated as a power plant. Further development on the Grayson Power Plant site will not impact agriculture lands, sensitive biological resources, or ~~cultural/~~tribal cultural resources. The 150 MW Project Alternative also requires substantially more earthwork related to the transmission line development than the Project. This Alternative would necessitate demolition of the Boiler Building, and similar to the proposed Project, would therefore result in a significant and unavoidable impact on a discretionary historic resource. Because of the transmission line component, the 150 MW Project Alternative would have greater off-site potential aesthetic, agriculture and forestry resources, biological resources, cultural/tribal cultural resources, environmental justice, geology and soils, land use and planning, ~~and~~ population and housing, and wildfire impacts than those of the Project.

5.2.4.3 Objectives Consistency Evaluation – Alternative 4

The 150 MW Project Alternative does not feasibly meet many of the Project objectives or meet them as well as the Project. Specifically, the 150 MW Project Alternative:

1. Would integrate with local and remote distributed renewable energy resources but would not provide sufficient capacity and energy to ensure reliable service at all times for the City and to support the City's compliance to California's Renewable Portfolio Standards.

2. Would utilize current technology and control systems, but the technology and control systems would not provide reliable, cost effective, and flexible generation capacity for the City to serve its customer load.

3. Would provide a local generation resource, but not one that is sufficient to meet resource adequacy requirements, and the City's obligation within the Balancing Area to balance load and resource at the interconnection with the Balancing Authority, in accordance with industry standards including NERC/WECC requirements. Thus, the 150 MW Alternative would not provide local reliability and would not contribute to grid stability within the Los Angeles Basin to the same extent as the Project.

4. Would provide a locally controlled source of generation, but the amount of generation would not be sufficient to minimize the City's reliance on importing power from remote generation locations through a congested transmission grid system subject to planned and unplanned outages and de-rates making the delivery of energy to serve load less reliable than local generation. This Alternative would need additional transmission capacity to adequately respond to and serve customer load.

5. Would replace the aged, unreliable, less efficient, high maintenance steam boilers, with new generation, but this new generation would create emissions that are not likely to comply with SCAQMDs Rule 1304(a)(2).

6. Would be able to locate at the existing City property already permitted and used for generation, but it would not minimize the need for major infrastructure improvements such as fuel supply, water, wastewater, recycled water and transmission facilities.

7. Would not provide generation that is highly efficient to maintain at a reasonable cost of generation (due to the inherently poorer efficiency of simple cycle units as compared to combined cycle units) to minimize the impact on the rates and help manage costs of delivering energy to the City's customers because the amount of power generated would require supplementation for new transmission sources that are limited both in terms of negotiating their development with applicable agencies, but in terms of the ability to physically develop these sites.

8. Would support water conservation efforts by eliminating the use of potable water for generation purposes.

9. Would reduce the per megawatt-hour (MWH) creation of emissions and may reduce the water consumption

5.2.4.4 Summary – Alternative 4

The 150 MW Project Alternative would involve a reduced size power project located on the existing project site with a new transmission interconnection. While the 150 MW Project Alternative would have ~~incrementally~~ less potential air quality, greenhouse gas emissions and noise impacts than those of the Project, the potential impacts at the Grayson Power Plant site are generally similar.

~~However, the 150 MW Project Alternative also includes construction of a new transmission line that has the potential to result in greater potential impacts to aesthetics, agriculture and forestry resources, cultural/tribal cultural resources, environmental justice, geology and soils, land use and planning, and population and housing. In addition to the potential environmental impacts, the 150 MW Project Alternative does not feasibly meet many of the Project objectives or meet them as well as the Project.~~ The 2019 IRP analysis concluded that this alternative would not provide sufficient power to serve the City's energy demands.

5.2.5 Alternative 5 - 200 MW Project Alternative

5.2.5.1 Description – Alternative 5

A 200 MW Project Alternative would consist of two simple cycle units and one combined cycle unit. A 200 MW Project Alternative was selected because it was one of the alternatives studied within the 2015 Integrated Resource Plan study[17]. This alternative also included a 50 MW/200 MWH BESS to replace one of the turbines from the proposed Project to arrive at this Alternative. ~~Because 200 MW of generation alone does not provide sufficient capacity that meet required planning scenarios, this Alternative would~~

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[17] In addition to a 150 MW and a 250 MW option that were also studied.

~~require either additional transmission capacity or "time shifting" energy storage via a BESS to provide the requisite capacity and energy to serve load.~~

~~Given the amount of required additional capacity, and the difference in necessary activities to implement the two options, an energy storage system is preferred over transmission because:~~

- ~~Developing a new transmission connection presents property siting and acquisition challenges and new environmental impacts.~~
- ~~The source of power to be imported over the new transmission system would necessarily be located outside of the City and create a new contingency.~~
- ~~Having the 50 MW source located within the City is preferred.~~

~~For energy storage, a BESS is the only available storage technology that can be sited at Grayson. The BESS could utilize either Lithium ion rechargeable battery or reduction-oxidation flow battery technologies.~~

~~The BESS would be charged during times of the day when there is available energy not needed to serve the City's load. That energy would be stored within the BESS and "time shifted" to be used during high load periods when the available transmission capacity is inadequate to serve the City's load. Energy to charge the BESS would come from either electricity imported through the transmission systems, or on-site generation if the transmission capacity is fully utilized or unavailable. During periods of consecutive high-load days when the BESS would need to be fully charged each evening and the amounts of renewable energy being produced are reduced, on-site generation would likely be used to charge the BESS. For the reasons previously discussed in the Energy Storage Project Alternative (usable capacity, battery degradation, round trip efficiency), to provide an additional 50 MW of usable capacity for four (4) hours would necessitate a BESS of approximately 200 MWH of storage capacity.~~

~~When comparing the benefit of 50 MW of BESS versus 50 MW of generation, 50 MW of generation from the project is preferred because:~~

- ~~50 MW generation provides dispatchable capacity beyond the time that the BESS storage capacity would be exhausted.~~
- ~~The scale of the required BESS is larger than other battery energy storage systems that have been built to date, with the largest project being a 30 MW 120 MWH project[18]. This Alternative would require a BESS project with two times the power delivery and three times the energy storage as the largest existing BESS project.~~
- ~~The initial cost of the BESS is as at least as great as 50 MW of generation.~~
- ~~The batteries have a finite life requiring periodic replacement every 10 years (or earlier) with current battery replacement costs of $200,000/MWH for the batteries alone. While these costs~~

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[18] ~~A project built for San Diego Gas and Electric by AES Energy Storage.~~

~~have been declining, the rate of decline has slowed. For 300 MWH of storage the replacement cost could be over $50,000,000.~~

- ~~These costs do not include the cost of energy to charge the batteries (the functional equivalent to the natural gas fuel for the proposed project).~~

~~Although feasible to develop, the 200 MW Alternative would not be as cost-effective or reliable as the Project.~~

5.2.5.2 Potential Environmental Impacts – Alternative 5

Following are the potential environmental impacts that would result from the 200 MW Project Alternative.

Potential Environmental Impacts Less than Those of the Project

The 200 MW Project Alternative would combust a lower volume of natural gas and generate less electricity than the proposed Project. As a result, the 200 MW Project Alternative could be more consistent with the State's Renewable Portfolio Standard requirements compared to the proposed Project (if the BESS was charged with renewable sources). The 200 MW Project Alternative and Project would involve large construction efforts with short-term air emissions and noise, however, long-term operation phase emissions and noise associated with this Alternative would be less than those of the Project due to the reduction in the number of generation units and capacity. Potential air quality, energy, greenhouse gas emissions, and noise impacts of the 200 MW Project Alternative would be ~~incrementally~~ less than those of the Project.

Potential Environmental Impacts Similar to Those of the Project

Similar to the Project, the 200 MW Project Alternative involves electrical generation at the same 10-acre urban industrial site already permitted, developed, and operated as a power plant. The primary difference is that the 200 MW Project Alternative includes a 50 MW BESS in lieu of one of the two combined cycle generation units associated with the Project. This Alternative would necessitate demolition of the Boiler Building and similar to the proposed Project, would therefore result in a significant and unavoidable impact to a discretionary historic resource. As a result, the 200 MW Project Alternative would have similar environmental impacts as the Project on aesthetics, agriculture and forestry resources, biological resources, cultural/tribal cultural resources, environmental justice, geology and soils, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, population and housing, public services, recreation, socioeconomics, transportation and traffic, ~~and~~ utilities and service systems, and wildfire.

Potential Environmental Impacts Greater than Those of the Project

The 200 MW Project Alternative would not have any potential environmental impacts greater than those of the Project.

5.2.5.3 Objectives Consistency Evaluation – Alternative 5

The 200 MW Project Alternative meets most of the Project objectives, but not to the same extent as the Project. Specifically, the 200 MW Project Alternative:

1. Would integrate with local and remote distributed renewable energy resources and provide sufficient reliable capacity and energy to ensure reliable service at all times for the City and to support the City's compliance to California's Renewable Portfolio Standards.

2. Would utilize current technology and control systems, and the technology and control systems would provide reliable, cost effective, and flexible generation capacity ~~for~~ to support the City to serve its customer load.~~ However, the battery storage portion of the project would require a very significant upscaling compared to existing BESS projects~~.

3. ~~Would provide a local generation resource, but not one that is sufficient to meet resource adequacy requirements without a storage system~~. This Alternative would meet the City's obligation within the Balancing Area to balance load and resource at the interconnection with the BA, in accordance with industry standards including NERC/WECC requirements as well as the Project.

4. Would provide a locally controlled source of generation~~, but the amount of generation~~ that would ~~not be sufficient to minimize~~ support the City's reliance on ~~a storage system that is potentially more expensive to maintain, and would necessitate~~ power imports from remote generation locations through a congested transmission grid system subject to planned and unplanned outages and de-rates ~~making the delivery of energy to serve load less reliable than local generation. This Alternative would not respond to and serve customer load as efficiently or as well as the Project~~.

5. Would replace the aged, unreliable, less efficient, high maintenance steam boilers, with new generation that would comply with SCAQMDs Rule 1304(a)(2).

6. Would be able to be located at the existing City property already permitted and used for generation and would minimize the need for major infrastructure improvements such as fuel supply, water, wastewater, recycled water, and transmission facilities to the same extent as the Project.

7. Would provide generation that is efficient to maintain~~, but not at as reasonable a cost of generation as the Project such that this Alternative would not minimize the impact on the rates and help manage costs of delivering energy to the City's customers to the same degree as the Project~~.

8. Would support water conservation efforts by eliminating the use of potable water for generation purposes.

9. Would reduce the per megawatt-hour (MWH) creation of emissions and water consumption to the same extent as the Project.

5.2.5.4 Summary – Alternative 5

The 200 MW Alternative would ~~have~~ reduce~~d~~ air pollutant and greenhouse gas emissions and noise because this Alternative has one less generation unit compared to the Project, with the reduction of one unit offset by the addition of a battery energy storage system (one that is smaller than the earlier alternative). ~~The battery energy storage system adds the impact of the cost of periodic battery replacement as well as the need to dispose/recycle the batteries when they reach end of life~~. The BESS, if charged with renewable sources, would represent a reduced potential energy impact compared to the proposed Project that involves only natural gas fueled electricity generation. If sufficient transmission capacity were not available for charging the BESS, then the air emissions may not be reduced due to the need to operate additional unit(s) to charge the BESS.

For these reasons, the overall environmental impacts of a 200 MW Alternative are expected to be comparable to the Project~~, but at the expense of not having fully dispatchable generation capacity after exhaustion of the BESS as well as potentially greater cost~~.

5.2.6 Alternative 7 - Tesla/Wartsila Repowering Project Alternative[19]

5.2.6.1 Project Description – Alternative 7

The Tesla/Wartsila Repowering Project Alternative demolishes all units and buildings on the Project site, replaces the existing units with the exception of Unit 9, and replaces it with the following:

- Five Wartsila 18V50SG reciprocating internal combustion engine units producing approximately 93 MW net at average annual site conditions.
- A battery energy storage system producing approximately 75 MW with a storage capacity of 300 MWH net at average annual site conditions. Through the Clean Energy RFP process, the City selected Tesla's Megapack technology as the preferred energy storage technology amongst the several different technologies offered based on the consideration of several factors such as performance, capacity maintenance/degradation, guarantees, long-term service agreement, space utilization, and cost. Therefore, the environmental evaluation of this alternative assumes the Tesla Megapack design and the supporting engineering and test data supplied by Tesla.

  The final choice of design technology for the battery energy storage system will be determined as part of the final design for the Project. Depending on further information that may be available at the final design stage, this alternative could be re-configured to use an alternative or updated battery energy storage technology. If the environmental impacts resulting from the use of an

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[19] Alternative 6 was screened out from further consideration. See Executive Summary and Section 5.3.6.

updated or alternative battery energy storage technology were substantially different than what is evaluated in the PR-DEIR, then the PR-DEIR would be updated.

As this PR-DEIR was being finalized for release, information became available regarding a fire incident on Friday July 30, 2021, in which a Tesla Megapack caught fire during testing at the Victorian Big Battery Project in Victoria, Australia. Following the incident, visible flames had subsided by approximately 5.5 hours later and the Country Fire Association (CFA) with assistance from Fire Rescue Victoria have remained on site to continue to monitor the temperature decline of the two battery packs impacted by the fire. The EPA's air monitoring has shown there has been good air quality in the local community. There were no injuries, the site was disconnected from the grid and there has been no impact to electricity supply. Investigation preparations are underway and physical inspections will commence once the CFA have completed their procedures. This is the first Megapack fire that has occurred other than those started artificially for testing purposes.

Tesla is still in the process of investigating what occurred, what actions need to be taken to prevent reoccurrence, and whether any changes may be needed to avoid or combat a Megapack fire. Installation of the battery energy storage system at Grayson is not anticipated to begin until the first quarter of 2023. If the results of the investigation into the Tesla fire find that changes in design, testing, or other factors impact the technical studies supporting the PR-DEIR, they will be re-assessed to determine whether any changes in the conclusions of the PR-DEIR are warranted.

- A new switching station, and related facilities.

The Wartsila power island would be located on the northern side of the Project (about the middle of the Utility Operations Center) and the Tesla power island would be located to the southwest. The Boiler Building would need to be removed in order to provide room for a portion of the 75 MW of battery energy storage system and to make room for the new Workshop and Warehouse building.

Additional engineering information regarding the Alternative 7 is provided below:

1) The Wartsila 18V50SG reciprocating internal combustion engine would utilize air-cooled radiators to dissipate heat from the engine jacket water and engine-generator lube oil systems to reduce water consumption. These closed cooling systems require minimal make-up water, reducing the plant's consumptive use of cooling water. Recycled water, processed into demineralized water and then treated to meet Wartsila's requirements, will be used for occasional make-up to the closed cooling systems and on-line turbocharger washes. The engines would be located within an Engine Hall to reduce the radiated noise. The stack emissions control systems and air-cooled radiators would be located outside the building.

2) Each Wartsila unit would include a stack emission control system featuring SCAQMD approved best available control technology consisting of selective catalytic reduction

system for the control of nitrogen oxides (NOx) emissions and an oxidation catalyst to control carbon monoxide (CO) and volatile organic compound (VOC) emissions.

3) The Wartsila units would feature fast starting (from off to full load within ten minutes or less), and fast ramping up and down to support spinning and non-spin reserves, regulation and reactive power support, and integration of renewable resources.

4) The Tesla Megapack Lithium-ion battery energy storage systems utilize an integrated liquid cooling and heating system to maintain the battery operating temperature within operating limits. No other external cooling system is needed, further reducing the need for consumptive cooling water use.

5) A new water treatment system would treat and demineralize the recycled water, primarily for use in Unit 9 for power augmentation and NOx reduction, and occasional use by the Wartsila engines for makeup to the closed cooling water systems and turbocharger on-line water washing. The water treatment system would use a combination of installed equipment in combination with mobile trailer-mounted micro-filtration, reverse osmosis, and demineralizer systems to batch process recycled water that would then be stored on-site in tanks. The mobile trailer-mounted demineralizer would be regenerated off-site and brought back as needed to maintain minimum storage volumes. Reject water from the reverse osmosis system would be discharged to the process drains and from there to the Glendale sewer system.

6) New plant control room and plant operations offices would also be constructed.

7) A new Workshop/Warehouse to serve the Grayson Power Plant would also be constructed.

8) All interconnections to the City's electrical grid would occur on-site and no new off-site electrical transmission line modification or construction would be necessary for the Project.

9) The Project would be designed, constructed, and inspected in accordance with the current California Building Standards Code, also known as Title 24, California Code of Regulations, which encompasses the California Building Code, California Administrative Code, California Electrical Code, California Mechanical Code, California Plumbing Code, California Energy Code, California Fire Code, California Code for Building Conservation, California Reference Standards Code, and all other applicable laws, ordinances, regulations, and standards in effect at the time initial design plans are submitted to the City for review and approval.

10) The Project would utilize certified engineers and geologists to perform design reviews, obtain approval by the City, and monitor construction to ensure compliance with laws, ordinances, regulations, and standards. In addition, certified third party inspections would

be performed to ensure that any work requiring such inspection is constructed in accordance with LORS, including excavation and backfill work and the installation of piles.

11) Structural support would be in accordance with the recommendations provided in Section 8.0 of the Geotechnical Investigation Report prepared by Black & Veatch and as may be updated after demolition and improving the site geotechnical condition (Appendix B of this PR-DEIR). Deep foundations for power plant structures would utilizes piles.

This Alternative would encompass approximately ten acres within the City's Utility Operations Center located within the Grayson Power Plant existing site.

This Alternative would also include a new Glendale Switching Station to add resiliency to the GWP electrical distribution system, as well as a new aqueous ammonia storage tank and unloading facility for the Wartsila engines.

Additionally, this Alternative would connect to existing off-site linear facilities, such as, natural gas, potable water, recycled water, stormwater discharge, processed wastewater discharge, and sanitary sewer pipelines, and electrical transmission lines that are currently serving the existing facilities.

Underground 69 kV electrical interconnections would connect the new power islands to the existing Kellogg Switching Station and the new Glendale Switching Station. Both Switching Stations are or would be located within the Project boundaries, and entirely within the footprint of the existing City Utility Operations Center property boundaries. From the existing Kellogg Switching Station and new Glendale Switching Station, power generated by the Project would interconnect to GWP's existing distribution system serving the City's electric load.

All interconnections to the City's electrical grid would occur on-site and no new off-site electrical transmission line modification or construction would be necessary for the Project.

This Alternative would use recycled water for the majority of plant operations and would reduce even further the use of potable water provided by the City at the Grayson Power Plant. Potable water would, after completion of the Project, only be used for domestic use, eye wash stations, fire protection, and as an emergency source of water. Potable water would no longer be normally used for equipment cooling or process water purposes, eliminating the use of potable water for Unit 9 and the units that would be demolished.

Wastewater and other process waste generated by the Project and Unit 9 would be treated as required by the discharge permit and discharged into the existing sanitary sewer connection. This discharge would be conveyed back to the Los Angeles-Glendale Water Reclamation Plant, where it would be processed and again recycled to be made available for use at the Project site or at other facilities as recycled water for beneficial use.

On-site stormwater runoff from within the Project site would flow via surface sheet flow and localized gutters to on-site storm drain piping. The storm drain piping would be connected to an on-site detention basin and pump station. Stormwater from the 85th percentile storm would be collected and pumped to a new aboveground storage tank. Stormwater would then be gravity drained from that tank to the Glendale sewer system. During storm events that exceed the design capacity of the stormwater system, overflow runoff would be discharged into the adjacent Verdugo Wash and Los Angeles River through existing stormwater outfalls.

Stormwater that falls within process equipment containment areas would be collected separately from typical site runoff, treated, and discharged into the existing public sanitary sewer system.

Tesla Megapack

The Tesla Megapack is an all-in-one utility-scale energy storage system, fully integrated and AC coupled (electrical connections are made at the 480 V AC terminals). It includes the DC batteries, bi-directional inverter, and thermal management system. A single Tesla Site Controller with intelligent software manages the Megapacks and interfaces with the overall Plant Control System.

The Megapack is capable of various on-grid applications, such as tariff optimization, peak load shaving, energy shifting, and demand response. In addition, the system can operate as a microgrid to support backup and islanded systems.

Each Megapack enclosure includes the following components provided by Tesla:

- A Smart Inverter composed of multiple Powerstage inverters.
- An AC main breaker on the 480 VAC output from the Megapack.
- Battery modules to store electrical energy.
- A thermal system to cool the inverters and batteries.
- A Tesla Site Controller that provides a control interface between the plant control system and the Megapacks as well as an interface for remote diagnostic monitoring of the Megapacks.
- A low voltage interface panel that provides power for auxiliary equipment.

The bi-directional Smart Inverter converts supplied AC power to DC power to charge the rechargeable lithium-ion battery packs as well as converting DC power from the battery packs to supply AC power to the GWP transmission system.

The Megapack is rated in terms of net power and energy at the AC output terminals of the Megapack. Loads and losses, including converters efficiency losses, thermal system losses, auxiliary loads, and chemical/ionic losses are considered internal to the system and ratings are net of these loads.

The Tesla Site Controller is a turnkey controller that actively monitors the system's performance, displays operating information to the control room and system operators via various interfaces, and offers multiple automated modes of operation.

The Tesla Site Controller communicates to each Megapack over a private Transmission Control Protocol (TCP) network. The controller aggregates real-time information from all Megapacks and leverages the information to optimize the commands sent to and operation of each Megapack.

Tesla's BESS power island would be comprised of the following major components

- Each Megapack is rated at approximately 3,000 kilowatt-hour (kWH) and 750 kilovolt-amps (kVA), 480 V output, three-phase 60 hertz (Hz).
- Each medium voltage step up transformer is rated at 3,400 kVA with a 34.5 kV delta primary connection and 480 V wye solidly grounded secondary connection, FR3 (a natural ester derived from renewable vegetable oils) filled, outdoor rated, and pad-mounted with secondary oil containment for spill prevention.
- Medium Voltage switchgear lineups based on an aisleless outdoor rated metal clad Main-Tie-Main configuration providing full power redundancy to the medium voltage collection system. The switchgear is rated nominally at 34.5 kV, 1200 amps (A), and 25 kiloamps (kA) short circuit interrupt rating and includes microprocessor-based protective relays.
- A Controls Equipment Building - consisting of a prefabricated, outdoor rated and temperature-controlled metal enclosed building. It will house all the control equipment such as the Tesla Site Controller, control, and data acquisition system, 125 volts direct current (VDC) low voltage auxiliary power distribution, and 125 VDC station battery system.
- Each generator step-up transformer is rated at 55 megavolt-amps (MVA) with a 69 kV delta primary connection and 34.5 kV wye resistance grounded secondary connection, and FR3 filled. Each transformer is located within a secondary oil containment for spill prevention with fire barriers as needed to protect adjacent equipment in the event of catastrophic failure. Each transformer would deliver the full output of the Tesla power island to its respective switching station (Kellogg and Glendale).

The energy storage system would provide capacity for:

- A fast response source of power (within the limits of the stored energy),
- Spinning reserve, regulation up and down, and reactive power (VAR) support without the need to operate thermal generation, and
- A means to store and time-shift excess renewable energy (within the limits of the available storage capacity).

Wartsila 18V50SG

The Wartsila 18V50SG is a four-stroke, spark-ignited lean-burn gas engine. The eighteen-cylinder engine is arranged in a "V" configuration. Each bank of nine cylinders is fed by its own exhaust gas driven turbocharger. Each cylinder is approximately 19.7 inches in diameter with a stroke of approximately 22.8 inches. The engine has a net thermal efficiency of approximately 41 percent and operates at 514 revolutions per minute (rpm). The engines are started using high pressure compressed air. They can start and be at full power within ten minutes.

The thermal power island would consist of five Wartsila W18V50SG reciprocating internal combustion engines, each connected to their own electric power generator. Each engine would have its own emission control system, air-cooled radiator, and auxiliary equipment. Each unit has a capacity of 18.8 MW_{gross} and 18.5 MW_{net} at average annual ambient site conditions. The five units would be located within a common Engine Hall with an adjacent Utility Building containing the electrical and mechanical rooms, and a local control room. The five engine-generators would each connect to two fully redundant generator step-up transformers, with one connected to the existing Kellogg Switching Station and the second to a new Glendale Switching Station. The Wartsila engines provide quick-starting operational flexibility to efficiently serve peak load and other services on an as-needed basis.

The Wartsila power island would be comprised of the following major components:

- Five 18V50SG reciprocating internal combustion engine generators - each engine is rated at 18,817 kW, 0.8 power factor, 13,800 V output, three-phase 60 Hz.
- One Wartsila Operator Information System (WOIS) to manage the Wartsila engines and which interfaces with the overall Plant Control System through which the plant operators control the Tesla. Wartsila, and other plant equipment.
- Two (2) three-winding generator step-up transformers – each transformer is rated at 142 MVA with a 69 kV wye primary connection and two 13.8 kV delta resistance grounded secondary connections and are FR3 filled. One of the two secondary windings is connected to a bus that has three engine generators connected to it, and the other secondary winding is connected to a bus that has two engine generators connected to it. This allows one transformer to deliver the full output of all five generators when needed. Each transformer is located within a secondary oil containment for spill prevention with fire barriers as needed to protect adjacent equipment in the event of catastrophic failure. Each transformer can deliver the full output of the Wartsila power island to its respective switching station (Kellogg and Glendale).
- One (1) Medium Voltage switchgear lineup - the switchgear lineup is an indoor rated metal clad system rated nominally at 13.8 kV, 4000 A, and includes microprocessor-based protective relays.
- One (1) Low Voltage switchgear lineup - the switchgear lineup is based on an indoor rated metal clad Main-Tie-Main configuration providing full power redundancy to the low voltage auxiliary loads. The switchgear is rated nominally at 480 V, 3200 A, and includes protective trips.

- Two (2) auxiliary transformers – each dry type transformer is rated at 2.5 MVA with a 13.8 kV primary connection and a 480 V secondary connections. Each transformer can carry the full auxiliary load of the five engines.
- Two (2) 69 kV breakers and associated disconnect switches, microprocessor-based protective relays, and transition structures for the underground 69 kV cable interconnection for both the existing Kellogg and new Glendale Switching Stations.
- One Gas Pressure Reduction Station to filter and reduce the pressure of the incoming natural gas from approximately 300 psig down to 100 psig.
- One 15,000-gallon 19 percent aqueous ammonia storage tank with containment.
- One (1) Engine Hall - consisting of a steel and concrete construction building that encloses the engines.
- One (1) Utility Building – consisting of a steel construction building adjacent to the Engine Hall the electrical room, mechanical equipment room, and a local control room.

Demolition

The Grayson Power Plant currently has eight operating generating units (Units 1, 2, 3, 4, 5, 8A, 8BC, and 9) and ancillary facilities that, except for Unit 9, will be removed as part of this Alternative. Units 1 through 5, 8A, and 8BC along with their existing cooling towers, buildings, and all ancillary systems including foundations and underground utilities not associated with Unit 9 or required as part of the repowered facility (such as the Kellogg Switching Station) would be demolished and removed in order to make room for the new facilities. Unit 9 would remain in operation during the demolition and construction phases and would be integrated into the Project facilities.

The existing water treatment facilities are old and would be replaced in a different location with a new smaller capacity system that uses recycled water in place of potable water and a combination of permanently installed and mobile trailer-mounted equipment. This system, if space permits for its installation, would support Unit 9 operation during demolition and construction, and Unit 9 and the Wartsila engines during operations. If space does not permit, a smaller temporary system with potable water as feed will be installed to serve Unit 9 until space is made available for the larger recycled water treatment system to be installed. The existing potable water system would be modified to provide fire protection during demolition, construction, and operations as well as potable water.

Demolition and removal work are expected to take twelve (12) months and if this project alternative were selected, would start during the first quarter of 2022.

Construction

Construction of the Tesla BESS and the Wartsila power islands would commence in the first quarter of 2023 and would be expected to extend through the third quarter of 2024.

In addition to field office siting, areas within the site would be used for offloading and staging and for storage of materials, equipment, and vehicles. This Alternative would utilize space within the Utility Operations Center and under adjacent Highway 134 to provide construction laydown and construction parking.

Some limited off-site laydown space is planned at this time for the following reasons:

1. Construction of the Tesla power island would begin after demolition is complete. The Tesla power island would be built early in the construction sequence in order to supplement Glendale's local energy sources as soon as practical. Because the Megapacks arrive by truck and are off-loaded directly onto their foundations, no off-site laydown would be needed.

2. Construction of the Wartsila power island would also begin after demolition is complete. However, as the engines must be assembled on site, it is expected that the engine components may need to be staged at an off-site location between their off-loading from the ship bringing them from Finland and their delivery to the Project site for assembly.

Construction access would be generally from Fairmont Avenue. Large or heavy equipment, such as the Tesla Megapacks, Wartsila engines, and generator step-up transformers would be delivered to the site by heavy haul truck/trailer.

Construction activities at the site would proceed in parallel with the normal GWP work activities taking place at other areas of the Utility Operations Center.

New construction for the Tesla/Wartsila Repowering Project Alternative would include the following new buildings:

- An Engine Hall approximately 43-feet tall, 160-feet long and 104-feet wide.
- A Utility Building approximately 26-feet tall, 107-feet long and 31-feet wide.
- A control room/operations building approximately 25 feet tall, 140-feet long and 70 feet wide.
- A Workshop and Warehouse Building approximately 20-feet tall, 95-feet long and 55-feet wide.
- Small single-story buildings/enclosures to serve as enclosure for the Continuous Emissions Monitoring Systems, and house control and communication equipment.

In addition, there would be five exhaust stacks, each approximately 80 feet tall.

The Project would be designed using commercially-proven technology equipped with stringent environmental protection, monitoring, and safety systems to provide safe and reliable operation over a

30-year operating life. The Tesla/Wartsila Alternative’s reciprocating internal combustion engines and associated equipment would feature the use of South Coast Air Quality Management District (SCAQMD) approved best available control technology to meet air pollution emission standards.

During construction, existing Utility Operations Center utilities would be used for the construction offices, laydown area, and the Project site. The City would provide temporary construction power. Area lighting would be provided and strategically located for safety and security.

Construction water would be potable water supplied by the existing GWP water system and by water truck deliveries, as necessary. Water use would be primarily for dust suppression as well as hydro testing of piping as needed. The hydro test water would be tested, and if suitable, reused, or disposed of in accordance with applicable LORS. Other construction water uses may include compaction, concrete placement, grouting, curing, and cleaning. Portable toilets would be provided on-site.

Operations

The facility would be manned and capable of being operated year-round (24 hours per day, 7 days per week, 365 days a year) to serve electricity demand and provide ancillary services necessary for GWP to integrate renewable energy into its energy portfolio, manage the intermittent energy at the interconnection with the Balancing Authority Area (LADWP), and provide local system reliability.

With exception of planned and unplanned outages, the BESS would be in-service year-round with its primary application being to provide spinning reserve which can be accomplished without creating any emissions. Its secondary application would be to provide load regulation up/down, as well as voltage and frequency support, serving as a generator or a load as needed to help keep transmission imports and system load in balance, including integrating renewables. When import capability is greater than the GWP load, the BESS could also be used for “time-shifting” excess energy from the middle of the day when solar energy is abundant to early evening periods when solar energy is not available. The BESS would be committed to provide up to the full 75 MW of output during peak load periods subject to available energy.

The Wartsila units would be dispatched when needed to 1) provide ancillary services when the Grayson BESS is incapable of doing so due to its energy state, or 2) serve load when imports and the Grayson BESS alone are incapable of doing so. The Wartsila units would be operated preferentially over Unit 9 because 1) they are more efficient, particularly at low loads, and 2) with their increased granularity (18 MW full load for a single Wartsila engine versus 48 MW for Unit 9), they can better match changes in load in a stepwise fashion.

Both the BESS and Wartsila units would be able to provide ancillary services and serve system load, offering GWP a flexible resource to meet future needs as forecasted in the 2019 Integrated Resource Plan. All would have fast startup, significant turndown, fast ramp rates, automatic generation control, and 0.8 power factor generators.

While the BESS and Wartsila units, in concert with Unit 9 and other resources, would be able to cover peak load, it would not fully cover required contingencies.

5.2.6.2 Potential Environmental Impacts – Alternative 7

Following are the potential environmental impacts that would result from the Tesla/Wartsila Repowering Project Alternative.

Potential Environmental Impacts Less than those of the Project

The Tesla/Wartsila Repowering Project Alternative emissions are significantly reduced compared to the proposed Project. This reduction is largely achieved through a reduction in operating hours resulting in fewer emissions and reduced capability to cope with contingent events. The Tesla/Wartsila Repowering Project Alternative would involve the same demolition and similar construction activities as the proposed Project. Consequently, the short-term aesthetics impacts, criteria air pollutant emissions, and greenhouse gas emissions associated with demolition and construction of the Tesla/Wartsila Repowering Project Alternative would be similar to the proposed Project. However, the Tesla/Wartsila Repowering Project Alternative would include different physical components and equipment with different emissions of criteria air pollutants, toxic air contaminants, and greenhouse gases during operation. See analysis below in Tables 5-2 and 5-4. The Tesla/Wartsila Repowering Project Alternative would combust a lower volume of natural gas and generate less electricity than the proposed Project but would include a BESS that could be charged with renewable sources. See comparison below in Table 5-1.

Aesthetics

Photo simulations representing the Tesla/Wartsila Repowering Project Alternative from Key Observation Points 1 (Fairmont Avenue and Flower Street), 4 (San Fernando Road and Highland Avenue), 5 (Skyline Trail), and 6 (Confluence Park) are included below as Figures 5-2, 5-3, 5-4, and 5-5.

a) Simulation of Proposed Project from Fairmont Avenue and Flower Street.

b) Simulation of the Tesla / Wartsilla Repowering Project Alternative.

Stantec

Project Location

Glendale, CA

Project

Grayson Repowering Project

Figure No.

5-2

Title

KOP 1 – View of Proposed Project and Alternative 7 from Intersection of Fairmont Avenue and Flower Street

a) Simulation of Proposed Project from San Fernando Road and Highland Avenue.

b) Simulation of the Tesla / Wartsilla Repowering Project Alternative.

Stantec

Project Location
Glendale, CA

Project
Grayson Repowering Project

Figure No.
5-3

Title
KOP 4 – View of Proposed Project and Alternative 7 from Intersection of San Fernando Road and Highland Avenue

a) Simulation of Proposed Project from Skyline Trail.

b) Simulation of the Tesla / Wartsilla Repowering Project Alternative.

Stantec

Project Location
Glendale, CA

Project
Grayson Repowering Project

Figure No.
5-4

Title
KOP 5 – View of Proposed Project and Alternative 7 from Skyline Trail

a) Simulation of Proposed Project from Confluence Park.

b) Simulation of the Tesla / Wartsilla Repowering Project Alternative.

Stantec

Project Location
Glendale, CA

Project
Grayson Repowering Project

Figure No.
5-5

Title
KOP 6 – View of Proposed Project and Alternative 7 from Confluence Park

As shown in Figure 5-2, the internal combustion engine generator exhaust stacks associated with the Tesla/Wartsila Repowering Project Alternative as well as the existing Unit 9 exhaust stacks are prominently visible from Key Observation Point 1. However, the five exhaust stacks associated with the Tesla/Wartsila Repowering Project Alternative would be approximately 80 feet above surrounding ground level. As shown in Figure 5-2 and evidenced by the visibility of two existing trees, the exhaust stacks and visible structures associated with the Tesla/Wartsila Repowering Project Alternative and the existing Unit 9 exhaust stack would obscure the existing viewshed from Key Observation Point 1 less than the proposed Project. The Tesla/Wartsila Repowering Project Alternative would therefore have less aesthetics impacts from Key Observation Point 1 compared to the proposed Project.

As shown in Figure 5-3, the new Glendale Switching Station associated with the Tesla/Wartsila Repowering Project Alternative would be visible from Key Observation Point 4 and partially obscure the Santa Monica Mountains in the background. The five internal combustion engine generator exhaust stacks and engine hall are also subtly visible between the structural elements of the new Glendale Switching Station. The generation units, four exhaust stacks, and other structures associated with the proposed Project would be higher in the skyline and obscure more of the viewshed from Key Observation Point 4 compared to the Tesla/Wartsila Repowering Project Alternative. The Tesla/Wartsila Repowering Project Alternative would therefore have less aesthetics impacts from Key Observation Point 4 compared to the proposed Project.

As shown in Figure 5-4, the internal combustion engine generator building, exhaust stacks, radiators, Tesla Megapacks, smaller single-story enclosures and control buildings, and Glendale Switching Station associated with the Tesla/Wartsila Repowering Project Alternative are visible from Key Observation Point 5. While the visible components of the Tesla/Wartsila Repowering Project Alternative and proposed Project only occupy a small portion of the viewshed and appear largely comparable, the facilities associated with the proposed Project occupy more of the viewshed compared to the Tesla/Wartsila Repowering Project Alternative. The Tesla/Wartsila Repowering Project Alternative would therefore have less aesthetics impacts from Key Observation Point 5 compared to the proposed Project.

As shown in Figure 5-5, the internal combustion engine generator building, exhaust stacks, radiators, Tesla Megapacks, gathering system transformers, and stormwater storage tank associated with the Tesla/Wartsila Repowering Project Alternative are visible from Key Observation Point 6. However, facilities associated with the proposed Project would occupy the viewshed and obscure the mountains in the background substantially more than the Tesla/Wartsila Repowering Project Alternative. The Tesla/Wartsila Repowering Project Alternative would therefore have less aesthetics impacts from Key Observation Point 6 compared to the proposed Project.

Because the Tesla/Wartsila Repowering Project Alternative would have less aesthetics impacts from all the Key Observation Points modeled, the Tesla/Wartsila Repowering Project Alternative would have less aesthetics impacts compared to the proposed Project.

Air Quality

The generation capacity and natural gas combustion associated with the Tesla/Wartsila Repowering Project Alternative and proposed Project are summarized below in Table 5-1.

Table 5-1 Natural Gas-Fueled Generation Capacity and Combustion of Wartsila Reciprocating Internal Combustion Engines and Proposed Project

Scenario	Natural Gas-Fueled Generation Capacity (MW)	Natural Gas Combustion (MMBtu/Yr)
Proposed Project	262	9,740,104
Five Wartsila RICEs (Alternative 7)	93	1,018,080
Note: Does not include existing Unit 9 that would be retained under the Tesla/Wartsila Repowering Project Alternative and the proposed Project.		

As shown in Table 5-1, the Tesla/Wartsila Repowering Project Alternative involves substantially less natural gas-fueled generation capacity (-169 MW) and natural gas combustion (-89.5 percent) than the proposed Project. Criteria air pollutant, hazardous air pollutant, and greenhouse gas emissions were estimated for the Tesla/Wartsila Repowering Project. Details and assumptions used for estimating emissions are included in Appendix C.1 of this PR-DEIR. Table 5-2 below summarizes the annual emissions of criteria air pollutants for the Tesla/Wartsila Repowering Project Alternative and the proposed Project.

Table 5-2 Summary of Tesla/Wartsila Repowering Project Alternative and Proposed Project Criteria Air Pollutant Emissions

Equipment	NO_2 (tons/year)	CO (tons/year)	PM10 (tons/year)	VOC (tons/year)	SO_2 (tons/year)
Total Emissions from Proposed Project Emissions Units	51.5	37.6	15.1	13.1	3.0
Total Emissions from Tesla/Wartsila Repowering Project Alternative Emissions Units	8.2	13.9	5.0	8.4	0.4
Total 2015-2016 Baseline Emissions[1]	29.9	67.0	15.4	12.0	2.2
Total Updated 2018 Baseline Emissions[1]	28.5	56.9	8.6	6.1	1.0
Net Emissions Increase (Decrease) of Proposed Project relative to 2015-2016 Baseline Emissions	21.6	(29.4)	(0.3)	1.1	0.8
Net Emissions Increase (Decrease) of Tesla/Wartsila Repowering Project Alternative relative to 2015-2016 Baseline Emissions	(21.7)	(53.1)	(10.4)	(3.6)	(1.8)
Net Emissions Increase (Decrease) of Tesla/Wartsila Repowering Project Alternative relative to Updated 2018 Baseline	(20.3)	(43.0)	(3.6)	2.3	(0.6)
Note:					

Equipment	NO_2 (tons/year)	CO (tons/year)	PM10 (tons/year)	VOC (tons/year)	SO_2 (tons/year)
1. The emissions of replaced units were calculated based on the average emissions reported in SCAQMD Annual Emission Reports. Emissions from unit 9 are not included in this table because there are no modifications on Unit 9. Therefore, emissions from unit 9 will not have any effect on the net emission increase/decrease.					

As shown in Table 5-2, annual emissions of criteria air pollutants of the Tesla/Wartsila Repowering Project Alternative are lower than the proposed Project, with the exception of VOC, and represent a net reduction compared to existing emissions. Potential VOC emissions of Alternative 7, however, remain lower than potential emissions from the proposed Project and will be offset through the application of emission reduction credits pursuant to SCAQMD requirements if warranted. Table 5-3 below summarizes the potential health risks to residential receptors located adjacent to the Grayson Power Plant for the Tesla/Wartsila Repowering Project Alternative and the proposed Project.

Table 5-3 Summary of Tesla/Wartsila Repowering Project Alternative and Proposed Project Health Risks to Adjacent Residential Receptors

Health Risk	Significance Threshold	Tesla/Wartsila Repowering Project Alternative	Proposed Project
Maximum Individual Cancer Risk	≤10	0.5	0.91
Acute Hazard Index	≤1	0.06	Less than 0.01
Chronic Hazard Index	≤1	0.03	Less than 0.01
Note: Health risks expressed as number in one million. Rounded to nearest hundredth.			

As shown in Table 5-3, the maximum individual cancer rate of the Tesla/Wartsila Repowering Project Alternative and the proposed Project are both substantially lower than the significance threshold. However, the maximum individual cancer rate of the Tesla/Wartsila Repowering Project Alternative is lower than the proposed Project. Additionally, the acute and chronic hazard index of the Tesla/Wartsila Repowering Project Alternative and the proposed Project are both substantially lower than the significance thresholds. While the acute and chronic hazard index of the Tesla/Wartsila Repowering Project Alternative is higher than the proposed Project, they respectively remain 94 and 97 percent below the significance thresholds.

Energy

The Tesla/Wartsila Repowering Project Alternative would increase the City’s ability to integrate renewable resources as a result of the BESS compared to the proposed Project that only includes natural gas fueled electricity generation. The Tesla/Wartsila Repowering Project Alternative would therefore have a lower potential to conflict with or obstruct a state or local plan for renewable energy or energy efficiency and would therefore have lower potential energy impacts than the proposed Project.

Greenhouse Gas Emissions

Table 5-4 below summarizes the annual greenhouse gas emissions for the Tesla/Wartsila Repowering Project Alternative and the proposed Project.

Table 5-4 Summary of Tesla/Wartsila Repowering Project Alternative and Proposed Project Greenhouse Gas Emissions

	Annual Greenhouse Gas Emissions (Metric Tons CO2e)
Proposed Project	476,040
Tesla/Wartsila Repowering Project Alternative	54,063

As shown in Table 5-4 the natural-gas fueled generation units associated with this Alternative would emit approximately 54,063 metric tons of CO2e/year. By comparison, the natural gas-fueled electrical generation units associated with the proposed Project would emit approximately 476,040 metric tons of CO2e/year. This Alternative therefore has less potential greenhouse gas emissions impacts than the proposed Project.

Noise

Operation of the Wartsila engines and related equipment would generate noise. Table 5-5 shows a compassion of Project and Alternative 7 operation noise at sensitive receptors during the day and night. See Appendix E in this PR-DEIR for additional details.

Table 5-5 Predicted Operation Phase Noise Levels – Proposed Project and Alternative 7

Scenario	**Receptor**	**Predicted Operational Noise (dBA)**	**Daytime Ambient Sound Levels (dBA)**			**Nighttime Ambient Sound Levels (dBA)**		
			Current	**New**	**Increase**	**Current**	**New**	**Increase**
Proposed Project	R1	51.0	54.2	55.9	**1.7**	49.6	53.4	**3.8**
	R2	53.1	64.7	65.0	**0.3**	52.8	56.0	**3.2**
	R3	52.6	57.1	58.4	**1.3**	52.8	55.7	**2.9**
	R7	57.5	60.6	62.3	**1.7**	58.8	61.2	**2.4**
	R8	58.4	69.6	69.9	**0.3**	65.6	66.4	**0.8**
Alternative 7	R1	47.6	54.2	55.1	**0.9**	49.6	51.7	**2.1**
	R2	50.7	64.7	64.9	**0.2**	52.8	54.9	**2.1**
	R3	52.2	57.1	58.3	**1.2**	52.8	55.5	**2.7**
	R7	53.8	60.6	61.4	**0.8**	58.8	60.0	**1.2**
	R8	55.0	69.6	69.7	**0.1**	65.6	66.0	**0.4**

As shown in Table 5-5, the Tesla/Wartsila Repowering Project Alternative would result in lower noise level increases during the day and night compared to the proposed Project at all receptors modelled. Therefore, the Tesla/Wartsila Repowering Project Alternative would have lower noise impact than the proposed Project.

In summary, potential aesthetics, air quality, energy, greenhouse gas emissions, and noise impacts of the Tesla/Wartsila Repowering Project Alternative would be less than those of the proposed Project.

Potential Environmental Impacts Similar to Those of the Project

Similar to the Project, this Alternative involves electrical generation at the same 10-acre urban industrial site already permitted, developed, and operated as a power plant. The primary difference is that this Alternative includes a 75 MW/300 MWH BESS and five Wartsila reciprocating internal combustion engines with an approximate thermal generation capacity of 93 MW, compared to no BESS and a total thermal generation capacity of approximately 262 MW from two simple cycle and two combined cycle generation units associated with the proposed Project.

Agriculture and Forestry Resources, Biological Resources, Cultural/Tribal Cultural Resources, Environmental Justice, Land Use and Planning, Mineral Resources, Population and Housing, Public Services, Recreation, Socioeconomics, and Wildfire.

Similar to the proposed Project, the Tesla/Wartsila Repowering Project Alternative would not occur on lands zoned or used for agriculture or forestry resources, or mineral resources. Both this Alternative and the proposed Project would occur within the limits of the developed power plant site which lacks sensitive biological, archaeological, and tribal cultural resources and high fire hazard areas. The surrounding community was determined not to be considered an environmental justice community (refer to Appendix A, Section 2.19 of the Initial Study included in the 2018 Final EIR). The Boiler Building would be demolished and this Alternative, similar to the proposed Project, would result in a significant and unavoidable discretionary historic resource impact.

Geologic, Traffic, and Utilities and Service Systems

Demolition activities, ground disturbances during construction, site drainage, susceptibility to geologic hazards such as seismically induced ground shaking and liquefaction potential, operation phase vehicle trips, and utility/service systems needs associated with the Tesla/Wartsila Repowering Project Alternative would be similar to the proposed Project.

Hazards and Hazardous Materials

The emissions control system for the Wartsila reciprocating internal combustion engines would utilize 19 percent aqueous ammonia stored in a 15,000-gallon capacity above ground storage tank. An off-site consequence analysis was performed for the accidental release of aqueous ammonia from the 15,000-gallon storage tank associated with the Tesla/Wartsila Repowering Project Alternative. The analysis consists of a worst-case accidental release scenario involving the failure and complete discharge of the contents of the storage tank into the secondary containment structure below the tank. Similar to aqueous ammonia associated with the proposed Project, the results of the off-site consequence analysis for the Tesla/Wartsila Repowering Project Alternative which are included in Appendix D.1 of this PR-DEIR demonstrate that the worst-case release of ammonia would not exceed applicable Occupational Safety and Health Administration, U.S. Environmental Protection Agency, and California Energy Commissions health thresholds.

Under normal operations, the Megapacks do not store or generate hazardous materials in quantities that would represent a risk to off-site receptors. However, a fire or thermal runaway event of a Megapack may release hazardous materials to the environment. Based on the design of the Megapack and confirmed through testing conducted by Tesla, a reasonable worst-case scenario for Alternative 7 would be a fire or thermal runaway event consuming one Tesla Megapack and releasing carbon monoxide and hydrogen fluoride. An analysis of an Alternative 7 BESS fire and subsequent release of carbon monoxide and hydrogen fluoride was prepared using the U.S. Environmental Protection Agency's (USEPA) Areal Locations of Hazardous Atmospheres (ALOHA) model to identify estimated distances to regulatory-established toxic endpoints to determine potential significance of hazards impacts pursuant with CEQA. The analysis showed no significant impact.

With respect to the assessment of potential impacts associated with an accidental release of carbon monoxide, four offsite "bench mark" exposure levels were evaluated, as follows: (1) the Occupational Safety and Health Administration's (OSHA) Immediately Dangerous to Life and Health (IDLH) level; (2) the National Oceanic and Atmospheric Administration (NOAA) Office of Response and Restoration's Acute Exposure Guideline Levels (AEGLs) AEGL-3 which predicts that the general population, including susceptible individuals, could experience life-threatening health effects or death; (3) AEGL-2 which predicts that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape; and (4) AEGL-1 level (not established for carbon monoxide) which predicts that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

The results of the BESS fire OCA for Alternative 7 are included in Appendix D.2 and summarized below in Table 5-6 below.

Table 5-6 Carbon Monoxide and Hydrogen Fluoride Modeling Results

Chemical	Distance to IDLH[a]	Distance to AEGL-3[b]	Distance to AEGL-2[b]	Distance to AEGL-1[b]
Carbon Monoxide	Not Exceeded	Not Exceeded	167.98 ft	Not Established
Hydrogen Fluoride	Not Exceeded	Not Exceeded	Not Exceeded	108.01 ft

[a] Benchmark based on a 30-minute exposure or averaging time

[b] Benchmark based on a 60-minute exposure or averaging time

The power plant facility boundary would be located approximately 76 feet (23.16 meters) from a Megapack. The results of the OCA for the worst-case release of carbon monoxide indicates that the concentrations for benchmark criteria IDLH (1200 ppm) and AEGL-3 (330 ppm) would not extend beyond the facility fence line. AEGL-1 thresholds have not been established for carbon monoxide. However, the distance to AEGL-2 thresholds could potentially extend beyond the fence line by a distance of approximately 91.99 feet (28.04 meters). As displayed in Figure 1 of Attachment D.2, this would be mainly in a lightly trafficked segment of Fairmont Avenue on the southwestern fence line of the Grayson Power Plant. Thresholds would not be exceeded for any residences, schools, or commercial land uses.

Receptors along Fairmont Avenue would be predominantly mobile receptors such as vehicles that would not be exposed to substantial concentrations of carbon monoxide for the 60 minutes assumed in the reasonable worst-case scenario and AEGL thresholds. For example, the carbon monoxide AEGL-2 for a 30-minute and 10-minute exposures are 150 ppm and 420 ppm.

The results of the OCA for the worst-case release of hydrogen fluoride indicates that concentrations for benchmark criteria IDLH (30 ppm), AEGL-3 (44 ppm), and AEGL-2 (24) would not extend beyond the facility fence line. However, the distance to the AEGL-1 benchmark criteria (1 ppm) could potentially extend beyond the fence line by a distance of approximately 32.02 feet (9.76 meters).

An infrared camera system would be installed as part of this Project alternative to monitor the Megapacks. In the event of thermal runaway within the Megapack, the camera would detect the unit's change in temperature and provide notification to the plant operators. The plant operators would then contact the local fire department. The initial detection occurs approximately 15 minutes prior to smoke being released from the Megapack units. According to the City of Glendale, the average response time for the Local Fire Department is four minutes and 36 seconds[20]. The Fire Department would arrive on site in less than five minutes of the initial notification as the nearest fire station, Station 27, is located approximately 1.23 miles from the proposed Project. The affected section of Fairmont Avenue and the adjacent pedestrian bike path on the west side of Fairmont Avenue would immediately be closed to the public. The closure would remain in place until the area is deemed safe to the public. As a result, any long-term or permanent effects to the public from carbon monoxide are unlikely to occur. Additionally, the AEGL-1 threshold of exceedance for hydrogen fluoride predicts that the general population, including susceptible individuals, could experience temporary symptoms of exposure.

As a result, this Alternative would have similar environmental impacts as the proposed Project on agriculture and forestry resources, biological resources, cultural/tribal cultural resources, environmental justice, geology and soils, hazards and hazardous materials, hydrology, noise, and water quality, land use and planning, mineral resources, population and housing, public services, recreation, socioeconomics, transportation, utilities and service systems, and wildfire.

Potential Environmental Impacts Greater than those of the Project

This Alternative would not have any potential environmental impacts greater than those of the proposed Project.

5.2.6.3 Objectives Consistency Evaluation – Alternative 7

This Alternative would meet some of the Project objectives but would also not meet or meet them as well as the proposed Project. Specifically, the Tesla/Wartsila Repowering Project Alternative:

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[20] City of Glendale, 12.4 Public Safety Response, available at https://www.glendaleca.gov/government/departments/community-development/neighborhood-services/glendale-quality-of-life-indicators/12-4-public-safety-response.

1. Would integrate with local and remote distributed renewable energy resources to provide sufficient and flexible power and energy capacity to meet peak load while accommodating the loss of the single largest contingency. However, while the Tesla/Wartsila Repowering Project Alternative meets the N-1 contingency reserve requirements, until 2027, when the City will acquire an additional 72 MW of transmission, it does not meet the N-1-1 contingency reserve requirements and therefore, in the short term, would not provide sufficient capacity and energy to ensure reliable service at all times for the City.

2. Would utilize current and reliable technology and control systems to provide reliable, cost effective, and flexible generation to support the City's compliance with California's Renewable Portfolio Standards.

3. Would provide a local generation resource, but until the City acquires the additional 72 MW of additional transmission in 2027, is not one that is sufficient to meet resource adequacy requirements, and the City's obligation within the Balancing Area (BA) to balance load and resource at the interconnection with the BA, in accordance with industry standards including NERC/WECC requirements (including the N-1-1 contingency condition); thus, in the short term, would not fully provide local reliability or contribute to grid stability within the Los Angeles Basin.

4. Would provide a locally controlled source of generation and would support the City's reliance on power imports from remote generation locations through a congested transmission grid system subject to planned and unplanned outages and de-rates.

5. Would replace the aged, unreliable, less efficient, high maintenance steam boilers, with new generation that would comply with offset exemption provisions of SCAQMDs Rule 1304(a)(2) for advanced technology replacement of electric utility steam boilers.

6. Would be able to be located at the existing City property already permitted and used for generation and would minimize the need for major infrastructure improvements such as fuel supply, water, wastewater, recycled water, and transmission facilities to the same extent as the proposed Project.

7. Would provide generation that is efficient to maintain and would necessitate power imports from remote generation with less cost certainty which does not minimize the impact on the rates and help manage costs of delivering energy to the City's customers to the same degree as the proposed Project.

8. Would support water conservation efforts by eliminating the use of potable water for generation purposes.

9. Would have a higher reduction in emissions and water consumption than the proposed Project. The Tesla/Wartsila Repowering Project Alternative involves substantially less natural gas-fueled generation capacity (-169 MW) and natural gas combustion (-89.5 percent) than the proposed Project. Additionally, the Wartsila engines have virtually no consumptive water use.

5.2.6.4 Summary – Alternative 7

The Tesla/Wartsila Repowering Project Alternative would involve 89.5 percent less combustion of natural gas compared to the Project. As a result, it would have lower air pollutant and greenhouse gas emissions compared to the Project. The BESS, if charged with renewable sources, would represent a reduced potential energy impact compared to the proposed Project that involves only natural gas fueled electricity generation. It would also virtually eliminate all consumptive water use. The physical components of the Tesla/Wartsila Repowering Project Alternative would obscure views less than the proposed Project from the key observation points simulated and result in a lower increase in noise levels at sensitive receptors compared to the Project. The Tesla/Wartsila Repowering Project Alternative would have similar potential environmental impacts to all other environmental factors evaluated pursuant to CEQA. The Tesla/Wartsila Repowering Project Alternative would not result in any potential environmental impacts greater than the proposed Project.

For these reasons, the overall environmental impacts of the Tesla/Wartsila Repowering Project Alternative are expected to be less than the proposed Project.

5.2.7 Alternative 8 - Unit 8 Refurbishment Project Alternative

5.2.7.1 Project Description

The Unit 8 Refurbishment Project Alternative would retain and refurbish the existing Units 8A and 8BC gas turbine combined cycle units and add 75 MW/300 MWH Battery Energy Storage System (BESS). All the existing Units 1-5 boiler and steam turbine equipment, and Units 8A and 8BC equipment except for the gas turbine generators, will be shut down and removed (Units 6 and 7 were previously removed). Grayson's generating capabilities would be comprised of the following generation and storage units totaling 101 MW net at average annual site conditions and 75MW/300 MWH of energy storage:

- A 75MW/300 MWH battery energy storage system. Through the Clean Energy RFP process, the City selected Tesla's Megapack technology as the preferred energy storage technology amongst the several different technologies offered based on the consideration of several factors such as performance, capacity maintenance/degradation, guarantees, long-term service agreement, space utilization, and cost. Therefore, the environmental evaluation of this alternative assumes the Tesla Megapack design and the supporting engineering and test data supplied by Tesla. The final choice of design technology for the battery energy storage system will be determined as part of the final design for the project.

- Refurbishing the existing Unit 8A combined cycle unit. The refurbishment would retain the existing gas turbine generator and convert the unit from its current combined cycle configuration to a simple cycle configuration by replacing the existing heat recovery steam generator and associated steam turbine cycle with a new simple cycle emissions control system. This would allow Unit 8A to start and achieve full load within ten minutes thereby providing GWP with an additional quick starting resource that it needs to meet reserve requirements and integrate intermittent resources.

- Refurbishing the existing Unit 8BC combined cycle unit. The refurbishment would retain the existing gas turbine generator and replace the existing heat recovery steam generator and associated steam turbine cycle with a new once through boiler and new steam turbine cycle. This would allow Unit 8BC to start and achieve full load on the gas turbine within ten minutes thereby providing GWP with an additional quick starting resource it needs to meet reserve requirements and integrate intermittent resources. The steam turbine cycle could start and reach full load in approximately two hours providing additional energy and improved thermal efficiency.

Additional engineering information regarding the Project is provided below:

1) The Unit 8A and 8BC gas generators, power turbines, and generators would be refurbished by removing their rotating elements for inspection and overhaul. The stationary elements would be refurbished in place.

2) The rest of the Unit 8A and 8BC infrastructure including heat recovery steam generators, steam turbines, piping, cooling towers, transformers, control module, etc. would be demolished as is the case for the other alternatives.

3) Unit 8A would be equipped with an emission control system consisting of a selective catalytic reduction system for the control of nitrogen oxides (NOx) emissions and an oxidation catalyst to control carbon monoxide (CO) and volatile organic compound (VOC) emissions.

4) Unit 8A would feature fast starting (from off to full load within ten minutes or less), and fast ramping up and down to support spinning and non-spin reserves, regulation and reactive power support, and integration of renewable resources.

5) Unit 8BC would be equipped with a once through boiler with an integral emission control system consisting of selective catalytic reduction system for the control of nitrogen oxides (NOx) emissions and an oxidation catalyst to control carbon monoxide (CO) and volatile organic compound (VOC) emissions. The once through boiler would allow operation of Unit 8BC in a “dry” simple cycle mode allowing the unit to quickly startup like a simple cycle unit. The once through boiler could then transition to “wet” combined cycle mode and transfer the exhaust heat energy to water to produce steam for use in a new steam turbine to produce additional power.

6) A new water treatment system would treat and demineralize the recycled water, primarily for use in Unit 8A for NOx reduction, Unit 8BC for NOx reduction and steam production, and Unit 9 for power augmentation and NOx reduction. The water treatment system would use a combination of installed equipment and mobile trailer-mounted demineralizer systems to batch process recycled water that would then be stored on-site in tanks. The mobile trailer-mounted demineralizer would be regenerated off-site and brought back as needed to maintain minimum storage volumes. Reject water from the micro-filtration and

reverse osmosis system would be discharged to the process drains and from there to the Glendale sewer system.

7) New plant control room and plant operations offices would also be constructed.

8) A new Workshop/Warehouse to serve the Grayson Power Plant would also be constructed.

9) All interconnections to the City's electrical grid would occur on-site and no new off-site electrical transmission line modification or construction would be necessary for the Project.

10) The Project would be designed, constructed, and inspected in accordance with the current California Building Standards Code, also known as Title 24, California Code of Regulations, which encompasses the California Building Code, California Administrative Code, California Electrical Code, California Mechanical Code, California Plumbing Code, California Energy Code, California Fire Code, California Code for Building Conservation, California Reference Standards Code, and all other applicable LORS in effect at the time initial design plans are submitted to the City for review and approval.

11) The Project would utilize certified engineers and geologists to perform design reviews, obtain approval by the City, and monitor construction to ensure compliance with laws, ordinances, regulations, and standards. In addition, certified third party inspections would be performed to ensure that any work requiring such inspection is constructed in accordance with LORS, including excavation and backfill work and the installation of piles.

12) Structural support would be in accordance with the recommendations provided in Section 8.0 of the Geotechnical Investigation Report prepared by Black & Veatch, as may be updated by the Engineer-Procurement-Construction Contractors (Appendix B of this PR-DEIR). Deep foundations for power plant structures would utilizes piles.

This Alternative would encompass approximately ten acres within the City's Utility Operations Center located within the Grayson Power Plant existing site.

This Alternative would also include a new aqueous ammonia storage tank and unloading facility for Units 8A and 8BC.

Additionally, this Alternative would connect to the existing off-site linear facilities, such as, natural gas, potable water, recycled water, stormwater discharge, processed wastewater discharge, and sanitary sewer pipelines, and electrical transmission lines that are currently serving the existing facilities.

Underground 69 kV electrical interconnections would connect the new power islands to the existing Kellogg Switching Station and the new Glendale Switching Station. Both Switching Stations are or would be located within the Project boundaries, and entirely within the footprint of the existing City Utility Operations Center property boundaries. From the existing Kellogg Switching Station and new Glendale Switching Station, power generated by the proposed Project would interconnect to the GWP's existing distribution system serving the City's electric load.

All interconnections to the City's electrical grid would occur on-site and no new off-site electrical transmission line modification or construction would be necessary for the proposed Project.

This Alternative would use recycled water for a majority of plant operations and would reduce even further the use of potable water provided by the City at the Grayson Power Plant. Potable water would, after completion of the proposed Project, only be used for domestic use, eye wash stations, fire protection, and as an emergency source of water. Potable water would no longer be normally used for equipment cooling or process water purposes, eliminating the use of potable water for Unit 9 and the units that would be demolished.

Wastewater and other process waste generated by the Project and Unit 9 would be treated as required by the discharge permit and discharged into the existing sanitary sewer connection. This discharge would be conveyed back to the Los Angeles-Glendale Water Reclamation Plant, where it would be processed and again recycled to be made available for use at the Project site or at other facilities as recycled water for beneficial use.

On-site stormwater runoff from within the Project site would flow via surface sheet flow and localized gutters to on-site storm drain piping. The storm drain piping would be connected to an on-site detention basin and pump station. Stormwater from the 85th percentile storm would be collected and pumped to a new aboveground storage tank. Stormwater would then be gravity drained from that tank to the Glendale sewer system. During storm events that exceed the design capacity of the stormwater system, overflow runoff would be discharged into the adjacent Verdugo Wash and Los Angeles River through existing stormwater outfalls.

Stormwater that falls within process equipment containment areas would be collected separately from typical site runoff, treated, and discharged into the existing public sanitary sewer system.

Demolition

The Grayson Power Plant currently has eight operating generating units (Units 1, 2, 3, 4, 5, 8A, 8BC, and 9) and ancillary facilities that, except for Units 8A, 8BC, and 9, will be removed as part of this Alternative. Units 1 through 5 along with their existing cooling towers, boiler building, buildings, and all ancillary systems including foundations and underground utilities not associated with Unit 9 or required as part of the repowered facility (such as the Unit 8A and 8BC gas turbine generators and Kellogg Switching Station) would be demolished and removed. Unit 9 would remain in operation during the demolition and construction phases and would be integrated into the Project facilities.

The existing water treatment facilities are old and would be replaced in a different location with a new smaller capacity system that uses recycled water in place of potable water, and a combination of permanently installed and mobile trailer-mounted equipment. This system, if space permits its installation, would support Unit 9 operation during demolition and construction, and Units 8A, 8BC, and 9 during operations. If space does not permit, a smaller temporary system with potable water as feed will be installed to serve Unit 9 until space is made available for the larger recycled water treatment system to be installed. The existing potable water system would be modified to provide fire protection during demolition, construction, and operations as well as potable water.

Demolition and removal work are expected to take twelve (12) months and if this Alternative is selected, would start during the first quarter of 2022.

Construction

Construction of the 75 MW/300 MWH Tesla BESS and the refurbishments of Units 8A and 8BC would commence in the first quarter of 2023 and would be expected to extend through the third quarter of 2024.

In addition to field office siting, areas within the site would be used for offloading and staging and for storage of materials, equipment, and vehicles. This Alternative would utilize space within the Utility Operations Center and under adjacent Highway 134 to provide construction laydown and construction parking.

No off-site laydown space is planned at this time for the following reasons:

1. Construction of the Unit 8A and 8BC power island would begin after demolition is complete. Because the Megapacks arrive by truck and are off-loaded directly onto their foundations, no off-site laydown would be needed.
2. Construction of the Unit 8A and 8BC power island would begin after demolition is complete. Thus, all of the remaining site would be available for laydown and construction.

Construction access would be generally from Fairmont Avenue. Large or heavy equipment, such as the Tesla Megapacks, steam turbine, and generator step-up transformers would be delivered to the site by heavy haul truck/trailer.

Construction activities at the site would proceed in parallel with the normal GWP work activities taking place at other areas of the Utility Operations Center.

New construction for the Tesla/Unit 8 Refurbishment Project Alternative would include the following new buildings:

- A control room/operations building approximately 12-feet tall, 75-feet long and 45-feet wide.
- A Workshop and Warehouse Building approximately 20-feet tall, 100-feet long and 50-feet wide.
- Small single-story buildings/enclosures to serve as a water lab, enclosure for the Continuous Emissions Monitoring Systems, and house control and communication equipment.

In addition, Units 8A and 8BC would each have 115 feet tall exhaust stacks.

The Project would be designed using commercially proven technology equipped with stringent environmental protection, monitoring, and safety systems to provide safe and reliable operation over a 30-year operating life. The project would comply with South Coast Air Quality Management District (SCAQMD) air pollution emission standards.

During construction, existing Utility Operations Center utilities would be used for the construction offices, laydown area, and the Project site. The City would provide temporary construction power. Area lighting would be provided and strategically located for safety and security.

Construction water would be potable water supplied by the existing GWP water system and by water truck deliveries, as necessary. Water use would be primarily for dust suppression as well as hydro testing of piping. The hydro test water would be tested, and if suitable, reused, or disposed of in accordance with applicable LORS. Other construction water uses may include compaction, concrete placement, grouting, curing, and cleaning. Portable toilets would be provided on-site.

Operations

The facility would be manned and capable of being operated year-round (24 hours per day, 7 days per week, 365 days a year) to serve electricity demand and provide ancillary services necessary for GWP to integrate renewable energy into its energy portfolio, manage the intermittent energy at the interconnection with the Balancing Authority Area (LADWP), and provide local system reliability.

With the exception of planned and unplanned outages, the BESS would always be in-service year-round with its primary application being to provide spinning reserve as they can do so without creating any emissions. Its secondary application would be to provide load regulation up/down, as well as voltage and frequency support, serving as a generator or a load as needed to help keep transmission imports and system load in balance, including integrating renewables. When import capability is greater than the GWP load, the BESS could also be used for “time-shifting” excess energy from the middle of the day when solar energy is abundant to early evening periods when solar energy is not available. The BESS would be committed to provide up to the full 75 MW of output during peak load periods subject to available energy.

Units 8A and 8BC would be dispatched when needed to 1) provide ancillary services when the Grayson BESS is incapable of doing so due to its energy state, or 2) serve load when imports and the Grayson BESS alone are incapable of doing so. As Units 8A, 8BC, and 9 will all be equally capable of fast starts, the units would be operated holistically depending on how much power is needed and for how long. For example, while Unit 8A would be the least efficient, being a smaller unit, it will likely be more efficient than the other two units operating at part load to match Unit 8A’s output. Unit 8BC would be both the largest and most efficient unit when operating at full load in combined cycle.

Both the BESS and Units 8A and 8BC would be able to provide ancillary services and serve system load offering GWP a flexible resource to meet future needs. All would have fast startup, significant turndown, fast ramp rates, automatic generation control, and 0.9 power factor gas turbine generators and 0.8 power factor steam turbine generator.

5.2.7.2 Potential Environmental Impacts – Alternative 8

Following are the potential environmental impacts that would result from the Tesla/Unit 8 Refurbishment Project Alternative.

Potential Environmental Impacts Less than those of the Project

The Tesla/ Unit 8 Refurbishment Project Alternative emissions are significantly reduced compared to the proposed project. This reduction is largely achieved through a reduction in operating hours resulting in fewer emissions and reduced capability to cope with contingent events. The Tesla/Unit 8 Refurbishment Project Alternative would involve the same demolition and similar construction activities as the proposed Project. Consequently, the short-term aesthetics impacts, criteria air pollutant emissions, and greenhouse gas emissions associated with demolition and construction of the Tesla/ Unit 8 Refurbishment Project Alternative would be similar to the proposed Project. However, the Tesla/Unit 8 Refurbishment Project Alternative would include different physical components and equipment with different emissions of criteria air pollutants, toxic air contaminants, and greenhouse gases during operation. The Tesla/ Unit 8 Refurbishment Project Alternative would combust a lower volume of natural gas and generate less electricity than the proposed Project but would include a BESS that could be charged with renewable sources. As a result, the Tesla/ Unit 8 Refurbishment Project Alternative could be more consistent with the State’s Renewable Portfolio Standard requirements compared to the proposed Project (if the BESS was charged with renewable sources).

Aesthetics

Photo simulations representing the Tesla/Unit 8 Refurbishment Project Alternative from Key Observation Points 1 (Fairmont Avenue and Flower Street), 4 (San Fernando Road and Highland Avenue), 5 (Skyline Trail), and 6 (Confluence Park) are included below as Figures 5-6, 5-7, 5-8, and 5-9.

a) Simulation of Proposed Project from Fairmont Avenue and Flower Street.

b) Simulation of the Tesla / Unit 8 Refurbishment Project Alternative.

Stantec

Project Location
Glendale, CA

Project
Grayson Repowering Project

Figure No.
5-6

Title
KOP 1 – View of Proposed Project and Alternative 8 from Intersection of Fairmont Avenue and Flower Street

a) Simulation of Proposed Project from San Fernando Road and Highland Avenue.

b) Simulation of the Tesla / Unit 8 Refurbishment Project Alternative.

Stantec

Project Location
Glendale, CA

Project
Grayson Repowering Project

Figure No.
5-7

Title
KOP 4 – View of Proposed Project and Alternative 8 from Intersection of San Fernando Road and Highland Avenue

a) Simulation of Proposed Project from Skyline Trail.

b) Simulation of the Tesla / Unit 8 Refurbishment Project Alternative.

Stantec

Project Location

Glendale, CA

Project

Grayson Repowering Project

Figure No.

5-8

Title

KOP 5 – View of Proposed Project and Alternative 8 from Skyline Trail

a) Simulation of Proposed Project from Confluence Park.

b) Simulation of the Tesla / Unit 8 Refurbishment Project Alternative.

Stantec

Project Location
Glendale, CA

Project
Grayson Repowering Project

Figure No.
5-9

Title
KOP 6 – View of Proposed Project and Alternative 8 from Confluence Park

As shown in Figure 5-6, the cooling tower, steam turbine building, once through boiler, once through boiler exhaust stack, selective catalytic reduction and exhaust stack, demineralized water storage tank, and stormwater storage tank associated with the Tesla/ Unit 8 Refurbishment Project Alternative as well as the existing warehouse and Unit 9 are prominently visible from Key Observation Point 1. The Tesla Megapacks, while visible, are not substantially higher than the existing facility boundary wall. The two exhaust stacks associated with the Tesla/ Unit 8 Refurbishment Project Alternative would be approximately 115 feet above surrounding ground level. As shown in Figure 5-6, the exhaust stacks and visible structures associated with the Tesla/ Unit 8 Refurbishment Project Alternative and the existing Unit 9 exhaust stack would obscure the existing viewshed from Key Observation Point 1 less than the proposed Project. The Tesla/ Unit 8 Refurbishment Project Alternative would therefore have less aesthetics impacts from Key Observation Point 1 compared to the proposed Project.

As shown in Figure 5-7, the new Glendale Switching Station, the cooling tower, steam turbine building, once through boiler, once through boiler exhaust stack, selective catalytic reduction and exhaust stack, two demineralized water storage tanks, and stormwater storage tank associated with the Tesla/ Unit 8 Refurbishment Project would be visible from Key Observation Point 4 and partially obscure the Santa Monica Mountains in the background. The generation units, four exhaust stacks, and other structures associated with the proposed Project would be higher in the skyline and obscure more of the viewshed from Key Observation Point 4 compared to the Tesla/ Unit 8 Refurbishment Project Alternative. The Tesla/ Unit 8 Refurbishment Project Alternative would therefore have less aesthetics impacts from Key Observation Point 4 compared to the proposed Project.

As shown in Figure 5-8, the Tesla MegaPacks, cooling tower, steam turbine building, once through boiler, once through boiler exhaust stack, selective catalytic reduction and exhaust stack, two demineralized water storage tanks, stormwater storage tank, and Glendale Switching Station associated with the Tesla/ Unit 8 Refurbishment Project as well as the existing warehouse and Unit 9 are prominently visible from Key Observation Point 5 and Glendale Switching Station associated with the Tesla/Wartsila. While the visible components of the Tesla/Wartsila Repowering Project Alternative and proposed Project only occupy a small portion of the viewshed and appear largely comparable, the cooling towers and exhaust stacks associated with the proposed Project occupies more of the viewshed compared to the Tesla/Wartsila Repowering Project Alternative. The Tesla/ Unit 8 Refurbishment Project Alternative would therefore have less aesthetics impacts from Key Observation Point 5 compared to the proposed Project.

As shown in Figure 5-9, the cooling tower, steam turbine building, once through boiler, once through boiler exhaust stack, selective catalytic reduction and exhaust stack, two demineralized water storage tanks, and stormwater storage tank associated with the Tesla/ Unit 8 Refurbishment Project would be visible from Key Observation Point 6 and partially obscure the mountains in the background. The generation units, four exhaust stacks, and other structures associated with the proposed Project would be higher in the skyline and obscure more of the viewshed from Key Observation Point 6 compared to the Tesla/ Unit 8 Refurbishment Project Alternative. The Tesla/ Unit 8 Refurbishment Project Alternative would therefore have less aesthetics impacts from Key Observation Point 6 compared to the proposed Project.

Because the Tesla/Unit 8 Refurbishment Project Alternative would have less aesthetics impacts from all of the Key Observation Points modeled, the Tesla/Unit 8 Refurbishment Project Alternative would have less aesthetics impacts compared to the proposed Project.

Air Quality

The generation capacity and natural gas combustion associated with the Tesla/ Unit 8 Refurbishment Project Alternative and proposed Project are summarized below in Table 5-7.

Table 5-7 Natural Gas-Fueled Generation Capacity and Combustion of Refurbished Unit 8A and 8BC and Proposed Project

Scenario	Natural Gas-Fueled Generation Capacity (MW)	Natural Gas Combustion (MMBtu/Yr)
Proposed Project	262	9,740,104
Refurbished Unit 8A and 8BC (Alternative 8)	101	1,260,000
Note: Does not include existing Unit 9 that would be retained under the Tesla/Unit 8 Refurbishment Project Alternative and the proposed Project.		

As shown in Table 5-7, the Tesla/Wartsila Repowering Project Alternative involves substantially less natural gas-fueled generation capacity (-172 MW) and natural gas combustion (-87 percent) than the proposed Project. Criteria air pollutant, hazardous air pollutant, and greenhouse gas emissions were estimated for the Tesla/Wartsila Repowering Project. Details and assumptions used for estimating emissions are included in Appendix C.2 of this PR-DEIR. Table 5-8 below summarizes the annual emissions of criteria air pollutants for the Tesla/Wartsila Repowering Project Alternative and the proposed Project.

Table 5-8 Summary of Tesla/ Unit 8 Refurbishment Project Alternative and Proposed Project Criteria Air Pollutant Emissions

Equipment	NO_2 (tons/year)	CO (tons/year)	PM10 (tons/year)	VOC (tons/year)	SO_2 (tons/year)
Total Emissions from Proposed Project Emissions Units	51.5	37.6	15.1	13.1	3.0
Total Emissions from Tesla/ Unit 8 Refurbishment Project Alternative Emissions Units	10.9	53.9	2.0	7.6	0.5
Total 2015-2016 Baseline Emissions[1]	29.9	67.0	15.4	12.0	2.2
Total Updated 2018 Baseline Emissions[1]	28.5	56.9	8.6	6.1	1.0
Net Emissions Increase (Decrease) of Proposed Project relative to 2015-2016 Baseline Emissions	21.6	(29.4)	(0.3)	1.1	0.8
Net Emissions Increase (Decrease) of Tesla/ Unit 8 Refurbishment Project Alternative relative to 2015-2016 Baseline Emissions	(19.0)	(13.1)	(13.4)	(4.4)	(1.8)

Equipment	NO_2 (tons/year)	CO (tons/year)	PM10 (tons/year)	VOC (tons/year)	SO_2 (tons/year)
Net Emissions Increase (Decrease) of Tesla/ Unit 8 Refurbishment Project Alternative relative to Updated 2018 Baseline Emissions	(17.6)	(3.0)	(6.6)	1.5	(0.5)
Note: 1. The emissions of replaced units were calculated based on the average emissions reported in SCAQMD Annual Emission Reports. Emissions from unit 9 are not included in this table because there are no modifications on Unit 9. Therefore, emissions from unit 9 will not have any effect on the net emission increase/decrease.					

As shown in Table 5-8, annual emissions of criteria air pollutants of the Tesla/Unit 8 Refurbishment Project Alternative are lower than the proposed Project, and with the exception of VOC, represent a net reduction compared to existing emissions. Potential VOC emissions of Alternative 8, however, remain lower than potential emissions from the proposed project and will be offset through the application of emission reduction credits pursuant with SCAQMD requirements if warranted. Table 5-9 below summarizes the potential health risks to residential receptors located adjacent to the Grayson Power Plant for the Tesla/Unit 8 Refurbishment Project Alternative and the proposed Project.

Table 5-9 Summary of Tesla/Unit 8 Refurbishment Project Alternative and Proposed Project Health Risks to Adjacent Residential Receptors

Health Risk	Significance Threshold	Tesla/Unit 8 Refurbishment Project Alternative	Proposed Project
Maximum Individual Cancer Risk	≤10	0.014	0.91
Acute Hazard Index	≤1	0.0007	0.0073
Chronic Hazard Index	≤1	0.0004	0.0024
Note: Health risks expressed as number in one million			

As shown in Table 5-9, the maximum individual cancer rate of the Tesla/Unit 8 Refurbishment Project Alternative and the proposed Project are both substantially lower than the significance threshold. Additionally, the acute and chronic hazard index of the Tesla/Unit 8 Refurbishment Project Alternative and the proposed Project are both substantially lower than the significance thresholds. In comparison to the proposed Project, the maximum individual cancer rate, acute, and chronic hazard index of the Tesla/Unit 8 Refurbishment Project Alternative are also significantly lower.

Energy

The Tesla/Unit 8 Refurbishment Project Alternative would increase the City’s ability to integrate renewable resources as a result of the BESS compared to the proposed Project that only includes natural gas fueled electricity generation. The Tesla/Unit 8 Refurbishment Project Alternative would therefore have a lower potential to conflict with or obstruct a state or local plan for renewable energy or energy efficiency and would therefore have lower potential energy impacts than the proposed Project.

Greenhouse Gas Emissions

Table 5-10 below summarizes the annual greenhouse gas emissions for the Tesla/Unit 8 Refurbishment Project Alternative and the proposed Project.

Table 5-10 Summary of Tesla/Unit 8 Refurbishment Project Alternative and Proposed Greenhouse Gas Emissions

	Annual Greenhouse Gas Emissions (Metric Tons CO2e)
Proposed project	476,040
Tesla/Unit 8 Refurbishment Project Alternative (refurbished Unit 8A and 8BC)	66,925

As shown in Table 5-10 the natural-gas fueled generation units associated with the Tesla/Unit 8 Refurbishment Project Alternative would emit approximately 66,925 metric tons of CO2e/year. By comparison, the natural gas-fueled electrical generation units associated with the proposed Project would emit approximately 476,040 metric tons of CO2e/year. The Tesla/Unit 8 Refurbishment Project Alternative therefore has significantly less potential greenhouse gas emissions impacts than the proposed Project.

Potential Environmental Impacts Similar to Those of the Project

Agriculture and Forestry Resources, Biological Resources, Cultural/Tribal Cultural Resources, Environmental Justice, Geology and Soils, Hydrology and Water Quality, Land Use and Planning, Mineral Resources, Noise, Population and Housing, Public Services, Recreation, Socioeconomics, Transportation, Utilities and Service Systems, and Wildfire

Similar to the Project, the Tesla/Unit 8 Refurbishment Project Alternative involves electrical generation at the same 10-acre urban industrial site already permitted, developed, and operated as a power plant. The primary difference is that the Tesla/Unit 8 Refurbishment Project Alternative includes a 75 MW/300 MWH BESS and refurbishing of Units 8A and 8BC with an approximate thermal generation capacity of 101 MW, compared to no BESS and a total thermal generation capacity of approximately 262 MW from two simple cycle and two combined cycle generation units associated with the proposed Project.

Similar to the proposed Project, the Tesla/Unit 8 Refurbishment Project Alternative would not occur on lands zoned or used for agriculture, forestry resources, or mineral resources. Both the Tesla/Unit 8 Refurbishment Project Alternative and the proposed Project would occur within the limits of the developed power plant site which lacks sensitive biological, archaeological, and tribal cultural resources and high fire hazard areas. The surrounding community was determined not to be considered an environmental justice community (refer to Appendix A, Section 2.19 of the Initial Study included in the 2018 Final EIR). The Boiler Building would be demolished and this Alternative, similar to the proposed Project, would result in a significant and unavoidable discretionary historic resource impact.

Demolition activities, ground disturbances during construction, site drainage, susceptibility to geologic hazards such as seismically induced ground shaking and liquefaction potential, operation phase vehicle trips, and utility/service systems needs associated with the Tesla/Unit 8 Refurbishment Project Alternative would be similar to the proposed Project.

Hazards and Hazardous Materials

The emissions control system for Units 8A and 8BC would utilize 19 percent aqueous ammonia stored in a 15,000-gallon capacity above ground storage tank. An off-site consequence analysis was performed for the accidental release of aqueous ammonia from the 15,000-gallon storage tank associated with the Tesla/Unit 8 Refurbishment Project Alternative. The analysis consists of a worst-case accidental release scenario involving the failure and complete discharge of the contents of the storage tank into the secondary containment structure below the tank. Similar to aqueous ammonia associated with the proposed Project, the results of the off-site consequence analysis for the Tesla/Unit 8 Refurbishment Project Alternative which are included in Appendix D.1 of this PR-DEIR demonstrate that the worst-case release of ammonia would not exceed applicable Occupational Safety and Health Administration, U.S. Environmental Protection Agency, and California Energy Commissions health thresholds.

Under normal operations, the Megapacks do not store or generate hazardous materials in quantities that would represent a risk to off-site receptors. However, a fire or thermal runaway event of a Megapack may release hazardous materials to the environment. Based on the design of the Megapack and confirmed through testing conducted by Tesla, a reasonable worst-case scenario for Alternative 8 would be a fire or thermal runaway event consuming one Tesla Megapack and releasing carbon monoxide and hydrogen fluoride that could impact off-site receptors. An analysis of an Alternative 8 BESS fire and subsequent release of carbon monoxide and hydrogen fluoride was prepared using the U.S. Environmental Protection Agency's (USEPA) Areal Locations of Hazardous Atmospheres (ALOHA) model to identify estimated distances to regulatory-established toxic endpoints to determine potential significance of hazards impacts pursuant with CEQA.

With respect to the assessment of potential impacts associated with an accidental release of carbon monoxide, four offsite "bench mark" exposure levels were evaluated, as follows: (1) the Occupational Safety and Health Administration's (OSHA) Immediately Dangerous to Life and Health (IDLH) level; (2) the National Oceanic and Atmospheric Administration (NOAA) Office of Response and Restoration's Acute Exposure Guideline Levels (AEGLs) AEGL-3 which predicts that the general population, including susceptible individuals, could experience life-threatening health effects or death; (3) AEGL-2 which predicts that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape; and (4) AEGL-1 level (not established for carbon monoxide) which predicts that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

The results of the BESS fire OCA for Alternative 8 are included in Attachment D.2 and summarized below in Table 5-11 below.

Table 5-11 Carbon Monoxide and Hydrogen Fluoride Modeling Results

Chemical	Distance to IDLH[a]	Distance to AEGL-3[b]	Distance to AEGL-2[b]	Distance to AEGL-1[b]
Carbon Monoxide	Not Exceeded	Not Exceeded	167.98 ft	Not Established
Hydrogen Flouride	Not Exceeded	Not Exceeded	Not Exceeded	108.01 ft

[a] Benchmark based on a 30-minute exposure or averaging time

[b] Benchmark based on a 60-minute exposure or averaging time

The power plant facility boundary would be located as close as 40 feet (12.19 meters) from a Megapack. The results of the OCA for the worst-case release of carbon monoxide indicates that the concentrations for benchmark criteria IDLH (1200 ppm) and AEGL-3 (330 ppm) would not extend beyond the facility fence line. AEGL-1 thresholds have not been established for carbon monoxide. However, the distance to AEGL-2 thresholds could potentially extend beyond the fence line by a distance of approximately 127.99 feet (39.01 meters). As displayed in Figure 1 of Attachment D.2, this would be mainly in a lightly trafficked segment of Fairmont Avenue on the southwestern fence line of the Grayson Power Plant. Thresholds would not be exceeded for any residences, schools, or commercial land uses. Receptors along Fairmont Avenue would be mobile receptors such as vehicles that would not be exposed to substantial concentrations of carbon monoxide for the 60 minutes assumed in the reasonable worst-case scenario and AEGL thresholds. For example, the carbon monoxide AEGL-2 for a 30-minute and 10-minute exposures are 150 ppm and 420 ppm. Consequently, it would be unlikely that a receptor on Fairmont Avenue would be exposed to carbon monoxide concentrations of significant concern for a substantial period of time.

The results of the OCA for the worst-case release of hydrogen fluoride indicates that concentrations for benchmark criteria IDLH (30 ppm), AEGL-3 (44 ppm), and AEGL-2 (24) would not extend beyond the facility fence line. However, the distance to the AEGL-1 benchmark criteria (1 ppm) could potentially extend beyond the fence line by a distance of approximately 68.01 feet (20.73 meters). As displayed in Figure 2 of Attachment D.2, this would be similar to the AEGL-2 distance of threshold exceedance for carbon monoxide, concentrated mainly in a lightly trafficked segment of Fairmont Avenue on the southwestern fence line of the Grayson Power Plant.

An infrared camera system would be installed as part of this Project alternative to monitor the Megapacks. In the event of thermal runaway within the Megapack, the camera would detect the unit's change in temperature and provide notification to the plant operators. The plant operators would then contact the local fire department. The initial detection occurs approximately 15 minutes prior to smoke being released from the Megapack units. According to the City of Glendale, the average response time for the Local Fire Department is four minutes and 36 seconds[21]. The Fire Department would arrive on site in less than five minutes of the initial notification as the nearest fire station, Station 27, is located approximately 1.23 miles from the proposed Project. The affected section of Fairmont Avenue and the adjacent pedestrian bike path on the west side of Fairmont Avenue would immediately be closed to the public before carbon monoxide levels exceed AEGL-2 thresholds in the area. The closure would remain in place until the area is deemed safe to the public. As a result, any long-term or permanent effects to the public from carbon monoxide are unlikely to occur. Additionally, the AEGL-1 threshold of exceedance for hydrogen fluoride predicts that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. These effects would not be disabling and are transient and reversible upon cessation of exposure. Considering the above, the No long-term or permanent effects to the public from hydrogen fluoride exposure would likely result.

As a result, the Tesla/Unit 8 Refurbishment Project Alternative would have similar environmental impacts as the proposed Project on agriculture and forestry resources, biological resources, cultural/tribal cultural resources, environmental justice, geology and soils, hazards and hazardous materials, hydrology, noise, and water quality, land use and planning, mineral resources, population and housing, public services, recreation, socioeconomics, transportation, utilities and service systems, and wildfire.

Potential Environmental Impacts Greater than Those of the Project

Noise

Operation of refurbished Units 8A and 8BC and related equipment would generate noise. Table 5-12 shows a compassion of Project and Alternative 8 operation noise at sensitive receptors during the day and night. See Appendix E in this PR-DEIR for additional details.

Table 5-12 Predicted Operation Phase Noise Levels – Proposed Project and Alternative 8

Scenario	**Receptor**	**Predicted Operational Noise (dBA)**	**Daytime Ambient Sound Levels (dBA)**			**Nighttime Ambient Sound Levels (dBA)**		
			Current	**New**	**Increase**	**Current**	**New**	**Increase**
Proposed Project	R1	51.0	54.2	55.9	**1.7**	49.6	53.4	**3.8**
	R2	53.1	64.7	65.0	**0.3**	52.8	56.0	**3.2**
	R3	52.6	57.1	58.4	**1.3**	52.8	55.7	**2.9**
	R7	57.5	60.6	62.3	**1.7**	58.8	61.2	**2.4**
	R8	58.4	69.6	69.9	**0.3**	65.6	66.4	**0.8**
Alternative 8	R1	49.3	54.2	55.4	**1.2**	49.6	52.5	**2.9**
	R2	52.6	64.7	65.0	**0.3**	52.8	55.7	**2.9**

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[21] City of Glendale, 12.4 Public Safety Response, available at https://www.glendaleca.gov/government/departments/community-development/neighborhood-services/glendale-quality-of-life-indicators/12-4-public-safety-response.

Scenario	Receptor	Predicted Operational Noise (dBA)	Daytime Ambient Sound Levels (dBA)			Nighttime Ambient Sound Levels (dBA)		
			Current	New	Increase	Current	New	Increase
	R3	53.1	57.1	58.6	**1.5**	52.8	56.0	**3.2**
	R7	57.5	60.6	62.3	**1.7**	58.8	61.2	**2.4**
	R8	59.1	69.6	70.0	**0.4**	65.6	66.5	**0.9**

As shown in Table 5-12, the Tesla/Unit 8 Refurbishment Project Alternative would result in four slightly higher noise level increases as compared to the proposed Project (two during the day [R3 + 0.2 dBA, R8 + 0.1 dBA] and two during the night [R3 + 0.3 dBA, R8 + 0.1 dBA]), with impacts remaining less than significant. Alternative 8 would also result in three similar noise level increases (two during the day [R2, R3] and one during the night [R7]) and three lower noise levels increases (one during the day [R1 – 0.5 dBA] and two at night [R1 – 0.9 dBA, R2 – 0.2 dBA]) compared to the proposed Project at the receptors modeled.

As a result, Tesla/Unit 8 Refurbishment Project Alternative would have a slight but incrementally higher modeled noise impact than the Project. It should be noted that the assumptions used for modeling proposed Project and Alternative 7 operation noise levels were in part, based on data obtained through detailed engineering design. A similar level of detail was not available for Alternative 8 and therefore conservative assumptions were made for modeling operation noise associated with refurbished Unit 8. It is possible that Tesla/Unit 8 Refurbishment Project Alternative could result in lower noise levels than those conservatively modeled and predicted in Table 5-12.

5.2.7.3 Objectives Consistency Evaluation – Alternative 8

The Tesla/Unit 8 Refurbishment Project Alternative would meet most of the Project objectives. Specifically, the Tesla/Unit 8 Refurbishment Project Alternative:

1. Would integrate with local and remote distributed renewable energy resources and support the City’s ability to meet peak load with the N-1 (or single largest) contingency.

2. Would utilize reliable technology and current control systems to support the City’s ability to comply with California’s Renewable Portfolio Standards.

3. Would not provide a local generation resource that is sufficient to meet resource adequacy requirements for the N-1-1 contingency before the additional planed 72 MW of additional transmission imports becomes available in 2027. The City would be able to meet its obligations within the Balancing Area (BA) to balance load and resource at the interconnection with the BA, in accordance with industry standards including NERC/WECC requirements (the N-1-1 contingency in particular) after 2027.

4. Would provide a locally controlled source of generation that could support the City's power imports from remote generation locations through a congested transmission grid system subject to planned and unplanned outages and de-rate.

5. Would replace the aged, unreliable, less efficient, high maintenance steam boilers and steam turbines, with new generation that would comply with SCAQMDs Rule 1304(a)(2). Additionally, the removal of existing boilers would comply with SCAQMD Rule 1305(d)(6).

6. Would be able to be located at the existing City property already permitted and used for generation and would minimize the need for major infrastructure improvements such as fuel supply, water, wastewater, recycled water, and transmission facilities to the same extent as the proposed Project.

7. Aside from retaining the existing gas turbines and generators which would be refurbished, all other equipment would be replaced providing generation that is more efficient to maintain than the current units helping to minimize the impact on the rates and help manage costs of delivering energy to the City's customers.

8. Would support water conservation efforts by eliminating the use of potable water for generation purposes.

9. Would have a greater reduction in emissions and water consumption than the proposed Project. The Tesla/Unit 8 Refurbishment Project Alternative involves substantially less natural gas-fueled generation capacity (-172 MW) and natural gas combustion (-87 percent) than the proposed Project.

5.2.7.4 Summary – Alternative 8

The Tesla/Unit 8 Refurbishment Project Alternative would reduce air and greenhouse gas emissions compared to the Project, with the reduction of generation capacity and 87 percent less combustion of less natural gas. The physical components of the Tesla/Unit 8 Refurbishment Project Alternative would obscure views less than the proposed project from the key observation points. The Tesla/Unit 8 Refurbishment Project Alternative would have similar potential environmental impacts to all other environmental factors evaluated pursuant to CEQA. The Tesla/Unit 8 Refurbishment Project Alternative would not result in any potential environmental impacts greater than the proposed Project.

For these reasons, the overall environmental impacts of the Tesla/Unit 8 Refurbishment Project Alternative are expected to be less than the proposed Project.

5.2.8 Comparison of Alternatives

A comparison of the Project alternatives carried forward for further analysis ~~relative to the Project~~ with respect to ~~the~~each alternative's ability to meet the Project objectives and ~~relative~~ a comparison of each alternative's environmental impacts compared to the Project is summarized below in Tables 5-13, 5-14, and 5-15.

Table 5-13 Comparison of GWP Resources with Peak Load and Required Contingencies

		Project Alternative Number						
		1	2	3	4	5	7	8
Resource (MW)	**Proposed Project**	**No Project**	**Energy Storage**	**Alternative Energy**	**150 WM**	**200 MW**	**Tesla/ Wartsila**	**Tesla/ Unit 8 Refurbishment**
Pacific DC Intertie Transmission Imports	100	100	100	100	100	100	100	100
Southwest Area Transmission Imports	112	112	112	112	112	112	112	112
Existing Unit 9	48	48	48	48	48	48	48	48
Existing Magnolia Imports	35	35	35	35	35	35	35	35
Demand Response plus Virtual Power Plant	50	50	50	50	50	50	50	50
Alternative Energy	0	0	0	3	0	0	0	0
Energy Storage	0	0	161	0	0	50	75	75
Thermal Generation	262	0	0	0	150	200	93	101
Pre-2027 Total	**587**	**325**	**486**	**328**	**475**	**575**	**493**	**501**
Post-2027 Additional Southern Transmission System Transmission Imports from IPP	72	72	72	72	75	72	72	72
Post-2027 Total	**679**	**417**	**578**	**420**	**570**	**667**	**585**	**593**
Loss of Single Largest Contingency (N-1)	-100	-100	-100	-100	-100	-100	-100	-100
Pre-2027 Loss of Second Largest Contingency (N-1-1)	-70 (new CCGT)	-48 (U9)	-48 (U9)	-48 (U9)	-50 MW (new SCGT)	-70 (new CCGT)	-48 (U9)	-74 (U8BC)
Post-2027 Loss of Second Largest Contingency (N-1-1)	-70 (new CCGT)	-64 (STS)	-64 (STS)	-64 (STS)	-64 (STS)	-70 (new CCGT)	-64 (STS)	-74 (U8BC)
Pre-2027 Available Capacity with Loss of N-1 and N-1-1	**437**	**197**	**358**	**200**	**345**	**425**	**365**	**347**
Post-2027 Available Capacity with Loss of N-1 and N-1-1	**509**	**253**	**414**	**256**	**406**	**497**	**421**	**419**
Peak Load	**346**	**346**	**346**	**346**	**346**	**346**	**346**	**346**

Table ~~5-14~~ 5-14 Objectives Comparison of Project and Alternatives

		Project Alternative Number						
		1	2	3	4	5	7	8
	Proposed Project	**No Project Alternative**	**Energy Storage Project Alternative**	**Alternative Energy Project Alternative**	**150 MW Project Alternative**	**200 MW Project Alternative**	**Tesla/Wartsila Repowering**	**Tesla/ Unit 8 Refurbishment**
Ability to Meet Project Objective								
1. Integrate with local and remote distributed renewable energy resources to provide sufficient capacity and energy to ensure reliable service at all times for the City and to support the City's compliance with California's Renewable Portfolio Standards	**Yes**	No	No	No	~~No~~ **Yes**	**Yes**	**Yes**	**Yes**
2. Utilize current and reliable technology and control systems to provide reliable, cost effective, and flexible generation capacity for the City to serve its customers load.	**Yes**	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
3. Provide a local generation resource sufficient to meet resource adequacy requirements, and the City's obligation within the Balancing Area to balance load and resource at the interconnection with the BA, in accordance with industry standards including NERC/WECC requirements; thus, providing local reliability and contributing to grid stability within the Los Angeles Basin.	**Yes**	No	No	No	~~No~~ **Yes***	**Yes**	**Yes***	**Yes***
4. Provide sufficient locally controlled generation to minimize the City's reliance on importing power from remote generation locations through a congested transmission grid system subject to planned and unplanned outages and de-rates making the delivery of energy to serve load less reliable than local generation.	**Yes**	No	No	No	No	~~No~~ **Yes**	**Yes**	**Yes**
5. Replace the aged, unreliable, less efficient, high maintenance steam boilers with new efficient and less environmentally impactful generation technologies that meet SCAQMD Rule 1304(a)(2).	**Yes**	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
6. Locate the proposed Project at existing City property already permitted and used for generation to minimize the need for major infrastructure improvements such as fuel supply, water, wastewater, recycled water, and transmission facilities, or need to purchase additional property.	**Yes**	**Yes**	**Yes**	No	~~Yes~~ No	**Yes**	**Yes**	**Yes**

		Project Alternative Number						
		1	**2**	**3**	**4**	**5**	**7**	**8**
	Proposed Project	**No Project Alternative**	**Energy Storage Project Alternative**	**Alternative Energy Project Alternative**	**150 MW Project Alternative**	**200 MW Project Alternative**	**Tesla/Wartsila Repowering**	**Tesla/ Unit 8 Refurbishment**
Ability to Meet Project Objective								
7. Provide generation that is highly efficient to maintain reasonable cost of generation to minimize the impact on the rates and help manage costs of delivering energy to the City's customers.	**Yes**	No	No	No	No	~~No~~ **Yes**	**Yes**	**Yes**
8. Support water conservation efforts by eliminating the use of potable water for generation purposes.	**Yes**	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
9. Reduce the per megawatt-hour (MWH) creation of emissions and consumption of water.	**Yes**	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Total Number of Objectives Met (of 9)	9	1	5	4	6	9	9	9
Percent of Objectives Met	100%	11%	56%	44%	67%	100%	100%	100%
* Alternatives 7 and 8 would meet Project Objective #3 in 2027.								

Table 5-15 Potential Environmental Impacts Comparison of Project and Alternatives

		Project Alternative Number						
		1	2	3	4	5	7	8
		No Project Alternative	Energy Storage Project Alternative	Alternative Energy Project Alternative	150 MW Project Alternative	200 MW Project Alternative	Tesla/Wartsila Repowering Alternative	Tesla/Unit 8 Refurbishment Alternative
Resource Category	**Proposed Project Impacts**							
Aesthetics	Less than Significant Impact with Mitigation	Similar	Less	Greater	Greater	Similar	Less	Less
Agriculture & Forestry Resources	No Impact	Similar	Similar	Greater	Greater	Similar	Similar	Similar
Air Quality	Less than Significant Impact	Less	Less[22]	Less	Less	Less	Less	Less
Biological Resources	No Impact	Similar	Similar	Greater	Greater	Similar	Similar	Similar
Cultural Resources	Less than Significant Impact	~~Similar~~ Less	Similar	~~Greater~~ Less	Greater	Similar	Similar	Similar
Energy	Less than Significant Impact	Greater	Less	Less	Less	Less	Less	Less
Environmental Justice	No Impact	Similar	Similar	Greater	Greater	Similar	Similar	Similar
Geology & Soils	Less than Significant Impact	Similar	Similar	Greater	Greater	Similar	Similar	Similar
Greenhouse Gas Emissions	Less than Significant Impact	Less	Less	Less	Less	Less	Less	Less
Hazards & Hazardous Materials	Less than Significant Impact with Mitigation	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Hydrology & Water Quality	Less than Significant Impact	Similar	Less	Less	Similar	Similar	Similar	Similar
Land Use and Planning	No Impact	Similar	Similar	Greater	Greater	Similar	Similar	Similar
Mineral Resources	No Impact	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Noise	Less than Significant Impact with Mitigation	Less	Less	Less	Less	Less	Less	Greater
Population & Housing	No Impact	Similar	Similar	Greater	Greater	Similar	Similar	Similar
Public Services	No Impact	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Recreation	No Impact	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Socioeconomics	No Impact	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Transportation ~~and Traffic~~	Less than Significant Impact with Mitigation	Less	Less	Similar	Similar	Similar	Similar	Similar
Tribal Cultural Resources	Less than Significant Impact	Similar	Similar	Greater	Greater	Similar	Similar	Similar
Utilities and Service Systems	Less than Significant Impact	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Wildfire	Less than Significant Impact	Similar	Similar	Greater	Greater	Similar	Similar	Similar
# of Environmental Categories with Greater Impacts		1	0	9	9	0	0	1
# of Environmental Categories with Similar Impacts		16	15	7	9	18	17	17
# of Environmental Categories with Less Impacts		5	7	6	4	4	5	4

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[22] Does not include non-local air emissions resulting from generation of electricity to be imported to charge the BESS when renewables are not available.

While not the purpose of the EIR process, the following provides some relative cost perspective for the two new alternatives evaluated in this PR-DEIR and the proposed Project. Development of final cost estimates for Alternatives 7 and 8 are still underway.

- The demolition and site improvement scope of work is largely the same for all three with the exception that Alternative 7 is probably the most expensive of the three as it requires removal off all existing piles under the new Wartsila foundations.
- The proposed Project, which lacks the Glendale Switching Station, is the most expensive of three as it is the largest project and entails the most major equipment.
- The battery energy storage system scope of work is essentially the same between Alternatives 7 and 8.
- The Glendale Switching Station scope of work is essentially the same between Alternatives 7 and 8.
- Alternative 8 is likely the least cost alternative as it reuses some existing equipment whereas Alternative 7 utilizes all new equipment.

5.2.9 Identification of the Environmentally Superior Alternative

CEQA requires that an EIR identify the environmentally superior alternative(s) of a project other than the proposed project or the “no project” alternative (CEQA Guidelines Section 15126.6 (e)(2)). As stated at the beginning of this chapter, the purpose of this alternatives analysis is to consider a reasonable range of alternatives that could feasibly attain most of the basic project objectives and avoid or substantially lessen significant program impacts.

The No Project Alternative would have lower potential air quality, cultural resources, greenhouse gas emissions, noise, and traffic and transportation impacts compared to the Project. The No Project Alternative would additionally avoid the significant and unavoidable impact of the proposed Project’s demolition of the Boiler Building, which is considered a significant cultural resources impact. The No Project Alternative requires more natural gas combustion per MW of electricity generated compared to the proposed Project. As a result, the No Project Alternative would be more wasteful of energy and have a greater energy impact compared to the proposed Project. Potential impacts to all other environmental resource categories would be similar. The No Project Alternative would not satisfactorily meet the Project objectives and would fail to comply with Federal and State reliability standards. The No Project Alternative would result in the City needing additional transmission capacity if available, causing additional environmental impacts and necessitating power imports at a much higher cost to its customers.

The Energy Storage Project Alternative would have lower potential aesthetics, air quality, energy, greenhouse gas emissions, hydrology and water quality, noise, and transportation and traffic impacts compared to the Project. Potential impacts to all other environmental resource categories would be similar and the Energy Storage Project Alternative would not have any greater impacts compared to the proposed Project. The Energy Storage Project Alternative is completely dependent on excess energy being available to charge the batteries, primarily through daily imports over the existing transmission systems. During high load periods, there will not be sufficient excess capacity to charge the batteries thus compromising the ability of this Alternative to reliably serve the residents and customers of the City. While this Alternative, using batteries alone, does have reduced local environmental impacts, it does not meet several critical project objectives with regards to assuring reliability of supply at reasonable cost. It additionally does not consider potential environmental impacts of new transmission lines into the City which the 2019 IRP determined infeasible.

The Alternative Energy Project Alternative would have lower potential air quality, energy, greenhouse gas emissions, hydrology and water quality, and noise impacts compared to the Project. The Alternative Energy Project Alternative would additionally avoid the significant and unavoidable discretionary cultural resources impact of the proposed Project. As a result of new transmission into the City, the Alternative Energy Project Alternative would have greater impacts to aesthetics, agriculture and forestry resources, biological resources, environmental justice, geology and soils, land use and planning, population and housing, tribal cultural resources, and wildfire compared to the proposed Project. Potential impacts to all other environmental resource categories would be similar. ~~The Alternative Energy Project Alternative produces less potential air quality, greenhouse gas emissions, hydrology and water quality, and noise impacts than the proposed Project, but it would create greater impacts in several other resource categories because this Alternative requires additional development of transmission facilities on remote site(s); it requires a significantly greater amount of land to be disturbed in connection with development of new transmission line routes. In addition, as~~ As discussed and summarized in this Chapter, this Alternative would only meet 44% of the Project objectives. Additionally, the 2019 IRP determined that new transmission into the City is not feasible and concluded that Portfolio G, the 100% Clean alternative modeled in the 2019 IRP, would require more transmission than is available to charge the batteries and serve summer loads.

~~The 150 MW Alternative would have incrementally lower potential air quality, greenhouse gas emissions, and noise impacts compared to the Project but this Alternative would not totally avoid or significantly lessen significant impacts of the Project. This Alternative would create greater impacts in several resource categories described above because it would require a significantly greater amount of land to be disturbed for the development of new transmission line routes.In addition, this~~ The 150 MW Project Alternative would have lower potential air quality, energy, greenhouse gas emissions, and noise impacts compared to the Project. Because the 150 MW Project Alternative would require new transmission into the City, construction and operation of those new transmission facilities would result in greater impacts to aesthetics, agriculture and forestry resources, biological resources, cultural resources, environmental justice, geology and soils, land use and planning, population and housing, tribal cultural resources, and wildfire compared to the proposed Project. Potential impacts to all other environmental resource categories would be similar. This Alternative would ~~not~~ meet ~~most~~ only 67% of the Project objectives. Additionally, the 2019 IRP determined that building new transmission lines into the City is not feasible.

The 200 MW Alternative would have ~~incrementally~~ lower potential air quality, greenhouse gas emissions, and noise impacts compared to the Project ~~but it would not totally avoid or significantly lessen significant~~

~~impacts of the Project~~. Potential impacts to all other environmental resource categories would be similar and the 200 MW Project Alternative would not have any greater impacts compared to the proposed Project. This Alternative would meet ~~most of~~ the Project objectives~~, but not to the same extent as the Project~~. However, this Alternative represents a higher cost option than the proposed Project.

The Tesla/Wartsila Project Alternative would have lower potential aesthetics, air quality, energy, greenhouse gas emissions, and noise impacts compared to the Project. The Tesla/Wartsila Project Alternative would not have any greater potential environmental impacts compared to the proposed Project. The Tesla/Wartsila Project Alternative would meet the Project objectives.

The Tesla/Unit 8 Refurbishment Project Alternative would have lower potential aesthetics, air quality, energy, and greenhouse gas emissions impacts compared to the Project. The Tesla/Unit 8 Refurbishment Project Alternative would only have a slight increase in noise impacts compared to the proposed Project. Potential impacts to all other environmental resource categories would be similar. The Tesla/Unit 8 Refurbishment Project Alternative would meet the Project objectives.

As a result of this analysis, the ~~proposed Project~~ Tesla/Wartsila Project Alternative and Tesla/Unit 8 Refurbishment Project Alternative would meet all project objectives while resulting in the fewest impacts when compared to the feasible alternatives evaluated. While the potential environmental impacts between these two alternatives are very similar, the Tesla/Wartsila Project Alternative would have slightly lower noise impacts and is therefore considered the environmentally superior alternative.

5.3 Findings Regarding Alternatives Not Selected for FURTHER Analysis

Section 15126.6, subdivision (c) of the CEQA Guidelines describes selection of a reasonable range of alternatives and the requirement to include those that could feasibly accomplish most of the basic project objectives while avoiding or substantially lessening one or more of the significant effects. The analysis should identify any alternatives that were considered by the lead agency but were rejected as infeasible. CEQA requires a brief explanation of the reasons underlying the lead agency’s determination to eliminate alternatives from further analysis.

A number of alternatives were considered but eliminated from further consideration. The alternatives that were not evaluated further in Final 2018 EIR and/or this PR-DEIR include alternative sites, and a variety of alternative technologies (generation technology, fuel technology, and alternative power plant cooling). These alternatives are more fully discussed below.

5.3.1 Power Plant Site Alternatives

The proposed Project would be located within the boundary of the existing power plant property (Glendale’s Grayson Power Plant) with operating power plant units. Although the Project is not under the jurisdiction of the California Energy Commission (CEC) and is under the jurisdiction of the City of Glendale as the Lead Agency, the Project is being analyzed in a consistent manner to that applied by the CEC. The Public Resources Code 25540.6 (b) provides direction to the CEC that in part reads:

- The commission may also accept an application for a non-cogeneration project at an existing industrial site without requiring a discussion of site alternatives if the commission finds that the project has a strong relationship to the existing industrial site and that it is therefore reasonable not to analyze alternative sites for the project.

Locating the new units at the existing Grayson site minimizes the environmental impact of the Project that could result from a greenfield or infill development in another location and the attendant need to construct new utility and transmission connections. Utilizing the same location as the existing facility means the proposed Project can use ~~would result in utilizing~~ the same recycled and potable water as well as sanitary wastewater connection that support the existing Grayson Power Plant. In addition, the Project site would also use the same high-voltage electric transmission lines and the natural gas pipeline that serve the existing facility. The Project site has favorable geology and soils suitable for power plant development and has no significant engineering constraints. The land use designation of the site is consistent with power plant development and use.

However, as a part of preparing the EIR, a review of industrial zones with the lowest concentration of building was conducted and identified two alternative locations that were reviewed. ~~Neither site is owned by the City and would require the acquisition of new land by the City.~~ One alternative site is located at the corner of Western and Flower and the other potential alternative site is located at 5426 San Fernando Road. The first site is approximately 13 acres and consists of four different parking lots and two buildings. Two vacant lots on the site are designated for a road widening project. A substantial portion of the property is owned by Disney. The second property is zoned Industrial/Commercial Mixed Use (IMU) and is approximately 9.5 acres, which is not sufficient size ~~for~~ to accommodate the Project. Both sites would require the construction of new transmission lines to connect with the ones currently at the Grayson site as well as the extension of the recycled water line, high pressure gas line, and wastewater line. Neither site presents an environmentally superior alternative to the existing site. As a result, no alternate Project sites were analyzed in the 2018 Draft EIR and are also not considered in this ~~EIR~~ PR-DEIR ~~and onlyo~~ Only the proposed site for the Project is discussed.

Locating the Project at a different site would also result in the loss of ~~SCAQMD~~ ‘ SCAQMD’s “offset exemption for replacement in kind~~’~~” per SCAQMD Rule 1304(a)(2) that are applicable as long as the Project is located at the current site.

5.3.2.1 Project Site

The proposed Project would be located on the same site as the existing Grayson Power Plant at 800 Air Way, Glendale, CA 91201. The existing site consists of following generating units:

1. Unit 1 – 20 MW (gross) steam turbine-generator, built in 1941
2. Unit 2 – 20 MW (gross) steam turbine-generator, built in 1947
3. Unit 3 – 20 MW (gross) steam boiler turbine-generator, built in 1953
4. Unit 4 – 44 MW (gross) steam boiler turbine-generator, built in 1959

5. Unit 5 – 44 MW (gross) steam boiler turbine-generator, built in 1964
6. Unit 8-A – 32 MW (gross) combustion turbine-generator – combined cycle, built in 1977
7. Unit 8-BC – 55 MW (gross) combustion turbine-generator – combined cycle, built in 1977
8. Unit 9 – 50 MW (gross) combustion turbine-generator, simple cycle, built in 2003

With the exception of Unit 9, all the other units would be demolished and removed and replaced as part of the proposed Project.

The existing Grayson Power Plant is designated and zoned as industrial, which allows for the construction and operation of the proposed Project.

The Project site:

- Is located adjacent to a high-pressure natural gas pipeline
- Is located adjacent to an existing high voltage switchyard
- Is located adjacent to existing recycled water pipeline
- Minimizes construction impacts on existing residences and businesses
- Has good truck access
- Is owned by the City
- Is zoned for industrial use

5.3.2 Project Technology Alternatives

The Project configuration was selected from a wide array of technology alternatives. This includes generation technology alternatives, alternative fuel technology, and alternative power plant cooling alternatives. The following Project Technology Alternatives which were not selected for in depth analysis are discussed below.

5.3.2.1 Combustion Generation Technology Alternatives

Combustion Generation Technology Alternatives

Conventional boiler and steam turbine, large gas simple cycle combustion turbine, large combined cycle combustion turbine generator, and reciprocating engine generators were all considered as natural gas combustion generation technology alternatives and are discussed below in more detail.

Conventional Boiler and Steam Turbine

This technology burns fuel in the furnace of a conventional boiler to create steam. The steam is used to drive a steam turbine generator, and the steam is then condensed and returned to the boiler. This technology is less efficient and would not meet the California's SB 1368 Emission Performance Standard of less than 1,100 lbs of CO_2/MWh for new non-peaking generation~~.~~ ~~Because of these reasons~~ therefore, the conventional boiler and steam turbine generator technology was eliminated from consideration.

Large Simple Cycle Combustion Turbine Generator

Large aero-derivative gas turbines, such as the 100-megawatt General Electric (GE) LMS-100, is an efficient simple cycle gas turbine with a 50% turn down ratio. However, its size is such that it is as big as the City's existing single largest contingency. This size of a unit would further complicate the planning reserve situation.

The LMS100 generates more power from a single turbine than is required by the City. As such, this turbine is too large to provide the required need for flexibility of operation that allows for integration of the startup and shut down of the unit, load following, or the efficient integration of renewable resources into the City's electric grid.

Furthermore, one of the Project objectives is for the City to provide its own economic spinning and non-spinning reserve required by the WECC. Large turbines do not meet this requirement.

Lastly, simple cycle turbines are restricted in their operating hours by the air permitting process as the regulatory perspective is that units with high utilization should be combined cycle, not simple cycle. With only large simple cycle turbines, the capacity would be available however the total energy may not. Because of the reasons stated above, large turbines like the GE LMS-100 were eliminated from consideration.

Large Combined Cycle Combustion Turbine Generator

Large combined cycle combustion turbine generator, including 2x1 and large Frame type combustion turbines, are an efficient source of generation. These units typically range in size from 150 to over 500 MW in capacity and are too large given the City's existing single largest contingency. This technology does not provide the required need for flexibility of operation nor allows for the efficient integration of renewable resources into the City's electric grid.

Furthermore, one of the project objectives is for the Project is to provide its own economic spinning and non-spinning reserve required by the WECC for system stability. Large combined cycle combustion turbine generators would be considered as a single generator for spinning reserve requirement and would need spinning for one-half of the combined cycle unit capacity and therefore could not meet the WECC requirement. Because of the reasons stated above, large combined cycle units were eliminated from consideration.

Reciprocating Engine Generators (REGs)

~~The project seriously considered REGs to supply part of the simple cycle generation because of the flexibility and good efficiency over the load range that multiple REGs offer. However, the REGs were eliminated from consideration due to the higher expected total project cost, increased maintenance, and~~

~~air permitting concerns~~. Reciprocating engine generators are evaluated as part of the Tesla/Wartsila Repowering Project Alternative (Alternative 7). Please refer to Section 5.2.6.

5.3.3 Alternative Fuel Technologies

Technologies based on fuels other than natural gas were eliminated from consideration because they do not meet the Project objectives~~. Additional factors rendering alternative fuel technologies unsuitable for the Project are as follows~~ for the reasons stated below:

- No geothermal or hydroelectric resources are available within Glendale.
- Biomass fuels such as wood waste, digester or landfill gas are not locally available in sufficient quantities to make them practical as alternative fuels.
- Coal, nuclear, and oil technologies would not meet the environmental stewardship objective of the Project.

Distributed energy resources or microgrids are not practical for two reasons: 1) the City cannot mandate its customers to self-supply and 2) the City would still need to provide a reliable source of standby power to its customers. Renewable distributed energy resources are considered in Alternative 3.

5.3.4 Power Plant Cooling Alternatives

Heat from the Project would be by a combination of dry and wet cooling. In dry cooling, air-cooled heat exchangers transfer heat directly to the ambient air. Fans move the air across finned heat exchanger tubes containing the fluid to be cooled. Dry cooling would be used for such applications as combustion turbine generator cooling, lube oil cooling, and compressor cooling.

Wet cooling is used for the combined cycle turbine generators and their auxiliaries. In wet cooling, the cooling water is cooled in cooling towers where a portion of the water is evaporated to carry away the rejected heat, lost due to drift (circulating water that is emitted with the exhaust air of the tower), and blown down to maintain water quality. Recycled water is used to replace the water lost by evaporation, drift, and blowdown.

Wet cooling using fresh or potable water uses an essential resource that has a much higher beneficial use other than use for power plant cooling and was therefore eliminated from consideration. Wet cooling using recycled water is acceptable under state policy and is available at the Project site in sufficient quantity required by the Project.

Dry cooling using an air-cooled ~~steam~~ condenser (AC~~S~~C) was considered as an alternative to the use of wet cooling. Air-cooled condensers use fans to draw air through a heat exchanger where the air is exposed to pipes carrying exhaust steam from a steam turbine. The steam condenses to water and is pumped back through the steam cycle in a closed loop. Air-cooled condensers require much more space on the site than a conventional wet cooling system using cooling towers. They also consume more electricity, thereby reducing the efficiency of the power plant. There is also a performance penalty for using dry cooling in hot weather. Air-cooled condensers cannot produce as low a condensing pressure in hot weather as wet-cooled condensers. This results in higher steam turbine exhaust pressures and lower steam turbine output. According to a California Energy Commission report (Comparison of Alternate Cooling Technologies for California Power Plants, CEC, Sacramento 2002), the performance penalty for dry cooling can be between 5% and 20%. The report also finds that the capital cost is 1.5 to 3.0 times the cost of wet cooling. For these reasons, and since recycled water is available, dry cooling was not selected.

A third alternative that was considered was a hybrid of wet and dry cooling. These systems have the potential to offset the performance penalties of dry cooling while reducing the water consumption of wet cooling. There are several methods for implementing hybrid cooling. Some of these are currently being tested by the Electric Power Research Institute (EPRI). However, only two methods can be considered commercially available at this time.

The first of these methods is the plume abatement cooling tower. This is similar to a conventional cooling tower except that the hot cooling water return is first pre-cooled in an air-cooled heat exchanger before being fed to the cooling tower. This reduces the thermal load on the tower and consequently reduces the evaporation loss. The amount of water saved is roughly proportional to the amount of cooling duty done by the air-cooled exchanger. By locating the air cooling coils above the cooling tower fill, the cooling tower fans can serve both the air cooler and the cooling tower. According to the CEC report (see above) the capital cost of this Alternative is about the same as for dry cooling but the performance penalty is avoided. Since the cost of this Alternative is 1.5 to 3.0 times the cost of wet cooling, and commercial experience with these hybrid systems is limited, and there is available recycled water, this Alternative was not selected.

The second method is to have an AC~~S~~C and cooling tower in parallel service. When ambient air temperatures are low enough, only the AC~~S~~C is used. When the ambient temperature is high, the cooling tower is used to reduce the load on the AC~~S~~C. The water savings would depend on the operating profile of the power plant but would be between 20% and 80% per the CEC study. The parallel cooling method requires more land than any of the other options. According to the CEC study, the capital costs for this Alternative are 3 to 5 times that of straight wet cooling. For these reasons, as well as the limited commercial experience with hybrid systems, this Alternative was not selected for detailed analysis.

5.3.5 Boiler Building Alternatives

As part of the Project, the Boiler Building would be demolished to provide adequate space for construction of the power plant facilities. As discussed in Section 4.12 (Cultural/Paleontological Resources) of this PR-DEIR, the City has elected to consider the Boiler Building a discretionary historic resource; the demolition of which, even after implementation of feasible mitigation measures would constitute a significant and unavailable environmental impact.

The Boiler Building is located within the Grayson Power Plant site and does not connect directly to any publicly accessible area. The Kellogg Switching Station lies to the north, the Glendale Rack (a GWP 34.5 kV switchyard and substation for Units 1-5) lies to the east, Unit 9 lies to the south, and Units 8A and 8BC and cooling towers 1 through 5 are to the west.

The Boiler Building was constructed in different phases and the youngest portions of the building are more than 50 years old. Due to its age, the building has the typical ills of an older structure such as roof leaks, rusted structural members, and cracks in the walls and foundation. Additionally, the building was designed to earlier building codes that do not incorporate later changes in building codes to address increased seismic design requirements based on earthquake experience such as the Northridge earthquake. Lastly the building is a repository for significant amounts of hazardous materials such as asbestos (in pipe, wiring, and boiler insulation as well as the Transite exterior siding), lead based paint, and other materials.

The building footprint represents a significant portion of the Grayson Power Plant site that is not already used for other critical purposes such as the Kellogg Switching Station or reserved for the future Glendale Switching Station. Of the remaining space, a significant portion is required for the energy resources to be sited at Grayson, be they thermal or energy storage. Given that Grayson is the only feasible site within Glendale for high density energy development, the building footprint has an intrinsically high value in supporting Glendale’s future energy needs.

The No Project alternative clearly would allow for retention of the Boiler Building. However, this alternative also does not address Glendale’s long-term energy reliability needs and thus was not considered feasible.

The Alternative Energy alternative is space intensive and would need as much space at Grayson as could be made available. Thus, retaining the Boiler Building for the Alternative Energy alternative is not feasible.

For the 200 MW alternative, as with the Project, there is insufficient space to retain the Boiler Building. As with the proposed project, the gas turbines and the associated infrastructure would not allow the Boiler Building to be retained.

The Tesla/Wartsila and Tesla/ Unit 8 Refurbishment Alternatives require the space currently occupied by the Boiler Building to accommodate the development of 75 MW/300 MWH of energy storage. The general arrangement drawings for these alternatives portray the energy storage in addition to the thermal generation component (either Wartsila engines or refurbishing Units 8A and 8BC). A portion of the BESS overlays where the Boiler Building is located as there is no other space at Grayson that can accommodate the footprint and retain the Boiler Building.

Retention of the Boiler Building would logistically complicate and preclude development of the energy storage that is needed which make its retention infeasible. As stated previously, if the Boiler Building is retained there is insufficient space to locate the energy storage elsewhere within Grayson. Placing energy storage within the Boiler Building carries with it significant complications that make retention of the building infeasible, including:

- It would necessitate a surgical demolition around and hazardous materials cleanup of the Boiler Building interior, which results in potentially significant impacts due to possible building damage, and a release of hazardous materials.
- Increased construction time and cost

- It would also drive a structural upgrade of the building adding additional cost to the project, that would create a potentially significant impact to the Building.
- Locating some types of energy storage technologies within the building may not be feasible.

While not a formal alternative, the possibility of relocating a portion of the energy storage system to another part of the Utility Operations Center (UOC) was also considered. No feasible space was identified because there is no spare space at the UOC. Additionally, relocating the batteries would require GWP to dislocate some other function that is essential to GWP's operation and maintenance of the electric and water systems.

For these reasons, retaining the Boiler Building would be a barrier to providing the full 75 MW/300 MWH of energy storage at Grayson.

5.3.6 Reconfigured Tesla/Wartsila Repowering Project (Alternative 6)

As mentioned previously, in Alternative 6 is identical to Alternative 7, but with a different configuration. As work progressed on considering this Alternative, it was determined to be infeasible because the design for Wartsila's structures requires that all the existing piles be removed and not be backfilled with anything that would impede driving new piles. Given the close proximity of existing and new piles, work on this Alternative was terminated. Alternative 6 was determined to be infeasible during the engineering phase and was eliminated from further consideration see Executive Summary).

6.0 ~~8.0~~ REFERENCES

American Geosciences Institute, How Does Recycling Save Energy? Available at: https://www.americangeosciences.org/critical-issues/faq/how-does-recycling-save-energy. Accessed June 2021.

CAL FIRE. 2008a. Fire Hazard Severity Zones in State Responsibility Areas. Online: http://frap.fire.ca.gov/webdata/maps/san_bernardino_sw/fhszs_map.62.pdf

CAL FIRE. 2008b. Very High Fire Hazard Severity Zones in Local Responsibility Areas. http://frap.fire.ca.gov/webdata/maps/san_bernardino_sw/fhszl_map.62.pdf

CalFire (California Department of Forestry and Fire Protection). 2019. Wildland Hazards and Building Codes. Available online at https://osfm.fire.ca.gov/divisions/wildfire-prevention-planning engineering/wildland-hazards-building-codes/. Accessed June 2, 2021.

California Air Resources Board, Clean Car Standards – Pavley, Assembly Bill 1493. Available at: http://www.arb.ca.gov/cc/ccms/ccms.htm, last reviewed January 11, 2017. Accessed June 2021.

California Building Standards Commission, Guide to the 2016 California Green Building Standards Code Nonresidential, November 2019. Available at: https://codes.iccsafe.org/content/GCGBSCNR2019/guide-to-the-2019-california-green-building-standards-code-includes-verification-guidelines-nonresidential. Accessed June 2021.

California Department of Fee and Tax Administration, Fuel Taxes Statistics and Reports. Available at: https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts.htm. Accessed June 2021.

California Department of Transportation (Caltrans) Vibration Guidance Manual (2013)

California Energy Commission 2020 Integrated Energy Policy Report, Docketed April 15, 2021. Available at: https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-IEPR-01. Accessed April 2021. Based on the transportation sector accounting for 40 percent of the state's GHG emissions in 2018.

California Energy Commission 2020 Integrated Energy Policy Report, Docketed March 23, 2021. Available at: https://efiling.energy.ca.gov/getdocument.aspx?tn=237269. Accessed June 2021.

California Energy Commission, 2016 Building Energy Efficiency Standards. Available at: https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2019-building-energy-efficiency. Accessed June 2021.

California Energy Commission, 2019 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, December 2018. Available at: https://ww2.energy.ca.gov/2018publications/CEC-400-2018-020/CEC-400-2018-020-CMF.pdf. Accessed June 2021.

California Energy Commission, 2020-2021 Investment Plan Updated for the Alternative and Renewable Fuel and Vehicle Technology Program, Docketed April 2021. Available at: https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program/clean-transportation-program-investment-5. Accessed June 2021.

California Gas and Electric Utilities, 2020 California Gas Report. Available at: https://www.socalgas.com/sites/default/files/2020-10/2020_California_Gas_Report_Joint_Utility_Biennial_Comprehensive_Filing.pdf. Accessed June 2021.

California Gas and Electric Utilities, 2021 California Gas Report. Available at: https://www.socalgas.com/sites/default/files/2020-10/2020_California_Gas_Report_Joint_Utility_Biennial_Comprehensive_Filing.pdf. Accessed June 2021.

California Legislative Information, SB 100 (2017-2018 Regular Session) Stats 2018, Chapter 312. Available at: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB100. Accessed June 2021.

California Legislative Information, SB 1389 (Public Resources Code Section 25300 – 25323). Available at: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200120020SB1389. Accessed June 2021.

California Legislative Information, SB 350 (2015-2016 Regular Session) Stats 2015, Chapter 547. Available at: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350. Accessed June 2021.

California Public Utilities Commission, California Renewables Portfolio Standard (RPS), 2021. Available at: https://www.cpuc.ca.gov/rps/. Accessed June 2021.

California Public Utilities Commission, RPS Program Overview, 2021. Available at: http://www.cpuc.ca.gov/RPS_Overview/. Accessed June 2021.

CalRecycle, History of California Solid Waste Law, 1985–1989. Available at: http://www.calrecycle.ca.gov/laws/legislation/calhist/1985to1989.htm. Accessed June 2021.

City of Glendale Community Development Department, Greener Glendale Plan, The City of Glendale’s Sustainability Plan for Community Activities, Adopted by the Glendale City Council on March 27,

2012. Available at: https://www.glendaleca.gov/home/showdocument?id=6934. Accessed June 2021.

City of Glendale Community Development Department, Greener Glendale Plan, The City of Glendale's Sustainability Plan for Municipal Operations. Adopted by the Glendale City Council on November 1, 2011. Available at: https://www.glendaleca.gov/home/showdocument?id=6928. Accessed June 2021.

City of Glendale Construction and Demolition Debris Diversion Program, City of Glendale Ordinance 5895, Chapter 8.58. Available at: http://qcode.us/codes/glendale/view.php?topic=8-8_58-8_58_050&frames=on. Accessed June 2021.

City of Glendale Green Building Standards, July 27, 2011. Available at: https://www.glendaleca.gov/home/showdocument?id=6930.Accessed June 2021.

City of Glendale Municipal Code

City of Glendale Water and Power 2019 Integrated Resources Plan, Adopted July 23, 2019. Available at: https://www.glendaleca.gov/home/showdocument?id=51814. Accessed June 2021.

City of Glendale. 1995. Zoning Ordinance of the City of Glendale: Title 30 of the Glendale Municipal Code.

City of Glendale. 1998. General Plan. Available at City-Wide Plans | City of Glendale, CA (glendaleca.gov). Accessed on June 2, 2021.

City of Glendale. 2003. Safety Element of the General Plan. Available online at

City of Glendale. 2019a. Verdugo Fire Communications Unified Response.

City of Los Angeles Municipal Code

Critelli, S., P. Rumelhart, and R. Ingersoll. 1995. Petrofacies and provenance of the Puente Formation (Middle to Upper Miocene), Los Angeles Basin, Southern California: implications for rapid uplift ad accumulation rates. Journal of Sedimentary Research A65: 656-667.

Eisentraut, P. and J. Cooper. 2002. Development of a model curation program for Orange County's archaeological and paleontological collections. Prepared by California State University, Fullerton and submitted to the County of Orange Public Facilities and Resources Department/Harbors, Parks and Beaches (PFRD/HPB).

Glendale Historical Society

Glendale Water and Power Wildlife Mitigation Plan https://www.glendaleca.gov/home/showdocument?id=54585.

GWP’s 2019 Integrated Resource Plan

Historic Resource Inventory and Evaluation Report, Stantec Consulting Services Inc. (Stantec), 2015–2016, revised November 2018 and August 2020,

Hudson, D. and B. Brattstrom. 1977. A small herpetofauna from the Late Pleistocene of Newport Beach Mesa, Orange County, California. Bulletin of the Southern California Academy of Sciences 76: 16-20.

Jefferson, G.T. 1991a. A catalogue of Late Quaternary Vertebrates from California: Part One, nonmarine lower vertebrate and avian taxa. Natural History Museum of Los Angeles County Technical Reports No. 5.

Jefferson, G.T. 1991b. A catalogue of Late Quaternary Vertebrates from California: Part Two, Mammals. Natural History Museum of Los Angeles County Technical Reports No. 7.

McDonald, H. G. and G. T. Jefferson. 2008. Distribution of Pleistocene Nothrotheriops (Xenartha, Nothrotheridae) in North America. In: Wang, X. and L. Barnes, eds., Geology and Vertebrate Paleontology of Western and Southern North America. Natural History Museum of Los Angeles County Science Series 41: 313-331.

Miller, W. E. 1941. A new fossil bird locality. Condor 44:283-284.

Miller, W. E. 1971. Pleistocene Vertebrates of the Los Angeles Basin and Vicinity: exclusive of Rancho La Brea. Los Angeles County Museum of Natural History, No. 10.

Murphey, P. C., Knauss, G. E., Fisk, L. H., Demere, T. A., Reynolds, J. 2019. Best practices in mitigation paleontology. Proceedings of the San Diego Society of Natural History 47: 1-43.

National Highway Transportation Safety Administration, Laws and Regulations, Corporate Average Fuel Economy.

Natural History Museum of Los Angeles County (LACM) 2021.Paleontological resources for the Grayson Power Plant draft Environmental Impact Report project (185804681).

Norris, R., and R. Webb. 1990. Geology of California. Second Edition. John Wiley and Sons, Inc., New York.

Roth, V. L. 1984. How elephants grow: heterochrony and the calibration of developmental Stages in some living and fossil species. Journal of Vertebrate Paleontology 4:126-145.

Scott, E. 2010. Extinctions, scenarios, and assumptions: Changes in latest Pleistocene large herbivore abundance and distribution in western North America. Quaternary International 217: 225-239.

Scott, E., and K. Springer. 2003. CEQA and fossil preservation in southern California. The Environmental Monitor 4-10.

SoCalGas, Company Profile. Available at: http://www.socalgas.com/about-us/company-info.shtml. Accessed June 2021.

Society of Vertebrate Paleontology (SVP). 2010. Standard Procedures for the assessment and Mitigation of adverse impacts to paleontological resources. Available at https://vertpaleo.org/wp-content/uploads/2021/01/SVP_Impact_Mitigation_Guidelines.pdf; Accessed June 2, 2021.

Southern California Association of Governments, 2020 – 2045 Regional Transportation Plan/ Sustainable Communities Strategy. Available at: https://efiling.energy.ca.gov/GetDocument.aspx?tn=233400&DocumentContentId=65912. Accessed June 2021.

Springer, K., E. Scott, J. Sagebiel, and L. Murray. 2009. The Diamond Valley Lake local fauna: late Pleistocene vertebrates from inland southern California. In: Albright, L., ed., Papers on Geology, Vertebrate Paleontology, and Biostratigraphy in Honor of Michael O. Woodburne. Museum of Northern Arizona Bulletin 65: 217-237.

Stantec Environmental Consulting, Inc. (Stantec). 2016b. Phase II Environmental Site Assessment: Grayson Power Plant, 800 Air Way; Glendale, California 91201.

State of California Office of Planning and Research, Zero-Emission Vehicles. Available at: https://www.opr.ca.gov/planning/transportation/zev.html. Accessed July 2021.

United States Energy Information Administration, International Energy Outlook 2020. Available at: https://www.eia.gov/outlooks/ieo/. Accessed July 2021.

United States Energy Information Administration, Petroleum & Other Liquids, Crude Oil Proved Reserves, Reserves Changes, and Production - California. Available at: https://www.eia.gov/dnav/pet/pet_crd_pres_dcu_SCA_a.htm. Accessed July 2021.

United States Environmental Protection Agency, EPA and NHTSA Set Standards to Reduce Greenhouse Gases and Improve Fuel Economy for Model Years 2017-2025 Cars and Light Trucks, 2012. Available at: https://nepis.epa.gov/Exe/ZyPDF.cgi/P100EZ7C.PDF?Dockey=P100EZ7C.PDF. Accessed June 2021.

United States Environmental Protection Agency, Fact Sheet: EPA and NHTSA Adopt First-Ever Program to Reduce Greenhouse Gas Emissions and Improve Fuel Efficiency of Medium- and Heavy-Duty Vehicles, August 2011. Available at: https://nepis.epa.gov/Exe/ZyPDF.cgi/P100BOT1.PDF?Dockey=P100BOT1.PDF. Accessed June 2021.

United States Environmental Protection Agency, Federal Register/Vol. 81, No. 206/Tuesday, Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2, October 25, 2016. Available at: https://www.gpo.gov/fdsys/pkg/FR-2016-10-25/pdf/2016-21203.pdf. Accessed June 2021.

Yerkes, R. F., T. H. McCulloh, J. E. Schollhamer, and J. G. Vedder. 1965. Geology of the Los Angeles Basin – an introduction. Geological Survey Professional Paper 420-A.

Yerkes, R.F. 1996. Preliminary geologic map of the Burbank 7.5' quadrangle, southern California. U.S. Geological Survey Open-File Report OF-96-253. Scale 1: 24,000.

7.0 ~~10.0~~ MITIGATION MONITORING AND REPORTING PLAN

The following mitigation measures shall apply to the Grayson Repowering Project to reduce identified impacts to less than significant levels.

Mitigation Measure	Monitoring Action	Required Time of Compliance	Implementation Responsibility	Verification Responsibility	Verification Method	Compliance Date
AES-1	AES-1: Screen Laydown Areas: Staging and laydown areas within view of residences, motorists, and recreational facilities shall be located away from public views or effectively screened using opaque fencing to limit views of materials, equipment, vehicles, and other items used during construction. All laydown areas shall be effectively reclaimed immediately following completion of their use.	Duration of construction	Engineering, Procurement, and Construction Contractor (EPC)	City of Glendale	Review of EPC's written documentation demonstrating compliance and/or site inspection(s)	
CR-1	Prior to demolition of the Boiler Building, the City shall prepare Historic American Engineering Record (HAER) documentation for the Boiler Building. That documentation shall include preparation of a written narrative, photography, and drawings that meet the latest requirements in HAER History, Photography, and Drawing Guidelines. Archival and electronic full copies of that completed documentation shall be submitted to the HAER program in accordance with the most recent edition of "Preparing HABS/HAER/HALS Documentation For Transmittal." The City shall maintain the HAER documentation at the Glendale Central Public Library and information about accessing that information shall be available on the City's website. HAER documentation, as described, shall be complete and	Prior to demolition	Qualified Consultant	City of Glendale	Written documentation demonstrating compliance	

Mitigation Measure	Monitoring Action	Required Time of Compliance	Implementation Responsibility	Verification Responsibility	Verification Method	Compliance Date
	accepted by the HAER program before any demolition or dismantling of the Boiler Building. The City shall also display up to four (4) archival quality photographs of the historic Boiler Building in a publicly accessible location within the City's Perkins Building,					
CR-2	City shall provide permanent plaque to be located at the Flower Street entrance to the Grayson Power Plant that identifies the location of the former historic Boiler Building and provides a narrative statement about the Boiler Building that provides historic context	Prior to demolition	Qualified Consultant	City of Glendale	Documentation demonstrating compliance	
CR-3	City shall salvage and preserve a piece of equipment from the Boiler Building and display the piece of equipment along with an historic context statement in a publicly accessible location in the City.	Prior to demolition	Qualified Consultant	City of Glendale	Documentation demonstrating compliance	
HAZ-1	HAZ-1: Prior to demolition of facilities associated with the Grayson Repowering Project, hazardous materials stored onsite and not required for continued operation of the facility shall be inventoried, packaged, removed, and disposed in accordance with a Hazardous Materials Management Plan prepared by the demolition contractor and submitted to the City for review and approval prior to initiating demolition activities.	Prior to demolition	Demolition Contractor	City of Glendale	Review of Demolition Contractor's Hazardous Materials Management Plan and site inspection prior to initiating demolition	
HAZ-2	HAZ-2: Buildings or equipment to be demolished containing lead based paint or asbestos shall be either decontaminated or encapsulated prior to removal from the Project site and disposed in accordance with	Prior to demolition	Demolition Contractor	City of Glendale	Review of Demolition Contractor's Asbestos and Lead Paint Management Plan	

Mitigation Measure	Monitoring Action	Required Time of Compliance	Implementation Responsibility	Verification Responsibility	Verification Method	Compliance Date
	an Asbestos and Lead Paint Management Plan prepared by the demolition contractor and submitted to the City for review and approval prior to initiating demolition activities.					
HAZ-3	HAZ-3: Contaminated soil encountered during demolition activities shall be handled, removed, and disposed in accordance with regulatory requirements and the Project's Soil Management Plan.	During demolition	Demolition Contractor	City of Glendale	Review of Project's Soil Management Plan and site inspection(s)	
HAZ-4	HAZ-4: Hazardous materials used during construction shall be limited to the quantities required for construction and shall be stored and handled in accordance with regulatory requirements.	Duration of construction	Engineering, Procurement, and Construction Contractor (EPC)	City of Glendale	Periodic site inspection	
HAZ-5	HAZ-5: Utility trucks and refueling trucks operating onsite shall have a spill kit onboard at all times. Small spills of petroleum products or other hazardous materials during construction operations shall be reported to the Construction Supervisor and a Spill Response form completed with a description of the type and quantity of the spill accompanied by photographs and a description of the disposition of the spill material. Hazardous spill material shall be disposed according to regulatory requirements. In the event of a large spill of hazardous materials equal to or above reportable quantities federal, state, and local reporting requirements shall be followed.	Duration of construction	Engineering, Procurement, and Construction Contractor (EPC) and Demolition Contractor	City of Glendale	Periodic site inspection	
HAZ-6	HAZ-6: The surface area of the proposed and existing ammonia tank containment systems shall be effectively reduced by 90 percent or greater through the installation and maintenance of three-inch diameter high	Duration of construction	Engineering, Procurement, and Construction Contractor (EPC)	City of Glendale	Review of EPC's written documentation demonstrating compliance for the duration of construction.	

Mitigation Measure	Monitoring Action	Required Time of Compliance	Implementation Responsibility	Verification Responsibility	Verification Method	Compliance Date
	density polyethylene balls or similar method.				Site inspection for confirmation	
NOI-1	NOI-1: Noise Source and Required Noise Control Measures: Cooling Towers: The noise emissions from each cooling tower shall be limited to 57 dBA at 400 feet (107 dBA sound power level). Mats may be required to limit the water splash noise.	During operation	Engineering, Procurement, and Construction Contractor (EPC)	City of Glendale	Review of EPC's written documentation demonstrating compliance of noise controls	
NOI-2	NOI-2: Noise Source and Required Noise Control Measures: Cooling Tower Fan Motors and Gearboxes: The sound power levels for cooling tower motors shall be limited to 98 dBA (85 dBA at 3') the motors shall be placed on the west side of the towers.	During operation	Engineering, Procurement, and Construction Contractor (EPC)	City of Glendale	Review of EPC's written documentation demonstrating compliance of noise controls and placement	
NOI-3	NOI-3: Noise Source and Required Noise Control Measures: Fuel Gas Compressors: The noise emissions from each of the two fuel gas compressor areas shall be limited to 44 dBA at 400 feet. Compressor enclosures or properly designed noise barriers can be utilized. Under the current assessment scenario open air compressor equipment packages with total sound power level of 108 dBA were treated with 21-foot sound barrier to yield appropriate results.	During operation	Engineering, Procurement, and Construction Contractor (EPC)	City of Glendale	Review of EPC's written documentation demonstrating compliance of noise controls	
NOI-4	NOI-4: Noise Source and Required Noise Control Measures: Water Treatment Area: The noise emissions from the water treatment area shall be limited to 48 dBA at 400 feet. It is expected that this level can be achieved through a combination of equipment selection, small enclosures and barriers.	During operation	Engineering, Procurement, and Construction Contractor (EPC)	City of Glendale	Review of EPC's written documentation demonstrating compliance of noise controls	
NOI-5	NOI-5: Noise Source and Required Noise Control Measures: Boiler Feed Water Pumps for Combined Cycle Units: The sound power levels	During operation	Engineering, Procurement, and Construction Contractor (EPC)	City of Glendale	Review of EPC's written documentation demonstrating	

Mitigation Measure	Monitoring Action	Required Time of Compliance	Implementation Responsibility	Verification Responsibility	Verification Method	Compliance Date
	for boiler feed water pumps shall be limited to 105 dBA when placed outside near the respective HRSGs.				compliance of noise controls	
NOI-6	NOI-6: Noise Source and Required Noise Control Measures: Circulating Water Pumps for Cooling Towers: The sound power levels for circulating water pumps shall be limited to 101 dBA when placed outside near the respective cooling towers.	During operation	Engineering, Procurement, and Construction Contractor (EPC)	City of Glendale	Review of EPC's written documentation demonstrating compliance of noise controls	
NOI-7	NOI-7: Noise Source and Required Noise Control Measures: Generator Step-up Transformers: Standard NEMA 95 MVA rated transformers or lower shall be utilized.	During operation	Engineering, Procurement, and Construction Contractor (EPC)	City of Glendale	Review of EPC's written documentation demonstrating compliance of noise controls	
NOI-8	NOI-8: Noise Source and Required Noise Control Measures: Steam Turbine Building: The sound power level of the noise breaking out from the steam turbine building shall be limited to 95 dBA and 115 dBC (45 dBA and 65 dBC at 400 feet). Specialized enclosures for the gearboxes shall be required and steam turbine building walls and roofs shall have an STC 40 composite transmission loss rating.	During operation	Engineering, Procurement, and Construction Contractor (EPC)	City of Glendale	Review of EPC's written documentation compliance of noise controls	
NOI-9	NOI-9: Noise Source and Required Noise Control Measures: Steam Pipe Rack: The sound power level for the steam pipe rack shall be limited to 82 dBA per meter of piping.	During operation	Engineering, Procurement, and Construction Contractor (EPC)	City of Glendale	Review of EPC's written documentation compliance of noise controls	
NOI-10	NOI-10: Noise Source and Required Noise Control Measures: Steam Sky vents and safety valves: Steam sky and safety valves shall be equipped with silencers to limit their noise emissions to 115 dBA sound power (approximately, 90 dBA at 5').	During operation	Engineering, Procurement, and Construction Contractor (EPC)	City of Glendale	Review of EPC's written documentation compliance of noise controls	
PAL-1	Worker training. A paleontologist who meets professional paleontological	Prior to Demolition	Qualified Consultant	City of Glendale	Review of qualified consultant	

Mitigation Measure	Monitoring Action	Required Time of Compliance	Implementation Responsibility	Verification Responsibility	Verification Method	Compliance Date
	standards as defined by Murphey et al. (2019) shall design a Worker's Environmental Awareness Program reviewed and approved by a qualified consultant retained by the City that will provide training that communicates requirements and procedures for the inadvertent discovery of paleontological resources during construction, to be delivered by the paleontologist or their designee to the construction crew prior to the onset of ground disturbance. The training will be provided by a qualified paleontologist.				Written documentation demonstrating compliance	
PAL-2	Paleontological Monitoring. A paleontologist meeting professional standards as defined by Murphey et al. (2019) shall be retained to oversee all aspects of paleontological mitigation, including the development and implementation of a Paleontological Monitoring and Mitigation Plan (PMMP) tailored to the Project that provides for paleontological monitoring of earthwork and ground disturbing activities into undisturbed geologic units with high paleontological potential (undisturbed sediments over 10 feet in depth), to be conducted by a paleontological monitor meeting professional standards (Murphey et al. 2019).	During Construction	Qualified Consultant	City of Glendale	Review of qualified consultant written documentation demonstrating compliance	
PAL-3	Inadvertent Discoveries. In the event that paleontological resources are encountered during construction activities, all work must stop in the immediate vicinity of the finds while the paleontological monitor documents the find and the designated project	During Construction	Qualified Consultant	City of Glendale	Review of qualified consultant written documentation demonstrating compliance	

Mitigation Measure	Monitoring Action	Required Time of Compliance	Implementation Responsibility	Verification Responsibility	Verification Method	Compliance Date
	paleontologist assesses the find. Should the qualified paleontologist assess the find as significant, it should be collected and curated in an accredited repository along with all necessary associated data.					
TRA-1	TRA-1: To accommodate turning movements by large trucks (CA-Legal 65 feet) and public safety on Fairmont Avenue, the demolition and construction contractor shall be required to prepare a traffic control plan for City review and approval prior to initiating demolition and construction activities that includes the use of large trucks entering and departing the Grayson Power Plant from Fairmont Avenue.	Prior to initiating demolition and construction	Engineering, Procurement, and Construction Contractor (EPC) and Demolition Contractor	City of Glendale	Review of EPC and Demolition Contractor's traffic control plan prior to initiating demolition and construction	
TRA-2	TRA-2: To reduce construction traffic at the San Fernando Road and Doran Street intersection during the p.m. peak hours, a construction traffic control plan shall be developed by the contractor, reviewed and approved by the City, and implemented for the duration of the construction phase. The plan shall include measures to limit vehicle trips to a total of 24 trips or less during the hours of 4 to 6 p.m. for the San Fernando Road and Doran Street intersection. Measures may include scheduling of construction activities or trip routing to minimized travel during peak p.m. traffic times, ride sharing, closing the parking lot, and/or other effective and verifiable measure.	Duration of the construction	Engineering, Procurement, and Construction Contractor (EPC)	City of Glendale	Review of EPC's construction traffic control plan and periodic site inspection	
TRA-3	TRA-3: The applicant shall ensure that traffic control is implemented for the duration of demolition and construction phases. Traffic control shall include construction warning signs on Fairmont Avenue	Duration of demolition and construction	Engineering, Procurement, and Construction Contractor (EPC) and Demolition Contractor	City of Glendale	Review of EPC's written documentation compliance of traffic control plan and	

Mitigation Measure	Monitoring Action	Required Time of Compliance	Implementation Responsibility	Verification Responsibility	Verification Method	Compliance Date
	(Trucks Entering Exiting), and monitoring (flag person) on public roadways as needed during large transports.				periodic site inspection	
TRA-4	TRA-4: A construction traffic control plan shall include provisions for days when high truck traffic is generated (soil delivery days, peak concrete delivery days). The plan will include considerations for truck staging to ensure that truck parking/staging can be accommodated off the City streets.	Duration of construction	Engineering, Procurement, and Construction Contractor (EPC)	City of Glendale	Review of EPC's traffic control plan	
TRA-5	TRA-5: Traffic control monitors shall direct traffic whenever heavy construction equipment is entering and exiting the plant as warranted to ensure public safety. The traffic monitor shall be posted throughout the demolition and construction periods, as necessary. The applicant shall coordinate with the Glendale Fire Department in order to ensure that traffic control routes and procedures would allow for adequate emergency access.	Duration of demolition and construction	Engineering, Procurement, and Construction Contractor (EPC) and Demolition Contractor	City of Glendale	Review of EPC's written documentation compliance of traffic control plan and written confirmation of coordination with Glendale Fire Department	
TRA-6	TRA-6: All construction-related vehicles, equipment staging and storage areas shall be located in approved pre-determined areas that are outside of adjacent road right of ways. The applicant shall provide all construction personnel with a written notice of this requirement and a description of approved parking, staging and storage areas. The notice shall also include the name and phone number of the applicant's designee responsible for enforcement of this restriction.	Prior to construction	Engineering, Procurement, and Construction Contractor (EPC) and Demolition Contractor	City of Glendale	Review of EPC's written notice of parking requirement	
TRA-7	TRA-7: Construction traffic shall comply with the California Vehicle Code sections related to vehicle weight and width. Any extra-legal loads needed for	Duration of construction	Engineering, Procurement, and Construction Contractor (EPC) and	City of Glendale	Review of EPC and Demolition Contractor's written documentation compliance of	

Mitigation Measure	Monitoring Action	Required Time of Compliance	Implementation Responsibility	Verification Responsibility	Verification Method	Compliance Date
	specialized deliveries shall be subject to special permit requirements from the City of Glendale. Should roadway damage occur along the haul route that is directly attributable to the demolition and construction of the Project, repairs will be assessed by the City and completed accordingly.		Demolition Contractor		traffic control regulations	
TRA-8	TRA-8: Fugitive dust control shall be implemented according to SCAQMD Rule 402, 403 and 1186, and California Vehicle Code Section 23114, and Building & Safety requirements. Dust control mitigation measures include: • Soil stabilizers and dust suppressants to control fugitive dust levels from exposed soils. • On-site water trucks to provide control of fugitive dust while soil is moved or disturbed. • Off-site vacuum and broom sweepers to remove any fugitive materials from the public roadways. • Track-out control to prevent dirt and mud from being spread to public roadways: o Sweeping or spray cleaning trucks prior to leaving project site. o Adequate truck load covering. o Limit on-site vehicle speeds to 15 mph.	Duration of construction	Engineering, Procurement, and Construction Contractor (EPC) and Demolition Contractor	City of Glendale	Review of EPC and Demolition Contractor's written documentation compliance of SCAQMD Rules 402, 403 and 1186 and California Vehicle Code Section 23114, and Building & Safety requirements for fugitive dust. Periodic site inspection	
TRA-9	TRA-9: The temporary parking lot on Doran Street is	Duration of construction	Engineering, Procurement,	City of Glendale	Review of EPC and Demolition	

Mitigation Measure	Monitoring Action	Required Time of Compliance	Implementation Responsibility	Verification Responsibility	Verification Method	Compliance Date
	served by two driveways. To provide for sufficient spacing from the railroad tracks and sufficient queuing capacity, the driveway adjacent to the railroad tracks will be limited to entry only and the driveway located 400 feet west of the railroad tracks will be limited to exit only.		and Construction Contractor (EPC) and Demolition Contractor		Contractor’s written documentation compliance of traffic control plan	

APPENDIX/DIVIDER TITLE

Appendix Subtitle

Appendix A PALEONTOLOGICAL RESOURCES RECORDS SEARCH

Natural History Museum
of Los Angeles County
900 Exposition Boulevard
Los Angeles, CA 90007

tel 213.763.DINO
www.nhm.org

Research & Collections

e-mail: paleorecords@nhm.org

June 16, 2021

Stantec Environmental Consultants

Attn: Alyssa Bell

re: Paleontological resources for the Grayson Power Plant draft Environmental Impact Report project (185804681)

Dear Alyssa:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for proposed development at the Grayson Power Plant project area as outlined on the portion of the Burbank USGS topographic quadrangle map that you sent to me via e-mail on June 14, 2021. We do not have any fossil localities that lie directly within the proposed project area, but we do have fossil localities nearby from the same sedimentary deposits that occur in the proposed project area, either at the surface or at depth.

The following table shows the closest known localities in the collection of the Natural History Museum of Los Angeles County.

Locality Number	Location	Formation	Taxa	Depth
LACM VP CIT342	Sparkletts property near 45th & Lincoln in Highland Park	Unrecorded (Pleistocene)	Mammoth (*Mammuthus*), Bison (*Bison*)	14 ft bgs
LACM VP 6297-6299	Metro Rail Red Line Hollywood Blvd. subway tunnel, Hollywood Blvd from St. Andrews Place to Western Ave	Older alluvium (pebble-gravel; sand; sand & clay)	Horse (*Equus*), Bison (*Bison*), Mastodon (*Mammut americanum*)	47 feet bgs
LACM VP 6970	Lankershim Blvd & Bloomfield St	Old alluvium (pebble - gravel; sand; silt & clay)	Ground Sloth (*Glossotherium*); Camel (*Camelops*); Bison (*Bison*)	60-80 ft bgs (tunnel for Metrorail Redline)
LACM VP 6208	Burbank Blvd. & Kester Ave. in Van Nuys	Unknown formation (Pleistocene)	Bison (*Bison*)	20 ft bgs
LACM VP	5112 Kester Ave	Unknown formation	Horse family (Equidae)	11-20 ft bgs

3263		(Pleistocene)		(sewer excavations)
LACM VP 1023	Workman & Alhambra Sts	Unknown formation (Pleistocene)	sabertooth cat (*Smilodon*), horse (*Equus*), deer (*Odocoileus*), Turkey (*Meleagris*)	Unknown (excavations for storm drains)

VP, Vertebrate Paleontology; IP, Invertebrate Paleontology; bgs, below ground surface

This records search covers only the records of the Natural History Museum of Los Angeles County ("NHMLA"). It is not intended as a paleontological assessment of the project area for the purposes of CEQA or NEPA. Potentially fossil-bearing units are present in the project area, either at the surface or in the subsurface. As such, NHMLA recommends that a full paleontological assessment of the project area be conducted by a paleontologist meeting Bureau of Land Management or Society of Vertebrate Paleontology standards.

Sincerely,

Alyssa Bell

Alyssa Bell, Ph.D.
Natural History Museum of Los Angeles County

enclosure: invoice

Appendix B GEOTECHNICAL STUDY INFORMATION

REVISION 1

GEOTECHNICAL STUDY REPORT

Grayson Repowering Project

Glendale, California

B&V PROJECT NO. 405153
B&V FILE NO. 41.0000

PREPARED FOR

Glendale Water & Power

15 FEBRUARY 2021

BLACK & VEATCH

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1.0 Introduction

The purpose of this report is to address the soil liquefaction issues and to provide updated project seismic design parameters per the California Building Code (CBC) 2019 and ASCE 7-16 for the Grayson Repowering Project as requested by Glendale Water & Power Administration (GWP) at the Grayson Power Plant. This report is intended to provide responses to the requests by Wärtsilä via Nelson and Company letter dated February 25, 2020 (Nelson Letter).

To support geotechnical analysis and recommendations presented in this report, a supplementary subsurface investigation was performed by Black & Veatch Corporation (Black & Veatch) from September 14 to 19, 2020. Previous subsurface investigations were performed by URS Corporation (URS) in 2002 and Stantec Consulting Services Inc. (Stantec) in 2016. This report includes the following information:

- A summary of the previous and additional field and laboratory work.
- Project seismic design parameters determined in accordance with CBC 2019 and ASCE 7-16.
- Site response analyses to develop a site-specific design response spectrum.
- Documentation of liquefaction potential and hazard evaluation results for the Grayson Power Plant site based on the previous and recently collected geotechnical data based on the project seismic design criteria.
- Geotechnical engineering recommendations.
- Geotechnical field and laboratory data provided in appendices.

1.1 Limitations

The analysis, conclusions, and design recommendations in this report were based on geotechnical data provided by GWP and site conditions existing at the time of the supplemental investigations and on the assumption that the information obtained from the investigations is representative of the subsurface conditions throughout the site. Unanticipated conditions may be encountered during construction because of variations that were not detected during the investigation program. The construction process may also alter ground conditions. Therefore, experienced geotechnical engineering personnel are required to observe and document the conditions encountered and ensure that proper construction procedures are used. If, during construction, conditions differ as a result of natural or manmade causes, this report should be reviewed by qualified geotechnical engineers to determine the applicability of the conclusions and recommendations concerning the differences in conditions.

This report was prepared solely for the benefit of GWP by Black & Veatch under the terms and conditions of the Professional Services Agreement 8000847 effective March 10, 2020 between the City of Glendale and Black & Veatch (the Agreement) and is based on information not within the control of GWP or Black & Veatch. This report is being prepared per the requirements of Change Notice 4 - Task 5 “Geotechnical Investigation” which was authorized to proceed on July 27, 2020, per the terms of the agreement referenced above. Neither GWP nor Black & Veatch has made an analysis, verified data, or rendered an independent judgment of the validity of the information provided by others. WHILE IT IS BELIEVED THAT THE INFORMATION, DATA, AND OPINIONS CONTAINED HEREIN WILL BE RELIABLE UNDER THE CONDITIONS AND SUBJECT TO THE LIMITATIONS SET FORTH HEREIN, GWP AND BLACK & VEATCH DO NOT GUARANTEE THE ACCURACY THEREOF. EXCEPT AS OTHERWISE ALLOWED BY THE AGREEMENT, THIS REPORT MAY NOT BE USED BY ANYONE WITHOUT THE EXPRESS WRITTEN AUTHORIZATION OF BLACK & VEATCH, AND SUCH USE SHALL CONSTITUTE AGREEMENT BY THE USER THAT ITS RIGHTS, IF ANY, ARISING FROM THIS REPORT SHALL BE SUBJECT TO THE TERMS OF THE BLACK & VEATCH AUTHORIZATION, AND IN NO EVENT SHALL USER'S RIGHTS, IF ANY, EXCEED THOSE OF GWP UNDER THE AGREEMENT.

2.0 Site Conditions

2.1 Site Location

Item	Discussion
Address	800 Air Way
City	Glendale
State	California
County	Los Angeles County
Site access via	Northeast of the Interstate 5 and Highway 134 interchange via Air Way Street
Geographic coordinates	Latitude 34.155278 degrees, Longitude -118.278333 degrees
Site location map	Shown on Figure 2-1

2.2 Site Description

Item	Discussion
General site conditions	Existing Grayson Power Plant operated by Department of Water and Power of the City of Glendale.
Bounding site features	The site is bounded by the Verdugo Wash drainage channel and Highway 134 to the south, by the Los Angeles River and Interstate 5 to the west, by commercial properties to the north, and by commercial and residential properties to the east.
Ground surface elevation	The existing site grade varies from approximately Elevation 463 to 467 feet (NAVD88), gently sloping towards northwest. Figure 2-2 provides ground surface elevation contours at the project site based on the United States Geological Survey (USGS) 3D Elevation Program (3DEP).
Existing vegetation	The site is covered with existing roadways and paved areas with little vegetation. The surface runoff at and near the site drains into the Verdugo Wash drainage channel and Los Angeles River.
Other existing site features	Existing structures, including a boiler building, five cooling towers, designated as Cooling Tower 1 through 5, and generation units, designated as Unit 8A and 8B/C.

3.0 Subsurface Investigations

The initial subsurface investigations for the existing Grayson Power Plant were completed between 1941 and 1977 and were not available for review. In 2002, a geotechnical investigation was performed by URS for the addition of Unit 9. In 2016, Stantec performed an investigation to provide geotechnical data for the proposed Grayson Repowering Project in which the existing generation facilities (with the exception of Unit 9) would be replaced with a combination of combined cycle and simple cycle gas turbine generation units. A supplementary subsurface investigation was performed by Black & Veatch from September 14 to 19, 2020, to collect additional geotechnical data to address the potential for soil liquefaction, the liquefaction induced hazards, and to provide responses to the requests by Wärtsilä via the Nelson Letter dated on February 25, 2020.

The previous investigations are summarized in Sections 3.1 and 3.2. The Black & Veatch 2020 investigation is summarized in Section 3.3 with logs and testing results for the investigation included in the appendices of this report.

3.1 URS (2002) Geotechnical Investigation

Item	Discussion
Investigation type	Geotechnical investigation.
Performed by	URS Corporation.
Investigation date	2002
Borings	Six (6) soil borings drilled to depths of 60 to 61 feet below grade.
Drilling method	4-1/2 inch inside diameter hollow stem augers.
Fault study	Desk study.
Laboratory testing	Moisture content, density, sieve analysis, direct shear, consolidation, compaction, and corrosivity testing performed.
In-Situ testing	Standard penetration tests and penetration tests with a Dames & Moore Type-U sampler performed.
Report generated	URS, Geotechnical Investigation Report, Proposed New Combustion Turbine Generator Grayson Power Plant, 2002.

3.2 Stantec (2016) Geotechnical Investigation

Item	Discussion
Investigation type	Geotechnical and Geophysical investigation.
Performed by	Stantec Consulting Services Inc.
Investigation date	2016
Borings	Six (6) soil borings drilled to depths of 51.5 to 56.5 feet below grade.
Drilling method	3-1/4-inch inside diameter hollow stem augers.
Cone penetrometer soundings	Two (2) CPT soundings advanced at two locations to depths of about 60.5 and 33.5 feet below grade.
Seismic hazard study	A probabilistic seismic hazard analysis (PSHA) performed with faults based on the CGS fault catalog and design peak ground surface acceleration (PGA) determined using the computer program FRISKSP (Version 4.00), and a site-specific PGA developed based on ASCE 7-10.
Laboratory testing	Moisture content, density, sieve analysis, compaction, direct shear, thermal resistivity, R-value, and corrosivity testing performed.
In-Situ testing	Standard penetration tests (SPTs), refraction microtremor (ReMi), and electrical resistivity tests performed.
Report generated	Stantec Consulting Services, Inc., Geotechnical Investigation Report, Grayson Power Plant, Glendale, California, 2016.

3.3 Black & Veatch (2020) Geotechnical Investigation

Item	Discussion
Investigation type	Geotechnical investigation.
Performed by	Black & Veatch Corporation.
Investigation date	September 2020
Subcontractors	Terracon Consultants, Inc. for borings, and laboratory testing. Kehoe Testing & Engineering subcontracted to Terracon for seismic cone penetrometer testing (sCPT).
Investigation locations	The investigation locations are shown on Figure 3-1.
Borings	Borings were drilled at five (5) locations to depths of 43.5 to 74.5 feet below grade. Borings were drilled by Terracon Consultants, Inc. using a Diedrich D-90 track-mounted rig using 4-1/4-inch inside diameter hollow stem augers and 3-7/8-inch tricone roller bit with bentonite mud as drilling fluid. A 3-inch hand auger was used for the top 5 feet of soils prior to the advancement of borings with the hollow stem augers. The drilling technique was switched to mud rotary drilling at a depth above the anticipated water table as directed by the Black & Veatch field engineer. All borings were backfilled with cement-bentonite grout after the completion. The boring logs provide drilling details for each boring. The boring logs are included in Appendix A.
Sampling	Standard split barrel samples and 3 inch thin-walled tube samples were collected.
Sampling hammer	The split barrel samples were driven with a 140-pound auto hammer for both drill rigs. The hammer efficiencies were calibrated offsite following ASTM D4633 and determined to be 94.8 percent. The hammer energy calibration report for the drill rig is included in Appendix B.
Cone penetrometer soundings	Cone penetrometer testing (CPT) soundings were advanced at six (6) locations to depths of 41.7 to 61 feet using a truck-mounted CPT rig using an integrated electronic cone system manufactured by Vertek with a reaction weight of 30 tons. Shear wave velocity measurements were made during each CPT sounding at an approximate 5-foot intervals. The shear wave was generated using an air-actuated hammer, which is located inside the front jack of the CPT rig. The cone has a triaxial geophone, which recorded the shear wave signal generated by the air hammer. Three (3) pore pressure dissipation tests were performed at CPT soundings BVS-201, BVS-203, and BVS-206 at depths of 47 to 56 feet below grade. A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. The CPT soundings test data, shear wave velocity data, and pore pressure dissipation data are included in the summary report prepared by Kehoe Testing & Engineering in Appendix C.
Laboratory Testing	Moisture content, sieve analysis, Atterberg limits, hydrometer test, and passing No. 200 Sieve tests performed. Laboratory testing results are included in Appendix D.

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4.0 Seismicity

4.1 Seismic Parameters for Liquefaction Analysis

This section provides the seismic design parameters determined in accordance with CBC 2019 and ASCE 7-16 to calculate the seismic demand for liquefaction analysis. According to CBC 2019 Section 1803.5.12.1, the potential for liquefaction and soil strength loss shall be evaluated for site peak ground acceleration (PGA), earthquake magnitude and source characteristics consistent with the maximum considered earthquake (MCE) ground motions.

The moment magnitude for the MCE to be used to calculate the magnitude scaling factor for liquefaction analysis is obtained as the dominant magnitude(s) determined from deaggregation information using the USGS Unified Hazard Tool by latitude and longitude of the site. The inputs for the deaggregation are:

- Map edition: Dynamic Conterminous U.S. 2014 v4.2.0 (update)
- Latitude 34.15527778 deg and Longitude -118.2783333 deg
- Spectral Period: Peak Ground Acceleration
- Return period in years: 2475 (2 percent probability of exceedance in 50 years)
- Site Class: 259 m/s (850 ft/s) (Site Class D)

The Site Class D was determined based on the average shear wave velocity for the upper 100 feet of the site profile, V_{s100}, calculated from the ReMi and seismic CPTs from the current and previous investigations. The mean and modal values of deaggregation results for the PGA and Site Class D are listed in Table 4-1. The full deaggregation report from the USGS Unified Hazard Tool is available in Appendix E.

Table 4-1 PGA Deaggregation Results (Site Class D) for the Earthquake Magnitude for Liquefaction Analysis

Deaggregation Parameters	Mean	Mode
PGA (USGS 2475 year return period)	0.9067	
Magnitude (M)	6.95	6.9
Distance (R, in km)	8.34	6..41
Ground motion deviations (ε)	1.4σ	1.17σ
Contribution	-	17.65%

According to CBC 2019, the peak ground acceleration shall be determined based on either (1) a site-specific study in accordance with Chapter 21 of ASCE 7-16 or (2) the maximum considered earthquake geometric mean (MCE_G) peak ground acceleration adjusted for site effects (PGA_M) determined in accordance with Section 11.8.3 of ASCE 7-16. Table 4-2 provides the seismic design parameters for soil liquefaction analysis including the peak ground acceleration parameter, PGA_M, according to ASCE 7-16 Section 11.8.3 and earthquake magnitude based on the PGA deaggregation results in Table 4-1.

Table 4-2 PGA and Earthquake Magnitude for Liquefaction Analysis

Seismic Design Parameter	Value
PGA_M (g)	1.007
M_w	6.95

4.2 CBC 2019 Seismic Design Criteria

Table 4-3 presents the updated mapped spectral response accelerations for the site in accordance with CBC 2019 and ASCE 7-16.

Table 4-3 Mapped MCE_R Spectral Response Accelerations per CBC 2019

Seismic Design Parameter	Value
S_S – Mapped MCE_R short period spectral response accelerations (5 percent damped) (g)	2.133
S_1 – Mapped MCE_R 1 second period spectral response accelerations (5 percent damped) (g)	0.727

Notes:

1. In accordance with CBC 2019 Section 1613.2.2 and ASCE 7-16 Section 11.4.8, a site-specific response analysis shall be performed due to the presence of liquefiable soils in accordance with ASCE 7-16 Section 21.1 unless the fundamental periods of vibration of structures are equal to or less than 0.5s, a site class is permitted to be determined in accordance with Section 20.3 and the corresponding values of F_a and F_v determined from Tables 11.4-1 and 11.4-2 (Exception to provision 20.3.1.1);
2. According to ASCE 7-16 Section 11.4.8, “Site-Specific Ground Motion Procedures”, a ground motion hazard analysis shall be performed in accordance with Section 21.2 for structures on Site Class D and E with S_1 greater than or equal to 0.2 unless the seismic response coefficient, C_s, is conservatively calculated using Eq. (12.8-2) for $T \leq 1.5T_s$ and using 1.5 times the value computed in accordance with either Eq. (12.8-3) for $TL \geq T > 1.5Ts$ or Eq. (12.8-4) for $T > TL$ (Exception #2 to provision 11.4.8).

5.0 Soil Liquefaction Evaluation

Liquefaction potential of soils at the Grayson Repowering Project was evaluated using the SPT N-values, sCPT sounding data, and shear wave velocity (V_s) measurements using multiple simplified stress-based triggering criteria in the current standard of practice of liquefaction assessment (NAP 2016). The potential consequences of liquefaction are estimated including liquefaction induced settlement, lateral spread, seismic compression or settlement, cyclic softening of fine-grained soils, and residual shear strength. This section presents the summary of the liquefaction potential and hazard analyses for the Grayson Repowering Project based on all available geotechnical data and the seismic demand in accordance with CBC 2019 and ASCE 7-16.

5.1 Liquefaction Potential

Soil liquefaction is a phenomenon whereby a saturated soil loses its stiffness and strength with seismic generation of excess porewater pressure and disturbance of the soil structure, causing it to become easier to deform or even flow as a liquid. Liquefaction is typically associated with saturated granular or low plasticity soils. According to the seismic hazard zone report 016 by the Department of Conservation, Division of Mines and Geology of the State of California (CDMG), the project site is located in the young alluvium formation (Qyf1) (Figure 5-1) and consists of sand with silty sand, silt and gravel with high susceptibility to soil liquefaction when the groundwater is within 40 feet of the surface (CDMG 1998). The online application, California Earthquake Hazards Zone Application or "EQ Zapp", developed by California Geological Survey (CGS) shows the project site is located in a parcel zoned for potential liquefaction hazard (Figure 5-2).

In accordance with the guidelines provided in CGS, Special Publication 117A, the historical high groundwater table should be used for liquefaction analysis. Based on the LA County Public Works groundwater online database, four active groundwater monitoring wells are located at and close to the site (Figure 5-3). Groundwater data from these four wells (Figure 5-4) indicated that the historical high groundwater level is Elevation 434.1ft (NAVD88). This elevation corresponds to approximately 30 feet below the existing grade which is consistent with the findings in the Stantec (2016) study.

A quantitative liquefaction potential evaluation was conducted using the in situ and laboratory testing results available for the project site. Youd et al. (2001) provides the only consensus recommendation for liquefaction triggering assessment developed in the NCEER workshops held in 1996 and 1998 and has been the standard procedure for liquefaction evaluation in practice. However, analysis of liquefaction and its consequences remains an active area of research and development in geotechnical engineering. Since 2004, a number of alternative procedures (e.g., Idriss and Boulanger 2008, Moss et al. 2006, Kayen et al. 2013, and Boulanger and Idriss 2014) have been developed. The National Academies of Science, Engineering & Medicine (NASEM) recently released a state of art and practice report (NAP 2016) to help the technical community and practitioners reach consensus on issues related to methods to assess the liquefaction triggering and liquefaction hazards. NAP (2016) does not make recommendations on which of the recent procedures or the NCEER approach should be used.

However, it recommends using multiple methods for any liquefaction assessment to constrain uncertainties. Therefore, multiple methods were selected to assess the liquefaction potential using the CPT, SPT, and V_s data. Because of the differences in the methods (e.g., different magnitude scaling factors), all methods were applied in their entirety including method specific corrections.

The liquefaction potential analysis was performed using the different methods as summarized in Table 5-1 implemented in the software program CLiq (Version 3.0.3.4) and LiqSVs (Version 2.0.2.1) developed by Geologismiki in collaboration with Gregg Drilling & Testing Inc. and Dr. Peter Robertson.

Table 5-1 Summary of Methods for Liquefaction Triggering Assessment

Geotechnical Data	Liquefaction Triggering Analysis Methods
CPT	NCEER (1998), Moss et al. (2006), Boulanger and Idriss (2014)
SPT	NCEER (1998) and Boulanger and Idriss (2014)
V_s	NCEER (1998) and Kayen et al. (2013)

Based on the analysis results, liquefaction was predicted in various locations of the project site. The liquefaction potential, commonly expressed in terms of factor of safety against liquefaction (FS_L), is defined as the ratio between the cyclic resistance ratio (CRR) and the cyclic stress ratio (CSR). If the FS_L is less than 1.0, the soil is considered to liquefy during the evaluated seismic event. The CRR characterizes the available liquefaction resistance of a given soil, expressed in terms of the cyclic stresses required to cause liquefaction. The CSR represents the cyclic shear stress generated by the earthquake ground motions. Two cross sections, Cross Sections 1-1’ and 2-2’ shown in Figure 3-1, show the estimated extent and spatial variability of liquefaction at the site which include both CPT sounding data and boring logs. These cross sections include shaded intervals to represent where liquefiable soils, i.e. with FS_L less than 1.0, are predicted based on the available CPT and SPT data. The two cross sections are shown on Figures 5-5 and 5-6. Both cross sections cut through the site from plant east to west with Cross Section 1-1’ through the middle part of the existing Grayson Power Plant and Cross Section 2-2’ along the perimeter at plant south. As shown in Figures 5-5 and 5-6, the liquefiable soil zones appear to be thicker and more continuous at the perimeter of the site than the interior of the site.

Several liquefaction severity indices have been developed to provide a measure of the severity of surface manifestations and damage potential based on the cumulative liquefaction responses of the soil profile as described in the NAP (2016). Figures 5-7 and 5-8 present the calculated Liquefaction Potential Index (LPI) (Iwasaki et al., 1978) and Liquefaction Severity Number (LSN) (van Ballegooy et al. 2012) implemented in the software program CLiq (Version 3.0.3.4) for all available CPT data. Based on the calculated values of LPI and LSN, the site has generally low to moderate risk for liquefaction damage potential with the highest liquefaction damage potential located on the plant east where the site is underlain by relatively thicker fills.

5.2 Liquefaction Settlement

The dissipation of excess pore pressure in the liquefied soil during and after an earthquake generally causes volume loss resulting in ground surface settlement. This liquefaction induced settlement was calculated using the methods by Zhang et al. (2002) and Boulanger and Idriss (2014) implemented in the software program CLiq (Version 3.0.3.4) and LiqSVs (Version 2.0.2.1). For the estimate of liquefaction settlement for the shear velocity data, the normalized shear wave velocity for overburden stress, V_{s1}, was converted to the equivalent clean sand normalized CPT penetration resistance, $(q_{c1N})_{cs}$, based on the correlation developed by Andrus et al. (2009) and the post-liquefaction volumetric strains of the liquefiable soil layer was calculated based on the CPT-based method by Zhang et al. (2002).

Table 5-2 summarizes the estimated liquefaction settlement based on the different test data and analysis methods. As shown in Table 5-2, the liquefaction induced settlement is not uniform across the site due to the difference in soil layering and soil consistency or density. The amount of differential settlement can be assumed as 50 to 75 percent of the total liquefaction settlement (NEHRP, 2009).

Based on the comparison, the estimated liquefaction induced settlement from the CPT and SPT data show reasonable agreement based on the results from soil boring and CPT sounding located in close proximity as shown in Table 5-3. The differences between the CPT and SPT data are likely due to the thickness of the layers (i.e., about 5 feet for SPT and a couple inches for CPT) used to estimate the settlement. There appears to be consistent differences in the predicted liquefaction settlement using the two V_s-based methods which is likely due to the lack of limiting value of V_{s1} for liquefaction of soils in the method developed by Kayen et al. (2013) and the high seismic demand for the project site. The calculated liquefaction settlement based on the ReMi test results at RL-2 using the Kayen et al. (2013) method is significantly higher than the rest of the results including the result from NCEER (1998) method using the same V_s data and therefore is considered as an outlier. The average of the calculated liquefaction settlement from data points excluding the outlier is about 1.4 inch. Figure 5-9 shows a contour plot for the average estimated liquefaction settlement based on the CPT data and SPT data.

Table 5-2 Summary of Estimated Liquefaction Settlement using Different Data and Analysis Methods

Sub Inv Test #	Estimated Liquefaction Settlement (inch)				
	NCEER (1998)	Moss (2006)	Boulanger&Idriss (2014)	Kayen et al. (2013)	Average[1]
CPT-1	3.2	2.6	2.8	-	2.8
CPT-2	0.2	0.0	0.1	-	0.1
BVS-201	1.6	1.1	1.4	-	1.4
BVS-202	0.1	0.0	0.1	-	0.1
BVS-203	2.6	1.4	1.4	-	1.8
BVS-204	2.0	0.7	0.9	-	1.2
BVS-205	0.6	0.2	0.5	-	0.4
BVS-206	3.9	2.7	3.2	-	3.3
B-1	3.5	-	3.2	-	3.3
B-2	1.1	-	0.9	-	1.0
B-3	1.1	-	0.0	-	0.6
B-4	2.9	-	2.7	-	2.8
B-5	5.2	-	4.9	-	5.1
B-6	3.2	-	3.0	-	3.1
URS-B-1	2.8	-	2.8	-	2.8
URS-B-2	0.0	-	0.0	-	0.0
URS-B-3	2.8	-	2.8	-	2.8
URS-B-4	2.0	-	1.1	-	1.5
URS-B-5	2.7	-	2.5	-	2.6
URS-B-6	0.0	-	0.0	-	0.0
BVB-101	0.0	-	0.0	-	0.0
BVB-102	0.0	-	0.0	-	0.0
BVB-103	0.0	-	0.0	-	0.0
BVB-104	1.9	-	1.6	-	1.7
RL-1	0.0	-	-	0.0	-

Sub Inv Test #	Estimated Liquefaction Settlement (inch)				
	NCEER (1998)	Moss (2006)	Boulanger&Idriss (2014)	Kayen et al. (2013)	Average[1]
RL-2	0.0	-	-	14.3[2]	-
RL-3	0.0	-	-	1.3	-
RL-4	0.0	-	-	2.1	-
BVS-201	0.0	-	-	1.0	-
BVS-202	0.0	-	-	0.4	-
BVS-203	0.7	-	-	7.1	-
BVS-204	0.0	-	-	1.5	-
BVS-205	0.0	-	-	0.0	-
BVS-206	0.4	-	-	4.9	-

Note:

1. Average settlement values from different methods applicable for the CPT and SPT data. Due to the large differences between the two methods for the V_s data, the results are not averaged;
2. Value considered as an outlier.

Table 5-3 Comparison of Average Value of Estimated Liquefaction Induced Settlement from Boring and CPT Pairs Located in Close Proximity

Borings	CPTs
BVB-102 (0.0 inch)	BVS-202 (0.1 inch)
BVB-103/103A (0.0 inch)	BVS-205 (0.4 inch)
BVB-104 (1.7 inch)	BVS-203 (1.8 inch)
B-1 (3.3 inch)	BVS-204 (1.2 inch)
B-4 (2.8 inch)	BVS-201 (1.4 inch)
B-5 (5.1 inch)	CPT-1 (2.8 inch), BVS-206 (3.3 inch)
B-2 (1.0 inch)	CPT-2 (0.1 inch)

5.3 Lateral Spread

Lateral spreading is defined as permanent displacement that occurs incrementally when seismic loading occurs concurrently with soil liquefaction. Lateral spreading can develop in gentle slopes and move toward a free face, such as a river bank or channel. The project site is located at about 120 feet away from the Verdugo Wash drainage channel. According to a memorandum by the US Army Corps of Engineers, Los Angeles District in 2015, the Verdugo Wash drainage channel was constructed in 1937 as a flood damage reduction channel that consists of trapezoidal and rectangular reinforced concrete channel. The lateral spread deformation under gently sloping ground condition was evaluated for the site using the semi-empirical approach developed by Zhang et al. (2004) implemented in the software program CLiq (Version 3.0.3.4) and LiqSVs (Version 2.0.2.1). The average slope of the site was estimated to be about 0.8 percent from the existing boiler building to the site property on the plant south based on the elevation data from the USGS 3DEP and the elevation profile data in Google Earth Pro (Version 7.3.3).

Figures 5-10 through 5-12 compare the estimated horizontal deformation due to lateral spread based on the CPT, SPT, and V_s data. The estimated horizonal lateral spread deformation ranges from zero to 5 feet but generally less than 2 feet. The lateral spread hazard is not continuous throughout the site and the elevation of the soil layer contributing to lateral spread deformation varies from location to location. It should also be noted that the Verdugo Wash drainage channel is entirely lined with reinforced concrete. This channel should not be considered as a “free face” such as a natural river bank. The effect of the reinforced concrete on the lateral spread was not evaluated; however, it is likely to add conservativism to the results of the analysis.

5.4 Seismic Compression/Settlement

The settlement of soil layers above the historical high water table during earthquake, termed as seismic compression or sometimes referred to as dry sand seismic settlement, is the accumulation of contractive volumetric strains of unsaturated soil from earthquake shaking. The evaluation and consideration of seismic compression is not explicitly required in the building code since only the assessment of potential consequences of liquefaction including the evaluation of total and differential settlement is required (CBC 2019 Section 1803.5.12).

In the state of California, the dry sand seismic settlement must be considered for buildings and structures designated as essential facilities with Risk Category IV as specified in item 20 of the California Geological Survey Note 48 (CGS 2019). Since the Grayson Repowering Project has design Risk Category III, the consideration of the seismic compression settlement is not a requirement. The amount of seismic compression of soil above the groundwater table was evaluated to be on the order of 10 inches in the Stantec (2016) geotechnical report in accordance with California Building Code 2016. Although not a design requirement, the seismic compression was evaluated for completeness and comparison purpose based on the seismic demand in accordance with CBC 2019 for all available geotechnical data.

The seismic compression was firstly studied by Silver and Seed (1971) who proposed to correlate the amount of seismic compression with density of the soil, amplitude of the cyclic shear strain and number of shear strain cycles applied during the earthquake. The method was later modified by Pyke et al. (1975) to incorporate the effects of multidirectional shaking, which is typically incorporated by doubling the one-dimensional estimate. Tokimatsu and Seed (1987) furthered the simplified procedure framework proposed by Seed and Silver (1972) and developed the relationship between relative density of soil or SPT resistance of the sand, the effective cyclic shear strain, and the estimated volumetric strain due to seismic compression. Pradel (1998) proposed a set of equations based on the Tokimatsu and Seed (1987) method to allow the calculation of seismic compression without the iterations and the use of numerous design charts based on the SPT data. Robertson and Shao (2010) modified the Pradel (1998) method to CPT data.

The amount of seismic compression for the project site was estimated using all available geotechnical data and the method by Pradel (1998) and Robertson and Shao (2010) implemented in the software program CLiq (Version 3.0.3.4) and LiqSVs (Version 2.0.2.1) under the seismic demand in accordance with CBC 2019 and ASCE 7-16.

Figures 5-13 through 5-15 compare the calculated seismic compression of the unsaturated soil above groundwater table for the CPT, SPT, and V_s-based methods. The calculated one-dimensional seismic compression based on the CPT data are in the range from 0 to 11.4 inches with an average value of 4.3 inches while the estimated seismic compression based on the SPT data are in the range from 0.7 to 7.1 inches with an average value of 2.6 inches. The estimated seismic compression settlement based on the V_S data, however, are significantly lower, in the range from 0.1 to 0.2 inches. Based on the comparison, the seismic compression/settlement estimated based on the SPT data are lower than the ones from the CPT data but are still comparable and in the same order of magnitude of the amount of dry sand settlement reported in the Stantec (2016) study. Due to the inconsistency with other methods, the seismic compression settlement results from the shear wave velocity data were disregarded.

5.5 Cyclic Softening of Fine-Grained Soils

Based on the previous and current subsurface investigations, the site is underlain by both fine-grained soils (e.g., SILT, sandy SILT, and silty CLAY, and sandy CLAY) and coarse-grained soils. In the NCEER 1998 workshop report summarized in Youd et al. (2001), the “Chinese Criteria” was recommended to be used as a screening tool to judge whether or not fine-grained soils are subject to liquefaction. However, more recent research has identified a large number of cases where ground failure in silty and clayey soils containing more than 15 percent clay-size particles caused considerable damage to buildings and structures and it is recommended to use methods based on more recent research. In NAP (2016), three more methods were included to evaluate if the fine-grained soils are subjected to classic cyclic liquefaction (“sand like behavior”) or cyclic softening (“clay like” behavior):

- Seed et al. (2003);
- Boulanger and Idriss (2006);
- Bray and Sancio (2006).

Two fine-grained soil samples close to or below the historical high groundwater table, BVB-101 (at depth 33.5 to 35 feet) and BVB-102 (at depth 25 to 25.5 feet), were tested for Atterberg limits and moisture contents. The two soil samples were confirmed to be potentially liquefiable per Seed et al. (2003) criteria and the Bray and Sancio (2006) criteria or subject to cyclic softening with clay-like behavior in accordance with Boulanger and Idriss (2006) criteria.

6.0 Total Stress-Nonlinear Site Response Analysis

Due to the presence of liquefiable soils, the project site is classified as Site Class F and a site-specific response analysis was performed in accordance with CBC 2019 and Chapter 21 of ASCE 7-16. The base of the site response analysis reaches a shear wave velocity of about 2,500 feet per second based on the measurements of shear wave velocity from ReMi seismic survey. The site-specific base ground motion time histories at bedrock were developed for the Geometric Mean Maximum Considered Earthquake (MCE_G) and Risk-Targeted Maximum Considered Earthquake (MCE_R) response spectra at bedrock. A total stress-nonlinear (TS-NL) site response analysis (SRA) was completed using the program DEEPSOIL (Hashash et al., 2020).

6.1 Bedrock Target Spectra

The results of the 2014 U.S. Geological Survey (USGS) National Seismic Hazard Mapping Program (NSHMP) were used as the probabilistic seismic hazard analysis (PSHA) to determine the ground motions at the Site Class B/C boundary ($\bar{v}_S$ of 2,500 feet per second) in accordance with Chapter 21.2 of ASCE 7-16. The use of the 2014 USGS NSMP as the site-specific PSHA is appropriate since the 2014 USGS NSHMP (Petersen et al., 2014) would form the basis for a site-specific analysis completed between 2014 and the 2018 USGS NSHMP (Petersen et al., 2020) and the 2014 USGS NSHMP forms the basis for CBC 2019 and ASCE 7-16. The 2014 USGS NSHMP also includes the latest version of the Uniform California Earthquake Rupture Forecast model (UCERF3; Field et al., 2014) that has been retained for the next version of the USGS NSHMP.

The 2014 USGS NSHMP PSHA results represent the MCE_G target response spectrum from the online USGS Unified Hazard Tool. The MCE_R spectrum was developed using the recommended scaling factors from Chapter 21.2 of ASCE 7-16 to estimate the maximum horizontal response from the geometric mean response and risk coefficients (C_R) using Method 1 from Chapter 21.2.1.1 of ASCE 7-16. Table 6-1 summarizes the spectral acceleration (S_a) ordinates and the factors used to develop the MCE_R spectrum.

Table 6-1 Development of Site Class B/C Spectral Ordinates

Periods (s)	USGS PSHA S_a (g)	Max/Geomean Ratio (-)	Risk Coefficient	USGS MCE_R S_a (g)
0	0.925	1.1	0.893	0.909
0.1	2.080	1.1	0.893	2.043
0.2	2.243	1.1	0.893	2.204
0.3	1.842	1.125	0.893	1.850
0.5	1.309	1.175	0.893	1.374
0.75	0.936	1.238	0.894	1.035
1	0.691	1.3	0.894	0.803

Periods (s)	USGS PSHA S_a (g)	Max/Geomean Ratio (-)	Risk Coefficient	USGS MCE_R S_a (g)
2	0.299	1.35	0.894	0.361
3	0.181	1.4	0.894	0.226
4	0.127	1.45	0.894	0.164
5	0.098	1.5	0.894	0.131

Figure 6-1 compares the MCE_R target rock response spectrum, the USGS PSHA geometric mean response spectrum at the Site Class B/C boundary and the MCE_R Site Class B spectrum in accordance with Section 11.4.6 of ASCE 7-16. The parameters for Site Class B Spectrum were calculated by using ASCE 7 Hazard Tool with site coordinates of latitude and longitude. Based on this comparison, the PSHA MCE_R results from the USGS NSHMP will be used as the bedrock target spectrum. The PSHA geometric mean spectrum at B/C boundary will be used as bedrock target spectrum for selecting and scaling of time histories for liquefaction analysis.

6.2 Deaggregated Seismic Source Parameters

Seismic hazard deaggregation was performed to evaluate the predominant types of earthquake sources, magnitudes, and distances contributing to the probabilistic ground motion hazard at the Site Class B/C boundary. The USGS Unified Hazard Tool was used for the analysis. The deaggregation analysis was performed for PGA, periods of 0.2 second and 1 second. The deaggregation analysis results are presented in Table 6-2. Figures 6-2 through 6-4 are the 3-dimensional bar charts illustrate the relative contribution of the deaggregated earthquake sources for the three periods.

Table 6-2 Seismic Hazard Deaggregation Results for MCE (2475 Year Return Period) at the Site B/C Boundary at Periods of 0, 0.2, and 1.0 Seconds

Periods (s)	Mean magnitude	Mean distance (km)	Modal magnitude	Modal distance (km)
0 (PGA)	7.02	6.75	6.9	5.89
0.2	7.01	7.06	6.9	6.06
1.0	7.2	8.3	6.9	6.03

Based on the deaggregation results, the Hollywood Fault located less than 5 kilometers (km) to the south of the project site contributes the most seismic hazard (more than 30 percent of the total hazard at PGA, 0.2 and 1 second) which is capable of producing moment magnitude (M_w) of 6 or larger events. Therefore, the site is considered a “near fault” site per Section 11.4.1 of ASCE 7-16.

6.3 Time History Selection and Scaling

The web-based Pacific Earthquake Engineering Research Center (PEER) ground motion database was used to search, select, and scale the ground motions time histories to match the target bedrock spectra presented in Section 6.1. The time histories selected and matched to the MCE_R response spectrum are for development of the site-specific risk-based maximum direction of horizontal response spectrum. The time histories selected and matched to the MCE_G target response spectrum based on the 2014 USGS NSHMP PSHA results are for the site-specific response analysis for liquefaction and soil strength loss evaluation in accordance with Section 11.8.3 of ASCE 7-16. A total of seven (7) motions are selected and scaled to match each target spectrum. This number exceeds the minimum five input motions required by ASCE 7-16 for the site response analysis. The time histories search considered similar earthquake magnitudes, distances, and site conditions.

Figures 6-5 and 6-6 show the comparison of the target spectrum with the mean spectrum (Solid Red) of the scaled spectra of 7 selected ground motions (thin dash lines) with 5% damping. Information of earthquake for selected time histories is provided in Tables 6-3 and 6-4. All types of faults were considered in the time history search. The selected events included three reverse or reverse-oblique faults and four strike-slip faults. Pulse-type time histories were also included from the PEER database search as the site is considered a “near fault” site. The PEER database search results included one pulse-type ground motion record (Kocaeli Turkey 1999).

Table 6-3 Summary of Selected H1 Time Histories for USGS PSHA MCE_R Target Spectrum

Earthquake	Year	Magnitude	Station (H1)	R_{rup} (km)	V_{s30} (m/s)	5-95% Duration (sec)	Scaling Factor
Loma Prieta	1989	6.93	Gilroy - Gavilan Coll.	9.96	729.65	5	2.4816
Loma Prieta	1989	6.93	San Jose - Santa Teresa Hills	14.69	671.77	10.1	3.0761
Kocaeli_ Turkey	1999	7.51	Gebze	10.92	792	8.2	4.0588
Manjil_ Iran	1990	7.37	Abbar	12.55	723.95	29.1	1.7517
Hector Mine	1999	7.13	Hector	11.66	726	11.7	3.5928
Tottori_ Japan	2000	6.61	SMN015	9.12	616.55	9.9	4.556
Iwate_ Japan	2008	6.9	IWT010	16.27	825.83	22.6	3.3564

Table 6-4 Summary of Selected H1 Time Histories for USGS PSHA MCE$_G$ Target Spectrum

Earthquake	Year	Magnitude	Station (H1)	R_{rup} (km)	V_{s30} (m/s)	5-95% Duration (sec)	Scaling Factor
Loma Prieta	1989	6.93	Gilroy - Gavilan Coll.	9.96	729.65	5	2.3731
Loma Prieta	1989	6.93	San Jose - Santa Teresa Hills	14.69	671.77	10.1	2.9416
Northridge-01	1994	6.69	LA 00	19.07	706.22	8	2.9282
Kocaeli_ Turkey	1999	7.51	Gebze	10.92	792	8.2	3.8814
Manjil_ Iran	1990	7.37	Abbar	12.55	723.95	29.1	1.6751
Tottori_ Japan	2000	6.61	SMN015	9.12	616.55	9.9	4.3568
Iwate_ Japan	2008	6.9	IWT010	16.27	825.83	22.6	3.2096

6.4 Site Response Profile

The shear wave velocity profile was developed by fitting the measured shear-wave velocities based on the seismic CPT measurements to a depth of about 61 feet below grade and ReMi survey results from 0 to 175 feet below grade with the consideration of subsurface stratigraphy based on the soil borings and CPT soundings. Due to the limited number of methods used to measure the deep seismic data, the shear wave data collected at project site were compared with the shear wave velocity data measured from the ROSRINE project at the Receiver Station East (RSE) located further towards the center of the San Fernando Valley about 5 miles to the northwest of the site (Ahdi et al. 2017). Figure 6-7 compares the measured shear wave velocity data from the project site, the RSE site, and the shear wave velocity profile model developed for site response analysis. The shear wave velocity profile model in Figure 6-7 is then interpolated by using the computer program DEEPSOIL to subdivide the profile layers to meet a minimum passing frequency of 25 Hz. The total unit weight for the soil layers for the site response profile were developed based on the CPT correlations implemented in software program CPeT-IT (Version 3.3.1.15). To account for the uncertainties, deterministic lower bound (LB) and upper bound (UB) shear wave profiles were developed based on a coefficient of variation (COV) of 0.5 for shear modulus at a well characterized site in accordance with ASCE 4-16. Figure 6-8 presents the un-interpolated profile, the interpolated profiles achieve a minimum passing frequency of 25 Hz for the Best Estimate profile, the deterministic LB and UB profiles, and the measured seismic CPT data. This comparison shows that the COV of 0.5 covers a large portion of the measured data in the upper portions of the site. Table 6-5 presents the interpolated BE, LB and UB site response profiles.

Table 6-5 Interpolated Subsurface Soil Profile Model for Upper 175 Feet of the Site

Layer	Thickness (feet)	Total Unit Weight (pcf)	BE Vs (ft/s)	LB Vs (ft/s)	UB Vs (ft/s)
Layer 1	5	110	825	675	1010
Layer 2	5	110	825	675	1010
Layer 3	7.5	110	750	610	920
Layer 4	7.5	110	750	610	920
Layer 5	5	110	825	675	1010
Layer 6	7.5	125	881	720	1080
Layer 7	7.5	125	994	810	1215
Layer 8	5	125	1050	855	1285
Layer 9	10	125	1133	925	1390
Layer 10	10	125	1300	1060	1590
Layer 11	10	125	1467	1200	1795
Layer 12	15	125	1550	1265	1900
Layer 13	15	125	1550	1265	1900
Layer 14	15	125	1550	1265	1900
Layer 15	15	125	1550	1265	1900
Layer 16	15	125	1550	1265	1900

Ground improvement, such as Vibro stone columns (VSCs), may be performed to mitigate the liquefaction potential at site as discussed in Section 8. The impact to the site response profiles from a ground improvement program using VSCs with a replacement ratio (A_r) of 40 percent extended to a depth of 50 feet below grade is estimated based on the method established by Stuedlein et al. (2015). The A_r value of 40 percent is relatively large and considered as a possible upper limit for the site soil conditions based on engineering judgement and experience. Figure 6-9 presents the post ground improvement shear wave velocity profile compared to the measured data and the shear wave velocity profile under the existing condition. Table 6-6 presents the interpolated BE, LB, and UB site response profiles with consideration of impact from a ground improvement using VSCs with a replacement ratio of 40 percent. Figure 6-10 presents the post-improvement BE, LB, and UB shear wave velocity profiles.

Table 6-6 Interpolated Subsurface Soil Profile Model with Ground Improvement for Upper 175 Feet of the Site

Layer	Thickness (feet)	Total Unit Weight (pcf)	BE Vs (ft/s)	LB Vs (ft/s)	UB Vs (ft/s)
Layer 1	10	115	1020.0	835	1250
Layer 2	7.5	115	975.0	795	1195
Layer 3	7.5	115	975.0	795	1195
Layer 4	5	115	1020.0	835	1250
Layer 5	7.5	125	1053.8	860	1290
Layer 6	7.5	125	1121.3	915	1375
Layer 7	5	125	1155.0	945	1415
Layer 8	10	125	1220.8	995	1495
Layer 9	10	125	1352.5	1105	1655
Layer 10	10	125	1484.2	1210	1820
Layer 11	15	130	1550.0	1265	1900
Layer 12	15	130	1550.0	1265	1900
Layer 13	15	130	1550.0	1265	1900
Layer 14	15	130	1550.0	1265	1900
Layer 15	15	130	1550.0	1265	1900

6.5 Nonlinear Soil Properties and Sensitivity Analyses

The Generalized Quadratic/Hyperbolic (GQH) model with shear strength control (Groholski et al., 2016) based on discrete points from the modulus reduction and damping curves from EPRI (1993; 2013) were used for the TS-NL SRA. The EPRI curves were used for the site since they are intended to incorporate the effects of increased confining stress and represent the nonlinear response of cohesionless and low plasticity soils similar to the site soil conditions.

Prior to the final analyses, the following sensitivity analyses were performed to confirm the TS-NL SRA model is sufficient to produce reasonable results:

- Comparison of the use of the EPRI and Peninsular Range Modulus Reduction and Damping Curves.
- Evaluation of the impact of a deeper Site Class B/C boundary by extending the unimproved BE site response profile with an increasing velocity gradient through the lowest layer.

- Comparison of the amplification functions for the unimproved BE site response profile with different ground motion levels scaled to a PGA of 0.01g, 0.1g, and 0.5g.

The Peninsular Range modulus reduction and damping represent a subset of the EPRI curves where the 51 to 120 feet curves are applied to depths of 0 to 120 feet and the 501 to 1000 feet curves are applied to depths of 121 to 250 feet (EPRI, 2013). Figure 6-11 compares the amplification functions for the unimproved BE with the EPRI modulus reduction and damping curves, the improved BE with the EPRI modulus reduction and damping curves, and the unimproved BE with the Peninsular Range modulus reduction and damping curves. The comparison in Figure 6-11 shows that using the Peninsular Range curves results in a response for the site that is similar to the improved site response profile at shorter periods (less than 0.5 seconds) and similar to the EPRI curves at longer periods (0.5 to 10 seconds). This result is expected since the Peninsular Range curves should result in a more linear response that would be more similar to the improved profile at short periods. Based on this result, use of the unimproved and improved profiles with the EPRI curves is considered sufficient to represent uncertainty in the modulus reduction and damping.

As discussed in Section 6.4, data from an adjacent site further towards the center of the valley (ROSRINE Phase 4a) show lower shear wave velocities (less than 2500 feet per second) to greater depths. To evaluation the sensitivity of a potential deeper Site Class B/C boundary, another profile is constructed that extends the unimproved BE site response profile 25 feet deeper – consistent with the ReMi data from the site – with an increasing velocity gradient through the lowest layer. Figure 6-12 presents the existing unimproved BE shear-wave velocity profile with the extended shear-wave velocity profile. Figure 6-13 compares the amplification functions from the existing and the extended unimproved BE site response profiles. Although the deep seismic shear wave velocity data is limited for the project site, the results shows that small differences across the site in the depth to the Site Class B/C boundary, consistent with the ReMi data, will not significantly impact the results of the site response analysis.

Another sensitivity analysis was completed using the GQ/H nonlinear model and the EPRI modulus reduction and damping curves with an equivalent linear (EQL) model at multiple seismic loading levels (scaled to PGA of 0.01g, 0.1g, 0.5g, and the scaled values for the target bedrock spectrum). This analysis is intended to demonstrate similarities between the EQL and NL models at lower loading levels and divergence at higher loading levels. In addition, any differences due to fitting the EPRI modulus reduction and damping curves in DEEPSOIL for the GQ/H model can be documented. Figure 6-14 presents the amplification functions for the different models (EQL and NL) for the different levels of ground motion. For simplicity, only the results for time history “RSN763_LOMAP_GIL067” are presented. The results show reasonable agreement at low ground motion levels (0.01 g and 0.1g in the upper plots) for periods longer than about 0.1 seconds. At 0.1g, the values begin to diverge some between 0.1 and about 0.5 seconds but still exhibit similar amplification. The differences at these low loading levels are believed to primarily be due to the different characterization of the modulus reduction and damping between the GQ/H and discrete points of the EPRI curves. Based on the results of the sensitivity analyses, the prepared site response profiles in Section 6.4 and nonlinear material properties are considered sufficient to produce reasonable results.

6.6 TS-NL Site Specific Response Analysis Results

TS-NL SRA was completed using DEEPSOIL (Hashash et al., 2020) to determine the site-specific amplification functions from the Site Class B/C boundary to the ground surface at the project site, ground surface design response spectrum for the risk-targeted Maximum Considered Earthquake (MCE_R), the geometric-mean Maximum Considered Earthquake (MCE_G), the ground surface peak ground acceleration (PGA_M), and site-specific cyclic stress ratio for liquefaction analysis.

6.6.1 Site-Specific Design Response Spectrum

The site response analyses were performed for the unimproved and improved site response profiles for the BE, LB and UB shear wave velocity profiles using the seven (7) MCE_R ground motions. The three-point approximation of a normal distribution with weights of 0.4, 0.3, and 0.3 for the BE, LB, and UB profiles, respectively, were used to calculate the mean amplification function in accordance with EPRI (2013). Figures 6-15 and 6-16 present the BE, LB, UB, and the calculated mean amplification function for the unimproved and improved site response profiles, respectively. Figure 6-17 shows a comparison of the mean amplification functions for the unimproved and improved site response profiles. The envelope of these amplification functions – which changes at a period of 0.5 seconds – will be used to construct the site-specific design spectrum for the site. Therefore, the site-specific design spectrum should incorporate the existing and potentially improved site conditions as discussed in Section 6.4. Figure 6-17 also presents points that correspond to the MCE_R target response spectrum as discussed in Section 6.1. These enveloping amplification values were then applied to the bedrock MCE_R spectrum (Table 6-1) to calculate the site-specific ground surface spectrum as presented in Table 6-7. The site-specific values of MCE_R spectral response acceleration parameters for short periods (S_{MS}) and at 1 second (S_{M1}) were determined in accordance with Section 21.4 of ASCE 7-16.

Table 6-7 Site-Specific MCE_R Spectrum at the Ground Surface

Periods (s)	Bedrock MCE_R SA (g)	Enveloping Mean Spectral Ratio (-)	Ground Surface MCE_R SA (g)
0.01	0.909	0.8712	0.7919
0.1	2.043	0.7356	1.5029
0.2	2.204	0.7700	1.6970
0.3	1.85	1.0170	1.8814
0.5	1.374	1.3564	1.8637
0.75	1.035	1.8077	1.8710
1	0.803	1.8654	1.4979
2	0.361	1.5703	0.5669
3	0.226	1.2891	0.2913
4	0.164	1.1234	0.1842
5	0.131	1.0887	0.1426
Site-specific MCE_R spectral response acceleration parameters for short periods: S_{MS} (g) = 1.693 Site-specific MCE_R spectral response acceleration parameters for period of 1 second: S_{M1} (g) = 1.498			

Figure 6-18 compares the site-specific bedrock and ground surface MCE_R response spectra with the generic response spectra for Site Class D and E in accordance with CBC 2019 and ASCE 7-16. The code-based generic spectra are provided for comparison since the measured shear-wave velocities would indicate Site Class D, but the presence of potentially liquefiable soil would make Site Class E the appropriate comparison. As shown in Figure 6-18, the site-specific response spectrum at short periods – less than about 0.85 seconds – is intermediate between Site Class D and Site Class E. Beyond about 0.85 seconds, the site-specific ground surface spectrum is less than both site classes.

The site-specific design response spectrum is determined based on the site-specific MCE_R spectrum and the corresponding limits set for the appropriate seismic Site Class in accordance with Section 21.3 of ASCE 7-16. For this site, the Site Class is considered Site Class F without ground improvement due to potentially liquefiable soils. With ground improvement to mitigate soil liquefaction, the site class would likely be Site Class D. Thus, design response spectra for both scenarios shall be developed that meet the 80% requirement specified in the Section 21.3 of ASCE 7-16. The appropriate design response spectrum for final design should be based on the proposed mitigation strategy for the liquefiable soils at the site. The site-specific design response spectra with the 80% requirement for Site Class D and Site Class E from CBC 2019 and ASCE 7-16 are shown in Figure 6-19 with values provided in Table 6-8. Note the S_{MS} value of 1.693g in Table 6-7 was increased about 3 percent to 1.75g to avoid violating the 80% requirement at short periods (below T_0).

Table 6-8 Site-Specific Design Response Spectra for Site Classes D and E

Site Class D		Site Class E	
Seismic Design Parameters	**Value**	**Seismic Design Parameters**	**Value**
S_{DS} (g)	1.167	S_{DS} (g)	1.138
S_{D1} (g)	0.999	S_{D1} (g)	1.551
T_0 (s)	0.171	T_0 (s)	0.273
T_S (s)	0.856	T_S (s)	1.363
T_L (s)	8	T_L (s)	8

S_{DS} = Design earthquake spectral response acceleration parameters at short periods, 5% damped;
S_{D1} = Design earthquake spectral response acceleration parameters at 1-second period, 5% damped;
$T_0 = 0.2(S_{D1}/S_{DS})$, second;
$T_S = S_{D1}/S_{DS}$, second;
T_L = long-period transition period per Figures 22-14 through 22-17 of ASCE 7-16.

Period (s)	Spectral Acceleration (g)	Period (s)	Spectral Acceleration (g)
0.01	0.508	0.01	0.48
0.1	0.876	0.1	0.705
0.171	1.167	0.2	0.956
0.2	1.167	0.273	1.138
0.3	1.167	0.3	1.138
0.5	1.167	0.5	1.138
0.75	1.167	0.75	1.138
0.856	1.167	1	1.138
1	0.999	1.363	1.138
2	0.499	2	0.775
3	0.333	3	0.517
4	0.25	4	0.388
5	0.2	5	0.31
8	0.125	8	0.194
10	0.08	10	0.124

6.6.2 PGA$_M$ and Site-Specific Cyclic Stress Ratio

The MCE$_G$ analyses were completed to determine the site-specific F$_{PGA}$ and PGA$_M$ values for the site. Since these values are primarily for the evaluation of soil liquefaction, only the unimproved profiles are considered. Figure 6-20 present the BE, LB, UB, and the calculated mean amplification function for the unimproved soil profiles using the seven (7) MCE$_G$ ground motions. Similar to the MCE$_R$ analyses, the three-point approximation of a normal distribution with weights of 0.4, 0.3, and 0.3 for the BE, LB, and UB profiles, respectively, were used to calculate the mean amplification function. The mean amplification ratio at a period of 0.01 seconds – used for PGA – is 0.851 (shown as yellow circle in Figure 6-20). Applying this amplification factor to the MCE$_G$ spectral acceleration value of 0.9254g at 0.01 second results in a ground surface PGA$_M$ of 0.788g. In accordance with Section 21.5.3 of ASCE 7-16, the site-specific MCE$_G$ value shall not be taken as less than 80 percent of the PGA$_M$ determined from Section 11.8.3 of ASCE 7-16 based on the mapped MCE$_G$ peak ground acceleration and the site coefficient, F$_{PGA}$. As shown in Table 6-9, the PGA$_M$ for Site Class D and Site Class E is 1.007g. Therefore, the site-specific PGA$_M$ value was adjusted up from 0.788g to 0.806g to meet the 80% requirement in Section 21.5.3 of ASCE 7-16. This site-specific PGA$_M$ value can be used for liquefaction and soil strength evaluation in lieu of the mapped value MCE$_G$ peak ground acceleration adjusted for site effects as shown in Table 6-10.

Table 6-9 Site-Specific MCE$_G$ Peak Ground Acceleration

Seismic Design Parameter	Site Class D	Site Class E	Site Specific	Adjusted Site-Specific
MCE$_G$ peak ground acceleration for the site, PGA (g)	0.915	0.915	0.925	NA
Site coefficient, F$_{PGA}$	1.1	1.1	0.85	NA
MCE$_G$ peak ground acceleration for adjusted for site effects, PGA$_M$, (g)	1.007	1.007	0.788	0.806
NA: not applicable				

Table 6-10 Site-Specific PGA and Earthquake Magnitude for Liquefaction Analysis

Seismic Design Parameter	Value
PGA$_M$ (g)	0.806
M$_w$	6.95

The site-specific cyclic stress ratios (CSRs) were also determined in the TS-NL site response analysis using the MCE$_G$ ground motions. The site-specific CSR values for the unimproved BE, LB, and UB profiles are provided in Table 6-11. These values are mid-layer values for each layer for the design profile as shown in Table 6-6 calculated based on the geometric mean of the CSR values at the same depth from the seven (7) MCE$_G$ ground motion for the BE, LB, and UB profiles.

Table 6-11 Site-Specific CSR Values

Depth (ft)	Cyclic Stress Ratio		
	BE	LB	UB
2.5	0.75712	0.66370	0.89230
7.5	0.68287	0.59205	0.76764
13.75	0.65418	0.58321	0.73011
21.25	0.62455	0.53589	0.68719
27.5	0.60437	0.51933	0.65854
33.75	0.61347	0.52703	0.68147
41.25	0.64415	0.55331	0.72232
47.5	0.65576	0.56269	0.73551
55	0.66402	0.56612	0.75147
65	0.6765	0.57047	0.75931
75	0.68078	0.58028	0.7647
87.5	0.68358	0.58557	0.76217
102.5	0.68687	0.58527	0.77146
117.5	0.67622	0.58267	0.76542
132.5	0.6552	0.56219	0.75204
147.5	0.63367	0.54925	0.72748

7.0 Effective Stress-Based Liquefaction Analysis

An effective stress-nonlinear (ES-NL) SRA was completed as a continuation to the TS-NL SRA to evaluate the initiation of soil liquefaction, reconsolidation settlement in liquefiable soils, seismic compression above the water table, and the impact of liquefiable soils either at or near the site on the site-specific design response spectrum. Consistent with the TS-NL SRA, the same site response profiles and scaled ground motions were used in the ES-NL SRA complete using the program DEEPSOIL (Hashash et al., 2020). The primary difference between the TS-NL and ES-NL SRAs is the inclusion of a pore-water pressure (PWP) generation model to simulate the buildup of excess pore-water pressure (defined as the normalized excess pore water pressure ratio, $r_u = \Delta u/\sigma'_v$). Both the MCE_R and MCE_G ground motions were considered in the ES-NL SRA. The MCE_R ground motions were used exclusively to evaluate potential impacts to the design response spectrum and the MCE_G ground motions were used to evaluate the initiation and consequences of soil liquefaction.

7.1.1 Pore-Water Pressure (PWP) Generation Model

The PWP generation model of Mastasovic and Vucetic (1993; built on Vucetic and Dorby [1986]) for sands as implemented in DEEPSOIL is coupled with the GQ/H model. This combined model has been identified as the GQ/H + u model (e.g., Olson et al., 2020) where the GQ/H model is used to fit the modulus reduction and damping curves as well as the implied shear strength as described for the TS-NL SRA. The PWP generation model was defined for the sandy and low plasticity layers – which was considered to be all the layers of the site response profile based on the previous sections – using the model parameters (p, F, s) and the empirical correlations from Carlton (2014); a degradation parameter (v) and threshold shear strain (Υ_{tv}) based on measured values from similar soils summarized in Carlton (2014); and, multidirectional shaking (f=2). Parameters to define the dissipation and redistribution of excess PWP in the site response profiles were estimated from general values for a range of relative densities (D_r) in Olson et al. (2020) and estimates of the relative density in layers at the site. The dissipation parameters were used in a sensitivity analysis to evaluate the impact of pore pressure redistribution on the ES-NL SRA.

The empirical corrections of Carlton (2014) for the model parameters (F, s) depend on the shear-wave velocity (V_S) and the fines content (FC) of each layer. The shear-wave velocities established in the site response profiles (Section 6.4) were used to estimate the model parameter (F) in accordance with Carlton (2014). A fines content profile was developed based on measured values from subsurface investigations at the site. Figure 7-1 presents a plot of the measured fines content from the site with the model values assigned to each layer. These model values were used to estimate the fines content in each layer to establish the model parameter (s) in accordance with Carlton (2014). The shear-wave velocity, fines content and PWP model parameters for each layer below the water table (Layers 6 to 16) are provided in Table 7-1.

Similar to the previous model parameters, the relative density for each layer is needed to estimate the dissipation parameters and, later, to estimate the settlement from vibratory ground motions. Figure 7-2 presents the estimated relative densities from four of the deeper CPTs completed during the B&V subsurface investigation (BVS-201, BVS-203, BVS-204, and BVS-205). Figure 7-2 also presents the model relative density values that are considered the "Best Estimate" values for each layer. These relative density values are also presented in Table 7-1 with the interpolated values for the dissipation parameters. For layers below a depth of about 60 feet where the measured CPT data ended due to refusal, the relative density of 80 percent was assumed to extend to the total depth of site response profile based on the increasing measured shear-wave velocities. The dissipation parameters were interpolated from the range of relative densities – 30 percent of loose soil to 70 percent for dense soils – and the coefficients of consolidation (c_V) values of 0.066 to 0.328 ft^2/s (0.02 to 0.1 m^2/s) for loose to dense soils in accordance with Olson et al. (2020).

Table 7-1 PWP Model Parameters (BE V_S Values Only)

Layer	Thickness (feet)	D_r (%)	Fines Content (%)	BE Vs (ft/s)	c_V (ft^2/s)	v	f	p	F	s	γ_{tv} (%)
Layer 6	7.5	45	50	881	0.164	1	2	1	0.654	1.636	0.02
Layer 7	7.5	50	20	994	0.197	1	2	1	0.543	1.464	0.02
Layer 8	5	65	10	1050	0.295	1	2	1	0.499	1.350	0.02
Layer 9	10	70	10	1133	0.328	1	2	1	0.443	1.350	0.02
Layer 10	10	80	10	1300	0.394	1	2	1	0.358	1.350	0.02
Layer 11	10	80	10	1467	0.394	1	2	1	0.297	1.350	0.02
Layer 12	15	80	10	1550	0.394	1	2	1	0.273	1.350	0.02
Layer 13	15	80	10	1550	0.394	1	2	1	0.273	1.350	0.02
Layer 14	15	80	10	1550	0.394	1	2	1	0.273	1.350	0.02
Layer 15	15	80	10	1550	0.394	1	2	1	0.273	1.350	0.02
Layer 16	15	80	10	1550	0.394	1	2	1	0.273	1.350	0.02

A sensitivity analysis was completed to evaluate the impact of pore-pressure dissipation and redistribution on the results of the ES-NL SRA. This sensitivity analysis was completed using the unimproved, best estimate site response profile with and without pore-pressure dissipation and redistribution. This sensitivity analysis demonstrated that pore-pressure dissipation and redistribution does not significantly impact (less than 5 percent difference) the spectral ratio, excess pore pressures, or strains in the ES-NL SRA. Figure 7-3 presents the spectral ratios from the sensitivity analysis and shows minor differences at short periods. Based on this sensitivity analysis, pore-pressure dissipation and redistribution between the layers was not included in the subsequent analyses.

7.1.2 Modifications to the Site-Specific Design Response Spectrum

Three ES-NL SRAs were completed using the BE, LB, and UB site response profiles with the GQ/H + u model and the MCE_R ground motions to evaluate any potential impacts to the site-specific design response spectrum from liquefiable soils at or near the site. This analysis was completed in the same manner as the TS-NL SRA with the only difference being the inclusion of the PWP model.

Figure 7-4 presents a comparison of the mean amplification functions – all using the same three-point approximation of a normal distribution weights (0.4, 0.3, and 0.3) – to combine the three site response profiles for the unimproved and improved TS-NL SRA and the unimproved ES-NL SRA. This comparison demonstrates that the ES-NL SRA only controls the amplification function at periods longer than about 7 seconds. Thus, the value of S_{D1} based on the ES-NL SRA will not change and the site-specific design response spectra from the TS-NL SRA are confirmed to be applicable to the site.

7.1.3 Initiation of Soil Liquefaction

The ES-NL SRA allows the evaluation of the initiation of soil liquefaction by examining the excess pore-water pressure (r_u) and the associated increase in shear strain in each layer. To complete these evaluations, we use the r_u for the threshold for marginal liquefaction of 0.8 (Olson et al., 2020). Soil liquefaction and the associated reduction in shear strength and accumulation of shear strain is anticipated to be significant above a r_u of 0.8. Additionally, the increase in r_u is likely to be more gradual above a value of 0.8 in the PWP generation model.

Figure 7-5 presents the average shear strain profiles for the BE, LB, and UB site response profiles from the ES-NL SRA. The BE site response profile shows up to about 3.5 percent maximum strain in Layer 6, which is just below the water table and represents high r_u values and soil liquefaction. To better evaluate this larger maximum strain value, Figure 7-6 presents the r_u values versus time for all seven time histories in Layer 6. This comparison shows that four of the seven time histories quickly reach the threshold r_u value for marginal liquefaction of 0.8 and two time histories are approaching the threshold value at about 60 seconds. The threshold for marginal liquefaction is exceeded as the two time histories continue beyond 60 seconds. Only one time history maintains a r_u value below 0.8 and demonstrates that the ES-NL SRA indicates soil liquefaction in Layer 6 for the BE site response profile.

The plots of strain in Figure 7-5 illustrate layers where soil liquefaction is predicted. Specifically, soil liquefaction is predicted in Layer 6 of the BE site response profile and Layer 8 of the LB site response profile. This difference in the layer of predicted soil liquefaction is due to soil liquefaction occurring in Layer 8 and reducing the cyclic loading on Layer 6 for the LB sit response profile. In the BE site response profile, Layer 8 does not liquefy in most of the time histories and more cyclic loading occurs in Layer 6 that is slightly weaker. As described in Olson et al. (2020), large strains like those in the BE and LB site response profile may underestimate the ground surface response since the dilative soil response is not captured. This potential of underestimate is why the TS-NL and ES-NL SRA were combined to establish the site-specific design response spectrum previously. Soil liquefaction was not predicted in the UB site response profile; however, some time histories do reach the threshold for marginal liquefaction. This observation is true for the BE, LB, and UB site response profiles. Specifically, that different layers may liquefy for different time histories in the ES-NL SRA. The higher average strain values generally indicate the most common layer to liquefy in the analyses and the most likely layers to potentially liquefy during a seismic event. For this site, these layers generally agree well with the simplified, stress-based analyses that indicate liquefaction is likely during a seismic event in the upper 20 feet beneath the design water table at a depth of 30 feet.

7.1.4 Reconsolidation Settlement due to Soil Liquefaction

The reconsolidation settlement of potentially liquefiable layers in the site response analyses were evaluated following Idriss and Boulanger (2008). Specifically, the maximum shear strains (Υ_{max}) from the ES-NL SRA and the relative densities of each layer were used to estimate the volumetric strain (ε_v) in each layer. This was then integrated over the soil column to estimate the total settlement.

Table 7-2 presents the layers, the Υ_{max} values presented in Figure 7-5, and the D_r values. These values are used to estimate the ε_v and the associated settlement (S) within each model layer below the water table. These estimates indicate between about 1.2 and 3.1 inches of reconsolidation settlement should be anticipated in the layers below the water table. The majority of the settlement (about 70 to 80 percent) is expected to occur in the upper 20 feet below the water table. Small amounts of reconsolidation settlement may be expected in the deeper soil layers from smaller shear strains.

Table 7-2 Reconsolidation Settlement Estimates due to Soil Liquefaction (inches)

Layer	Thickness (feet)	D_r (%)	BE			LB			UB		
			γ_{max} (%)	ε_v (%)	S (in)	γ_{max} (%)	ε_v (%)	S (in)	γ_{max} (%)	ε_v (%)	S (in)
Layer 6	7.5	45	3.4353	1.67	1.51	0.8284	0.40	0.36	0.8563	0.42	0.38
Layer 7	7.5	50	1.3872	0.60	0.54	1.3493	0.58	0.52	0.6862	0.29	0.27
Layer 8	5	65	1.4750	0.44	0.26	9.9257	2.36	1.42	0.8530	0.25	0.15
Layer 9	10	70	0.2604	0.07	0.08	0.3492	0.09	0.11	0.1949	0.05	0.06
Layer 10	10	80	0.2056	0.04	0.05	0.2697	0.05	0.07	0.1456	0.03	0.04
Layer 11	10	80	0.1590	0.03	0.04	0.2260	0.05	0.06	0.1080	0.02	0.03
Layer 12	15	80	0.1545	0.03	0.06	0.2140	0.04	0.08	0.1016	0.02	0.04
Layer 13	15	80	0.2136	0.04	0.08	0.3091	0.06	0.11	0.1372	0.03	0.05
Layer 14	15	80	0.2737	0.06	0.10	0.4020	0.08	0.15	0.1787	0.04	0.07
Layer 15	15	80	0.2268	0.05	0.08	0.3103	0.06	0.11	0.1615	0.03	0.06
Layer 16	15	80	0.2587	0.05	0.09	0.3657	0.07	0.13	0.1755	0.04	0.06
Total Settlement (inches):					2.89			3.12			1.19

7.1.5 Seismic Compression due to Vibratory Ground Motion

Seismic compression of partially saturated or unsaturated layers above the water table is also considered using the shear strains from the ES-NL SRA. Since the certainty of models to estimate seismic compression is less robust than reconsolidation settlement, multiple models are used to account for uncertainty in estimates of ε_v and S. Specifically, the model of Yi (2010), Duku et al. (2008), and Yee et al. (2014) were used. The model of Yi (2010) is based on the work of Seed and Silver (1972) that was advanced by Tokimatsu and Seed (1987). The models of Duku et al. (2008) and Yee et al. (2014) are related studies that expanded the available data related to seismic compression. The model from Duku et al. (2008) is intended for "clean" sands while Yee et al. (2014) incorporated additional factors that included a correction for fines content. Additionally, all three models consider the D_r value and the Duku et al. (2008) and Yee et al. (2014) models also include a magnitude scaling factor based on the estimated number of equivalent cycles (N) for an earthquake.

The method of Liu et al. (2001) was used to estimate the value of N. For a magnitude 6.95 earthquake at a distance of about 8.5 km, this results in a value of almost 16 cycles (N = 15.9). This N value is larger than the historical estimated for similar magnitudes, but reflects the updated database, site conditions, and distance component identified in the study by Liu et al. (2001). An N of 15.9 is used in the subsequent calculations of seismic compression.

All three methods include a factor of two that doubles the initial estimate to account for multidirectional shaking that would occur during an earthquake.

The results from the method of Yi (2010) produce a range of values from about 1.3 to 1.7 inches for the BE, LB, and UB site response profiles (Table 7-3). This range of values is lower since the largest values in Layers 3 to 5 are typically above the limiting ε_v value ($\varepsilon_{v,lim}$). This $\varepsilon_{v,lim}$ value is a correction to previous methods to prohibit unreasonably large settlements caused by either very large ground motions or very loose sand. For the site, the large ground motions appear to be the primary reason for large estimates of ε_v without a limit. Therefore, the range of values is due to differences in shear strains and the layers that have smaller amounts of seismic compression where the $\varepsilon_{v,lim}$ does not apply.

Table 7-3 Seismic Compression Settlement Estimates (inches) Using Yi (2010)

				BE			LB			UB		
Layer	Thickness (feet)	D_r (%)	Fines Content (%)	γ_{max} (%)	ε_v (%)	S (in)	γ_{max} (%)	ε_v (%)	S (in)	γ_{max} (%)	ε_v (%)	S (in)
Layer 1	5.0	80	35	0.012	0.00	0.00	0.016	0.01	0.00	0.009	0.00	0.00
Layer 2	5.0	70	20	0.073	0.03	0.02	0.101	0.04	0.03	0.039	0.02	0.01
Layer 3	7.5	45	20	0.529	0.44	0.39	0.721	0.59	0.54	0.454	0.37	0.34
Layer 4	7.5	40	40	0.696	0.65	0.59	0.761	0.71	0.64	0.661	0.62	0.56
Layer 5	5.0	35	45	0.711	0.75	0.45	0.712	0.75	0.45	0.672	0.71	0.43
Total Settlement (inches):						1.45			1.66			1.33

The method of Duku et al. (2008) produces a range of values from about 5.3 to 7.0 inches of seismic compression settlement (Table 7-4). These estimates are valid for clean sands that are defined as less than 10 percent fines based on the results of Yee et al. (2014). As shown in Table 7-4, all of the layers have a fines content greater than 10 percent. However, there are a limited number of measurements from the site that indicate less than 10 percent fines (Figure 7-1). Based on this observation, the model of Duku et al. (2009) should be considered as a model that is less likely to represent the site conditions.

Table 7-4 Seismic Compression Settlement Estimates (inches) Using Duku et al. (2008)

Layer	Thickness (feet)	D_r (%)	Fine Content (%)	BE			LB			UB		
				γ_{max} (%)	ε_v (%)	S (in)	γ_{max} (%)	ε_v (%)	S (in)	γ_{max} (%)	ε_v (%)	S (in)
Layer 1	5.0	80	35	0.012	0.00	0.00	0.016	0.00	0.00	0.009	0.00	0.00
Layer 2	5.0	70	20	0.073	0.09	0.05	0.101	0.14	0.08	0.039	0.02	0.01
Layer 3	7.5	45	20	0.529	1.90	1.71	0.721	2.79	2.51	0.454	1.57	1.42
Layer 4	7.5	40	40	0.696	2.65	2.38	0.761	2.95	2.66	0.661	2.48	2.23
Layer 5	5.0	35	45	0.711	2.83	1.70	0.712	2.83	1.70	0.672	2.64	1.58
Total Settlement (inches):						5.84			6.96			5.25

Table 7-5 presents a range of seismic compression estimates from about 2.3 to 3.2 inches using the method of Yee et al. (2014). This estimate of settlement from seismic compression is considered most likely to represent the site conditions since it includes the influence of fines in the soils. This range of estimates is lower than the other estimates using other methods and data (e.g., CPT, SPT, etc.). A correction for saturation has not been applied in Table 7-5. This is because the saturation of state of the soil is likely variable and the relationship is considered the least well constrained (Yee et al., 2014). Applying a less well constrained saturation correction without sufficient data that would potentially lower the settlement estimates further is not considered conservative. From the three methods used to evaluate the seismic compression using the shear strains from the ES-NL SRA, the results from the method by Yee et al. (2014) is recommended since it is based on the most data more rigorous analysis.

Table 7-5 Seismic Compression Settlement Estimates (inches) Using Yee et al. (2014)

Layer	Thickness (feet)	D_r (%)	Fine Content (%)	BE			LB			UB		
				γ_{max} (%)	ε_v (%)	S (in)	γ_{max} (%)	ε_v (%)	S (in)	γ_{max} (%)	ε_v (%)	S (in)
Layer 1	5.0	80	35	0.012	0.00	0.00	0.016	0.00	0.00	0.009	0.00	0.00
Layer 2	5.0	70	20	0.073	0.06	0.03	0.101	0.09	0.06	0.039	0.02	0.01
Layer 3	7.5	45	20	0.529	1.25	1.12	0.721	1.83	1.65	0.454	1.03	0.93
Layer 4	7.5	40	40	0.696	0.92	0.83	0.761	1.03	0.93	0.661	0.87	0.78
Layer 5	5.0	35	45	0.711	0.99	0.59	0.712	0.99	0.59	0.672	0.92	0.55
Total Settlement (inches):						2.58			3.23			2.27

8.0 Conclusions and Recommendations

Liquefaction triggering and hazard analyses were performed using all available geotechnical data including CPT, SPT, and V_S data with multiple methods based on the seismic design parameters determined in accordance with the CBC 2019 Section 1803.5.12 and ASCE 7-16 Section 11.8.3. These methods include the simplified stress-based approaches as well as liquefaction triggering based on ES-NL SRA using the normalized excess pore-water pressure ratio above 0.8 as the criteria to indicate marginal liquefaction. The ES-NL SRA generally agrees with the results from the simplified stress-based approaches. Liquefiable soils were found to exist under a large portion of the site. The liquefaction zones are discontinuous and vary in thickness from about 30 to more than 50 feet below grade. The liquefiable soil zones appear to be thicker and more continuous along the perimeter of the site close to the Verdugo Wash drainage channel than the interior portion of the site where the major equipment and structures will be located.

Due to the presence of liquefiable soils, the project site shall be classified as Site Class F in accordance with ASCE 7-16 Section 20.1. A site-specific ground motion analysis in accordance with ASCE 7-16 Section 21 was completed to establish the design response spectrum for both Site Class F conditions that currently exist and the Site Class D conditions if the liquefiable soils are successfully mitigated by a ground improvement program. An ES-NL SRA was also completed with the MCE_R ground motions to evaluate any potential impacts to the site-specific design response spectrum from liquefiable soils at or near the site. It was confirmed that the site-specific design response spectra from the TS-NL SRA is applicable to the site.

The estimated liquefaction induced settlement across the site range from zero to about 7 inches with an average of 1.5 to 2.5 inches based on the simplified stress-based methods. The site-specific ES-NL SRA indicates about 1.2 and 3.1 inches of reconsolidation settlement of potentially liquefiable layers below the water table. The liquefaction severity indices such as LPI and LSN showed the site has generally low to moderate risk for liquefaction damage potential with the highest liquefaction damage potential located on the plant east where the site is underlain by relatively thicker fills. Unless the liquefaction is mitigated, deep foundations will be required to support the structures with downdrag loads considered in accordance with ASCE 7-16 section 12.13.9.3.

Based on the site topography and the Verdugo Wash drainage channel to the south, the potential for lateral spread was evaluated. The estimated horizonal lateral spread deformation ranged from zero to 5 feet; but, generally less than 2 feet. The lateral spread hazard is not continuous throughout the site and the elevation of the liquefiable zones contribute to lateral spread deformation vary from location to location. Therefore, the risk of continuous, downslope deformation and surface manifestation including ground fissure is considered low. However, unless the liquefaction is mitigated, the downslope loads from the soil to the piles and pile cap need to be considered due to the lateral spread deformation of localized liquefiable zones.

Since this project has a design Risk Category III, the consideration of the seismic compression settlement is not required by the CBC. However, the seismic compression settlement was evaluated for information and comparison purpose based on the seismic demand in accordance with CBC 2019 for all available geotechnical data. The calculated seismic compression based on the CPT data are in the range from 0 to 11.4 inches with an average value of 4.3 inches while the estimated seismic compression based on the SPT data are in the range from 0.7 to 7.1 inches with an average value of 2.6 inches. The ES-NL SRA also evaluated seismic compression and determined about 2.3 to 3.2 inches of settlement should be anticipated. Ground improvement to mitigate soil liquefaction settlement is anticipated to also reduce seismic compression.

Based on limited laboratory testing, fine-grained soils at the site may also be subject to liquefaction or cyclic softening. If the liquefaction potential is not mitigated, proper residual shear strength values should be evaluated for both coarse-grained and fine-grained soils that are subjected to strength loss due to liquefaction or cyclic softening in accordance with the state of practice procedures outlined in NAP (2016). Ground improvement to mitigate liquefiable sand is anticipated to also mitigate cyclic softening.

There are two general design approaches to address the liquefaction hazards found at the site: 1) design the structures to resist the liquefaction hazards; or 2) use ground improvement to mitigate the liquefaction potential and reduce the liquefaction hazards associated with liquefiable soils to a tolerable level. The typical structural measures that can resist the liquefaction hazards include the use of deep foundations, well reinforced mat foundations, and footings interconnected with ties. However, because the estimated lateral spread deformation for the site exceeds the upper limit of 12 inches for Risk Category III structures according to ASCE 7-16 Table 12.13-2, deep foundations are required to be used. In addition, the deep foundations and the structures shall be designed to accommodate the effects of liquefaction in accordance with the requirements in ASCE 7-16 Section 12.13.9.3 including the consideration of downdrag, the additional loading due to the lateral spreading, and the special detailing requirements if concrete piles including cast-in-place and precast piles are used in accordance with Sections 18.7.5.2 through 18.7.5.4 of ACI 318 from the top of pile to a depth exceeding that of the deepest liquefiable soil by at least seven (7) diameters.

As an alternative solution, soil improvement can be performed to mitigate the liquefaction potential and reduce the liquefaction hazards (e.g., seismic induced settlement and lateral deformation) to a level that the structures can tolerate and below the upper limit specified in the building code (e.g., ASCE 7-16 Table 12.13-2). Many ground improvement methods are available for liquefaction mitigation as described in California Geological Survey (CGS) Special Publication 117A (SP-117A) “Guidelines for Evaluating and Mitigating Seismic Hazard in California”. Vibro stone columns (VSCs) is recommended as it is likely the most cost-effective method with the consideration of soil type and required treatment depth. Rammed Aggregate Piers (RAPs) provide similar benefits as VSCs but typically treatment is cost-effective up to 35 feet below grade (ASCE 2007). Ground improvement techniques involved with grouting and cementation, such as deep soil mixing, and jet grouting, have significantly higher cost compared with VSCs. Dynamic compaction and vibro compaction have lower cost but may not effectively treat the soils at the site due to the relatively high fine contents. If the VSCs is selected for ground improvement method to treat the liquefaction potential at the site, the design construction, testing and inspection shall satisfy the requirements specified in CBC 2019 Sections 1813.2 through 1813.5.

With the consideration of the potential soil liquefaction induced hazards at the project site, the design approach of using deep foundations to resist the liquefaction hazards in accordance with requirements in ASCE 7-16 Section 12.13.9.3 would be more costly. The design approach of using ground improvement method, such as VSCs, to mitigate the liquefaction hazards is recommended.

9.0 Responses to the Nelson Letter Requests

This section provides responses to the requests included in the Nelson Letter regarding the necessary information to meet the current code requirements for sites with liquefiable soils.

i) A ground motion hazard study: due to the presence of liquefiable soils, the project site shall be classified as Site Class F and a site-specific response analysis was performed in accordance with CBC 2019 and Chapter 21 of ASCE 7-16. A TS-NL SRA was completed to determine the site-specific amplification functions from the Site Class B/C boundary to the ground surface at the project site, ground surface design response spectrum for the risk-targeted Maximum Considered Earthquake (MCE_R), the geometric-mean Maximum Considered Earthquake (MCE_G), the ground surface peak ground acceleration (PGA_M), and site-specific cyclic stress ratio for liquefaction analysis. The site-specific design response spectrum was determined based on the site-specific MCE_R spectrum the corresponding limits set for the appropriate seismic Site Class in accordance with Section 21.3 of ASCE 7-16 for two design scenarios: (1) Site Class F without ground improvement due to potentially liquefiable soils, and (2) Site Class D with the soil liquefaction being mitigated by ground improvement. An ES-NL SRA was also completed with the MCE_R ground motions to evaluate any potential impacts to the site-specific design response spectrum from liquefiable soils at or near the site. It was confirmed that the site-specific design response spectra from the TS-NL SRA is applicable to the site.

ii) Additional data due to liquefaction effects and consequences:

(1) Soil strength loss: the soils at the site are evaluated to be susceptible to liquefaction or cyclic softening under the seismic demand in accordance with CBC 2019 and ASCE 7-16. If the liquefaction potential is not mitigated, proper residual shear strength values should be evaluated for both coarse-grained and fine-grained soils that are subjected to strength loss due to liquefaction or cyclic softening in accordance with the state of practice procedures outlined in NAP (2016);

(2) Lateral soil movement: the horizontal deformation due to the lateral spreading of gently sloping ground towards the Verdugo Wash drainage channel was estimated to be in the range from zero to 5 feet but generally less than 2 feet. The lateral spread hazard is not continuous throughout the site and the elevation of the liquefiable zones contribute to lateral spread deformation vary from location to location due to the spatial variability of the liquefiable zones as shown in Figures 5-5 and 5-6.

(3) Lateral soil loads on foundations: the effect of the additional kinematic loading from permanent lateral ground deformation on the deep foundation due to the lateral spreading should be considered in the design. The kinematic pile loading from permanent lateral spread ground deformation may be calculated in accordance with CBC 2019 Section 3106F.10.2 by imposing the lateral spread displacement of the liquefied soil and overlying crust layer to the piles through

nonlinear soil springs using the p-y method. In accordance with ASCE 7-16 Section 12.13.9.3.4, the pile deformation under the kinematic loading due to lateral spread shall not result in loss of the pile's ability to carry gravity loads, nor shall the reduced pile lateral strength be less than 67 percent of the undamaged nominal strength.

(4) Reduction in foundation soil bearing capacity and lateral soil reaction from liquefaction: the downdrag load due to the liquefiable soil shall be assessed at the ultimate level in accordance with ASCE 7-16 section 12.13.9.3. The reduced lateral resistance of the liquefiable soils should be considered in the design by using appropriate soil models, e.g., the p-y criteria for liquefiable sand developed by Rollins et al (2005). If concrete piles are used including cast-in-place and precast piles, the structural design of the piles shall meet the special detailing requirements in accordance with Sections 18.7.5.2 through 18.7.5.4 of ACI 318 from the top of pile to a depth exceeding that of the deepest liquefiable soil by at least seven (7) diameters.

(5) Lateral deformations (including permanent) to occur, with depths of where the deformations are expected: the permanent lateral ground deformation occur in the zone of liquefiable soils at a depth range from 30 to 60 feet below the existing grade.

(6) Location(s) of unsupported pile lengths: in accordance with CBC 2019 Section 1810.2.1, the pile segment embedded in liquefiable soil shall be considered unsupported until a point 5 feet into stiff soil or 10 feet into soft soil to prevent buckling of piles. The locations and the dimensions (depth and length) of the unsupported length of pile can be determined based on the liquefiable zones presented in the liquefaction cross sections in Figures 5-5 and 5-6.

10.0 References

1. CBC, 2019 California Building Code, California Building Standards Commission.
2. ASCE 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures, American Society of Civil Engineers, 2017.
3. ASCE Hazard Tool, https://asce7hazardtool.online/, accessed on January 4, 2021.
4. ASCE 4-16, Seismic Analysis of Safety-Related Nuclear Structures, American Society of Civil Engineers, 2017.
5. ASCE, Highway Innovative Technology Evaluation Center, Technical Evaluation Report: Evaluation of Geopier Rammed Aggregate Piers: Technical Evaluation Report, 2007;
6. Ahdi, S.K., J.P. Stewart, T.D. Ancheta, D.Y. Kwak, and D. Mitra, Development of Vs profile database and proxy-based models for Vs30 prediction in the Pacific Northwest region of North America, Bull. Seis. Soc. Am., 107(4), 1781-1801, 2017, available at: https://uclageo.com/VPDB/login/index.php.
7. Andrus, Hayati, and Mohanan, Correlating Liquefaction Resistance for Aged Sands using Measured to Estimated Velocity Ratio, Journal of Geotechnical and Geoenvironmental Engineering, 135(6).
8. Boulanger, R. W., and I. M. Idriss. 2006. “Liquefaction Susceptibility Criteria for Silts and Clays,” ASCE Journal of Geotechnical and Geoenvironmental Engineering, 132(11).
9. Boulanger, R.W., and I.M. Idriss. 2014. CPT and SPT based liquefaction triggering procedures. Report No. UCD/CGM-14/01. Center for Geotechnical Modeling, Department of Civil and Environmental Engineering, University of California, Davis. 134 pp.
10. Bray, J. D., and R. B. Sancio. 2006. “Assessment of the Liquefaction Susceptibility of Fine-Grained Soils,” ASCE Journal of Geotechnical and Geoenvironmental Engineering, 132(9).
11. California Earthquake Hazards Zone Application, available at: https://www.conservation.ca.gov/cgs/geohazards/eq-zapp, accessed on 8/21/2020.
12. California Geological Survey - Note 48, Checklist for the Review of Engineering Geology and Seismology Reports for California Public Schools, Hospitals, and Essential Services Buildings, November 2019.
13. California Geological Survey (CGS), Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction In California, March 1999.
14. California Geological Survey (CGS), Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California, Guidelines for Analyzing and Mitigating Liquefaction in California, 2008.
15. Carlton, B., “An Improved Description of the Seismic Response of Sites with High Plasticity Soils, Organic Clays, and Deep Soft Soil Deposits,” Ph.D. dissertation, Department of Civil and Environment Engineering, University of California, 2014.
16. Department of Conservation State of California, Division of Mines and Geology, Seismic Hazard Zone Report 016, Seismic Hazard Zone Report for the Burbank 7.5-Minute Quadrangle, Los Angeles County, California, 1998.

17. Duku, PM, JP Stewart, DH Whang, and E Yee (2008). Volumetric strains of clean sands subject to cyclic loads, J. Geotech. & Geoenv. Engrg., ASCE, 134 (8), 1073-108.

18. Electric Power Research Institute, “Guidelines for Determining Design Basis Ground Motions,” Final Report, EPRI TR-102293, Volume 4, Palo Alto, CA, November 1993.

19. EPRI, Seismic Evaluation Guidance: Screening Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendations 2.1: Seismic, Report 1025287, 2013.

20. Field, E.H., Arrowsmith, R.J., Biasi, G.P., et al., Uniform California earthquake rupture forecast, version3 (UCERF3) — The time-independent model, Bulletin of the Seismological Society of America 104(3): pp 1122–1180, 2014.

21. Groholski, D., Hashash, Y., Kim, B., Musgrove, M., Harmon, J., and Stewart, J., "Simplified Model for Small-Strain Nonlinearity and Strength in 1D Seismic Site Response Analysis," Journal of Geotechnical & Geoenvironmental Engineering, Vol. 142 (9), September 2016.

22. Hashash, Y.M.A., Musgrove, M.I., Harmon, J.A., Ilhan, O., Xing, G., Groholski, D.R., Phillips, C.A., and Park, D., “DEEPSOIL 7.0, User Manual,” Urbana, IL, Board of Trustees of University of Illinois at Urbana-Champaign, 2020.

23. Idriss, I.M., and Boulanger, R.W., Soil Liquefaction during Earthquakes, Earthquake Engineering Research Institute (EERI), MNO-12, 2008.

24. Ishihara, K., and M. Yoshimine, 1992. Evaluation of settlements in sand deposits following liquefaction during earthquakes, Soils and Foundations 32(1), 173–188.

25. Iwasaki, T., F. Tatsuoka, K. Tokida, and S. Yasuda. 1978. A practical method for assessing soil liquefaction potential based on case studies at various sites in Japan. Pp. 885–896 in Proceedings of the 2nd International Conference on Microzonation, San Francisco, California.

26. Kayen, R.R., R.E.S. Moss, E.R. Thompson, R.B. Seed, K.O. Cetin, A. Derkiureghian, Y. Tanaka, and K. Tokimatsu. 2013. Shear wave velocity-based probabilistic and deterministic assessment of seismic soil liquefaction potential. Journal of Geotechnical and Geoenvironmental Engineering 139(3):407–419.

27. Kehoe Testing & Engineering, Summary of Cone Penetration Test Data, Grayson Repowering, prepared for Terracon Consultants, Inc., September 14 & 18, 2020.

28. Kramer, S.L., Geotechnical Earthquake Engineering, 1996.

29. Liu, A.H., Stewart, J.P., Abrahamson, N.A., and Moriwaki, Y., Equivalent Number of Uniform Stress Cycles for Soil Liquefaction Analysis, Journal of Geotechnical and Geoenvironmental Engineering, Vol. 127, Issue 12, December 2001.

30. Matasovic, N., and Vucetic, M., Cyclic Characterization of Liquefiable Sands, ASCE Journal of Geotechnical and Geoenvironmental Engineering, Vol. 119, No. 11, 1993.

31. Moss, R.E.S., R.B. Seed, R.E. Kayen, J.P. Stewart, A. Der Kiureghian, and K.O. Cetin. 2006. CPT-based probabilistic and deterministic assessment of in situ seismic soil liquefaction potential. Journal of Geotechnical and Geoenvironmental Engineering 132(8):1032–1051.

32. National Academies of Sciences, Engineering, and Medicine (2016), State of the Art and Practice in the Assessment of Earthquake-Induced Soil Liquefaction and Its Consequences. Washington, DC: The National Academies Press (NAP).

33. National Earthquake Hazards Reduction Program (NEHRP), Recommended Seismic Provisions for New Buildings and Other Structures, 2009 Edition, Resource Paper 12, “Evaluation of Geologic Hazards and Determination of Seismic Lateral Earth Pressures”.

34. Olson, S.M., Mei, X., and Hashash, Y.M.A., Nonlinear Site Response Analysis with Pore-Water Pressure Generation for Liquefaction Triggering Evaluation, Journal of Geotechnical and Geoenvironmental Engineering, Vol. 146, Issue 2, February 2020.

35. PEER NGA-West2 Database: https://ngawest2.berkeley.edu/, accessed on January 7, 2021.

36. Petersen, M.D., Moschetti, M.P., Powers, P.M., Mueller, C.S., Haller, K.M., Frankel, A.D., Zeng, Y., Rezaeian, S., Harmsen, S.C., N., Boyd, Field, Chen, R., Rukstales, K.S., Luco, N., Wheeler, R.L., Williams, R.A., and Olsen, A.H., Documentation for the 2014 Update of the United States National Seismic Hazard Maps, U.S. Geological Survey Open-File Report 2014-1091, p 243, 2014.

37. Petersen, M.D., Shumway, A.M., Powers, P.M., Mueller, C.S., Moschetti, M.P., Frankel, A.D., Rezaeian, S., McNamara, D.E., Luco, N., Boyd, O.S., Rukstales, K.S., Jaiswal, K.S., Thompson, E.M., Hoover, S.M., Clayton, B.S., Field, E.H., and Zeng, Y., The 2018 update of the US National Seismic Hazard Model: Overview of model and implications, EERI Earthquake Spectra, Vol 36(1), pp 5-41, 2020.

38. P. K. Robertson and K.L. Cabal, Guide to Cone Penetration Testing for Geotechnical Engineering, 6th Edition, 2015.

39. Pradel D. 1998. Procedure to evaluate earthquake-induced settlements in dry sandy soils, J. Geotech. & Geoenv. Engrg., ASCE, 124 (4), 364-368.

40. Public Works, Los Angeles County Groundwater wells online database, https://dpw.lacounty.gov/general/wells/#, accessed on 8/24/2020.

41. Pyke R., H.B. Seed, C.K. Chan, 1975. Settlement of sands under multidirectional shaking, J. Geotech. Engrg., ASCE, 101 (4), 379-398.

42. Robertson, P.K. and Shao, L., Estimation of Seismic Compression in Dry Soils Using the CPT, Fifth International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, 2010.

43. Rollins, K.M., Gerber, T.M., Lane, J.D., and Ashford, S.A. (2005), Lateral Resistance of a Full-Scale Pile Group in Liquefied Sand, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, Vol. 131, No. 1, 115-125.

44. Seed, H.B. and Silver, M.L. (1972). “Settlement of dry sands during earthquakes,” J. Soil. Mechanics and Foundations Div., ASCE, 98 (4), 381-397

45. Seed, R.B., K.O. Cetin, R.E.S. Moss, A.M. Kammerer, J. Wu, J.M. Pestana, M.F. Riemer, R.B. Sancio, J.D. Bray, R.E. Kayen, and A. Faris. 2003. Recent Advances in Soil Engineering: A Unified and Consistent Framework. Earthquake Engineering Research Center Report No. EERC 2003-06. University of California, Berkeley.

46. Silver, M.L. and Seed, H.B. (1971). “Volume changes in sands during cyclic loading.” J. Soil Mech. Found. Div., 97(SM9), 1171–1182.

47. Software user’s manual and online help files for CPeT-IT/V3.3.1.15, CLiq/V3.0.3.4, LiqSVs/V2.0.2.1, available at https://geologismiki.gr/support/.

48. Stantec Consulting Services, Inc., Geotechnical Investigation Report, Grayson Power Plant, Glendale, California, 2016.

49. Stuedlein, A., Abdollahi, A., Mason, H.B., and French, R., Shear Wave Velocity Measurements of Stone Column Improved Ground and Effect on Site Response, in Proceedings of the International Foundations Congress and Equipment Expo 2015, American Society of Civil Engineers, pp 2306-2317, 2015.

50. Terracon Consultant Inc., Summary of Laboratory Results, submittal transmitted via email “CB205080 Grayson Lab Results Final.pdf” from Askew, Keith P Keith.Askew@terracon.com (Terracon) Tue 10/13/2020 2:33 PM.

51. Terracon Consultants, Inc., Re: SPT Automatic Hammer Energy Calibration Report Terracon Drill Rig 508; Diedrich D-90, Terracon Project Number: BGXX0500, May 14, 2019.

52. Tokimatsu, K. and H.B. Seed, 1987. Evaluation of settlements in sands due to earthquake shaking, J. Geot. Engrg., 113 (8), 861-878.

53. URS, Geotechnical Investigation Report, Proposed New Combustion Turbine Generator Grayson Power Plant, 2002.

54. USGS DEM data from the USGS 3D Elevation Program (3DEP), https://apps.nationalmap.gov/3depdem/, accessed on 08/25/2020.

55. USGS Unified Hazard Tool, https://earthquake.usgs.gov/hazards/interactive/, accessed on January 4, 2021.

56. van Ballegooy, S., P.J. Malan, M.E. Jacka, V.I.M.F. Lacrosse, J.R. Leeves, and J.E. Lyth. 2012. Methods for Characterizing Effects of Liquefaction in Terms of Damage Severity. In Proceedings of the 15th World Conference on Earthquake Engineering, Lisbon, Portugal.

57. Vucetic, M., and R. Dobry, *Pore pressure build-up and liquefaction at level sandy sites during earthquakes*, Research Report No. CE-86-3. Troy, NY: Department of Civil Engineering, Rensselaer Polytechnic Institute, 1986.

58. Waldemar S. Nelson and Company, Inc., Memorandum, subject: Grayson Power Plant – Geotechnical Report, 25-February-2020.

59. Yee, E., Duku, P. M., and Stewart, J. P. (2014). Cyclic volumetric strain behavior of sands with fines of low plasticity, J. Geotech. & Geoenv. Engrg., ASCE, 140(4).

60. Yi, F., Procedure to Evaluate Seismic Settlement in Dry Sand Based on Shear Wave Velocity, 9th US National and 10th Canadian Conference on Earthquake Engineering, July 25-29, 2010.

61. Youd, T.L., et al., "Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils," Journal of Geotechnical and GeoEnvironmental Engineering, Vol. 127, No. 10, October 2001, pp. 817-833.

62. Zhang, G., P. K. Robertson, and R. W. I. Brachman, Estimating Liquefaction-Induced Ground Settlements from CPT, Canadian Geotechnical Journal, Vol. 39, 2002.

63. Zhang, G., P. K. Robertson, and R. W. I. Brachman, Estimating Liquefaction-Induced Lateral Displacements Using the Standard Penetration Test or Cone Penetration Test, Journal of Geotechnical and Geoenvironmental Engineering, Vol. 130 NO. 8, August 2004.

Figures

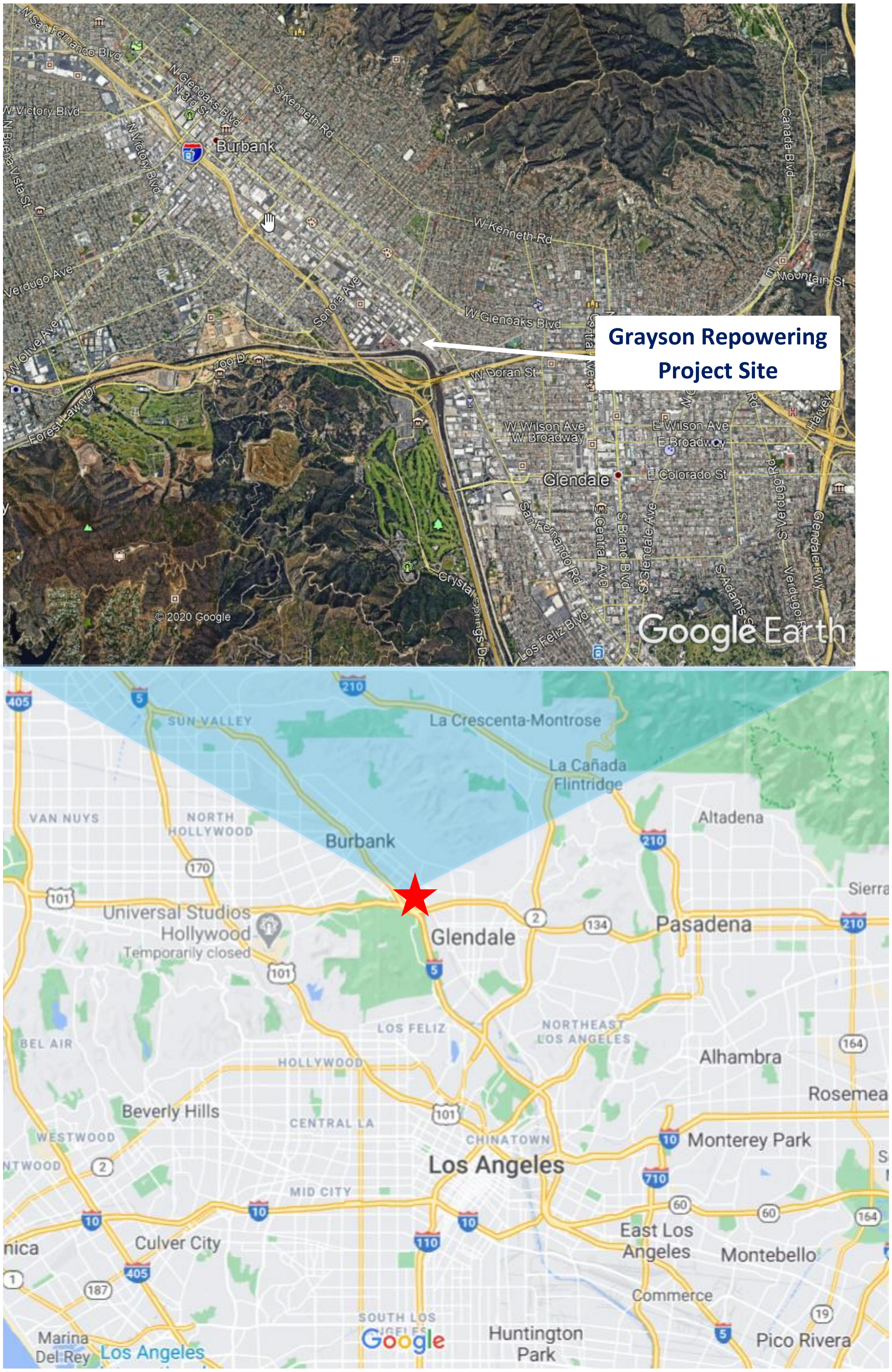


Figure 2-1 Site Location Map

Figure 2-2 USGS 3DEP Elevation Contour Map for the Project Site

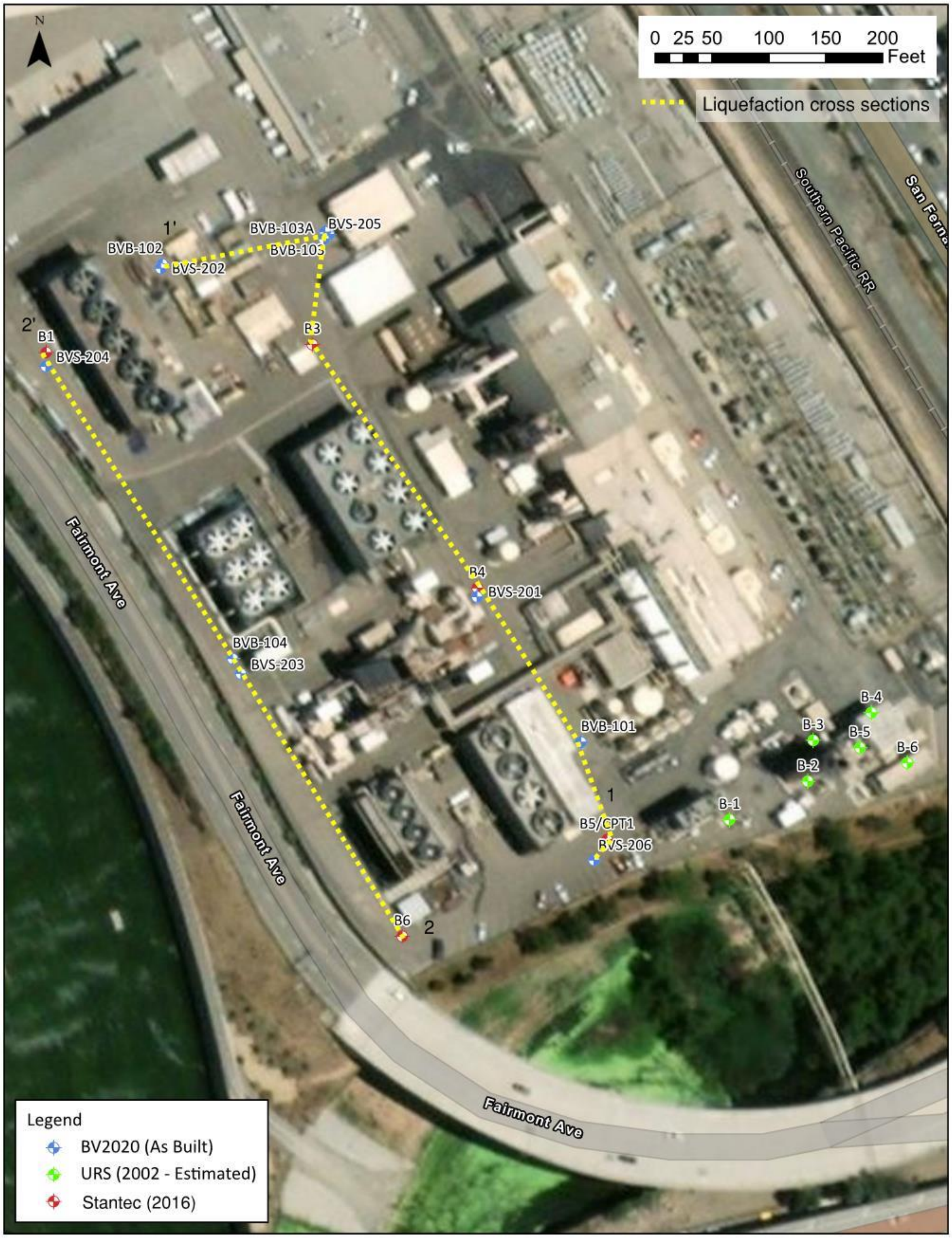
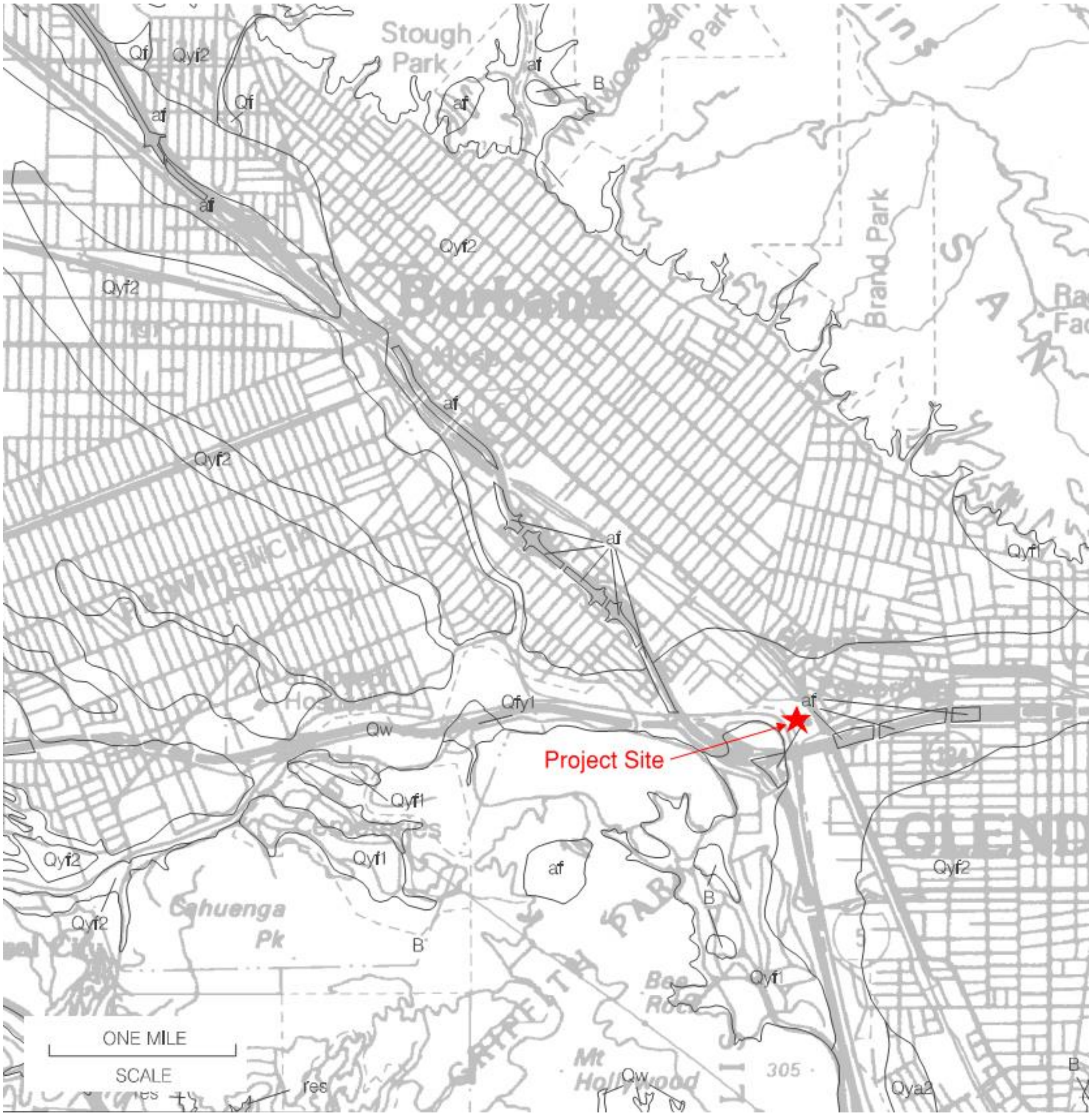


Figure 3-1 Subsurface Investigations Locations from Current and Previous Investigations including Liquefaction Cross Section Plans



	Alluvial Fan Deposits	Alluvial Valley Deposits	Age
Active	Qf- active fan	Qa- active depositional basin	
	Qw- active wash		
Young	Qyf2	Qyt	Holocene?
	Qyf1		
Old	Qof1		Pleistocene?

Figure 5-1 Geologic Map with Units for the Region around the Site (CDMG 1998)

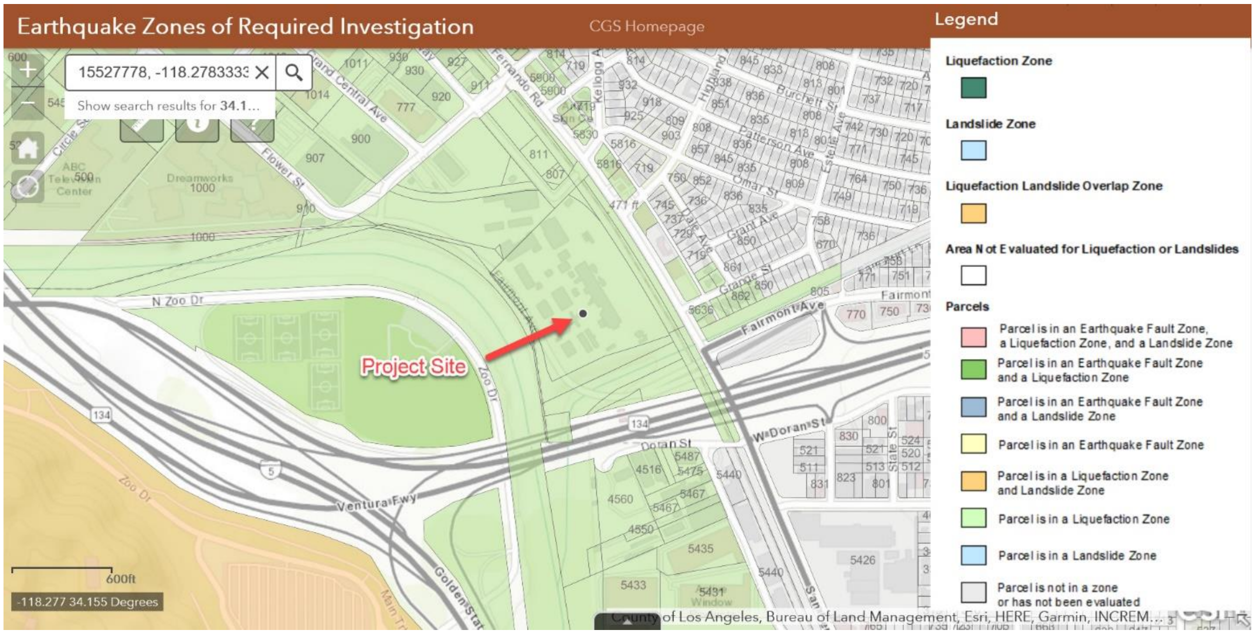


Figure 5-2 California Earthquake Hazards Zone Application (EQ Zapp) Map for the Project Site

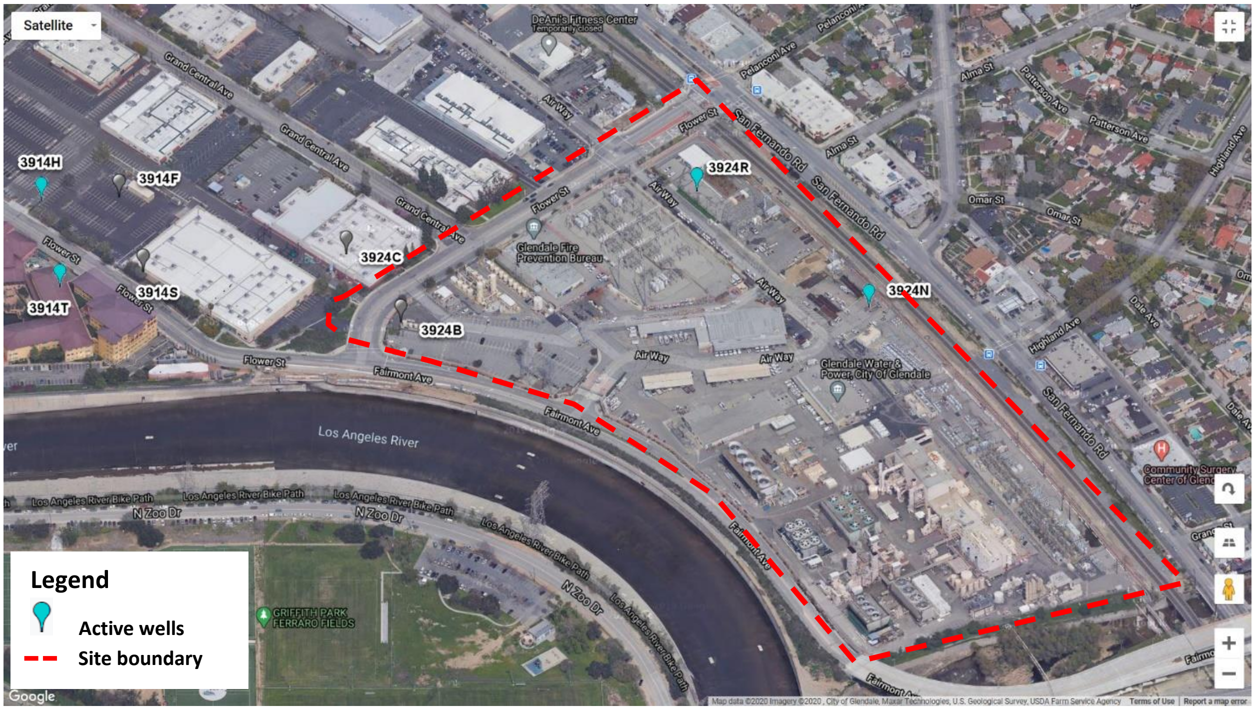


Figure 5-3 Available Active Groundwater Monitoring Wells at the Project Site Area (Los Angeles County Department of Public Works)

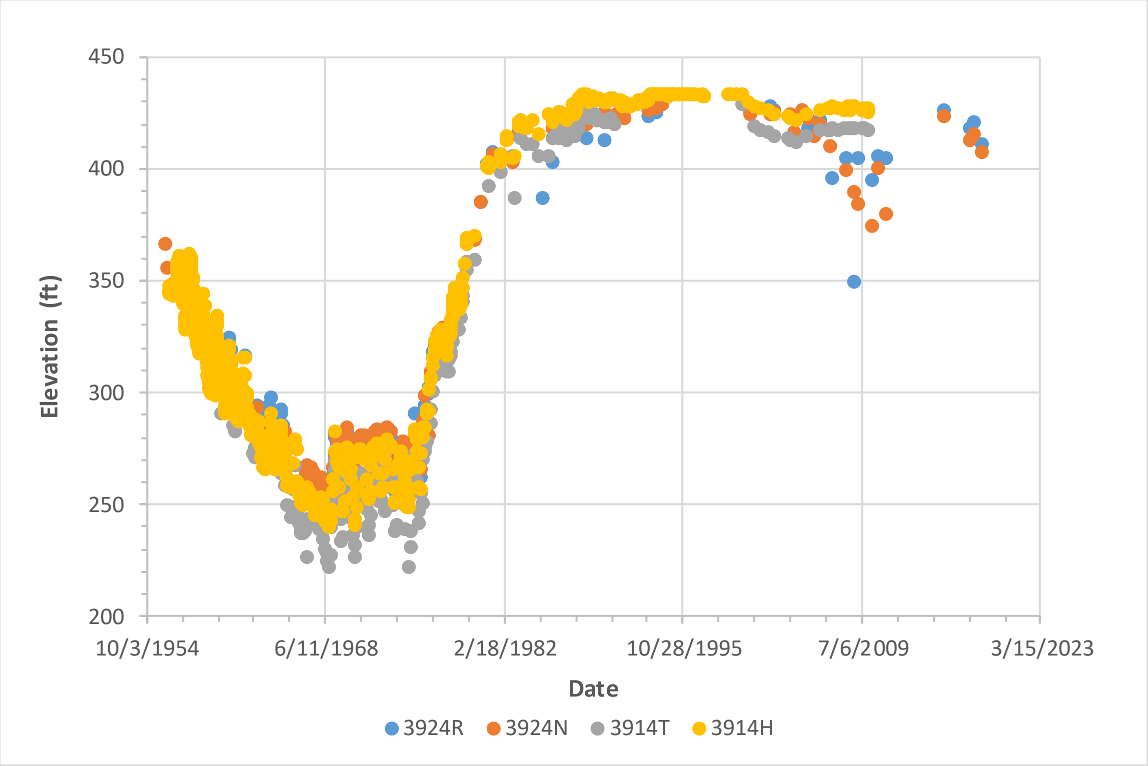
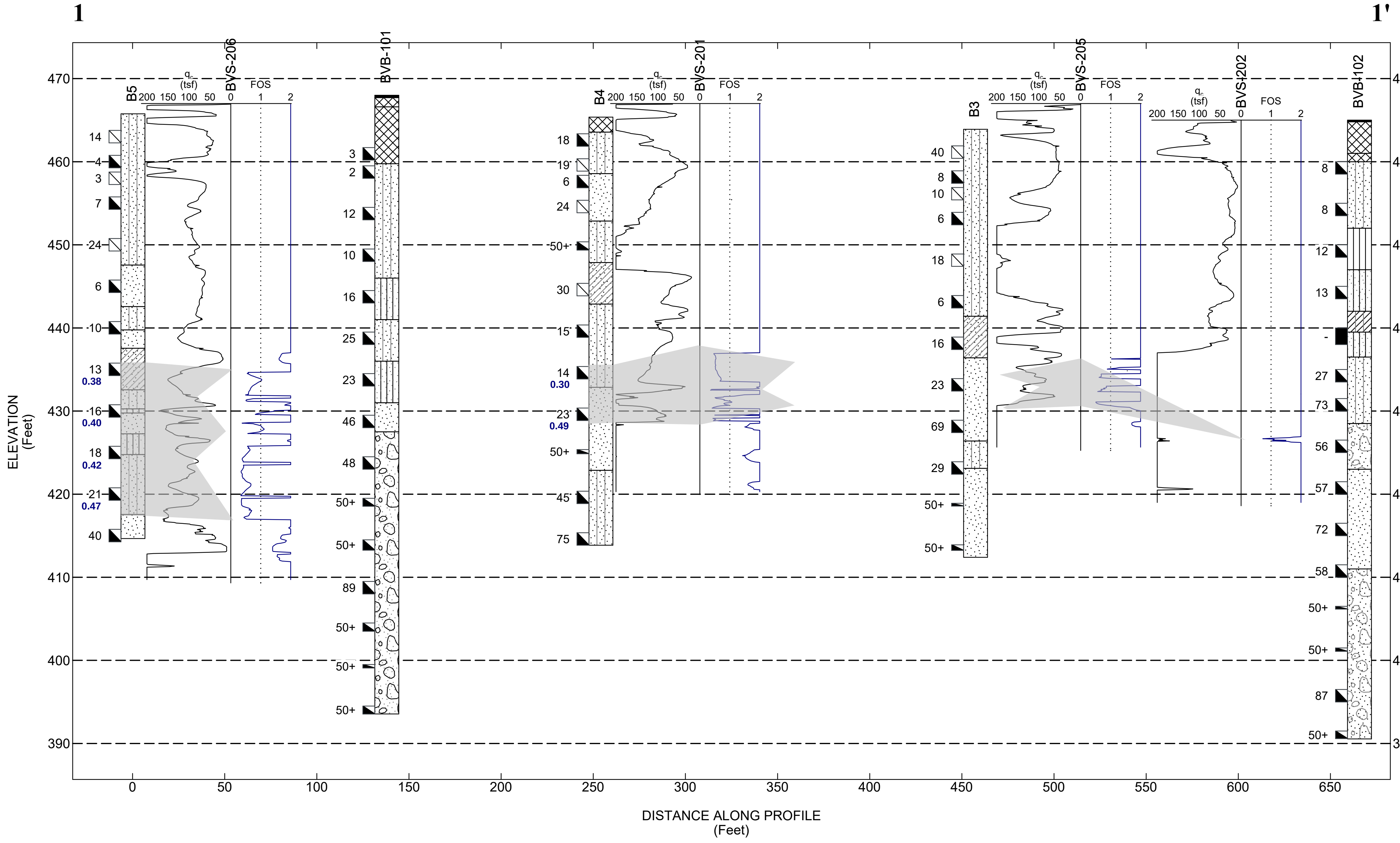


Figure 5-4 Historical Groundwater Measurement Data based on the Closest Active Groundwater Monitoring Wells (Los Angeles County Department of Public Works)



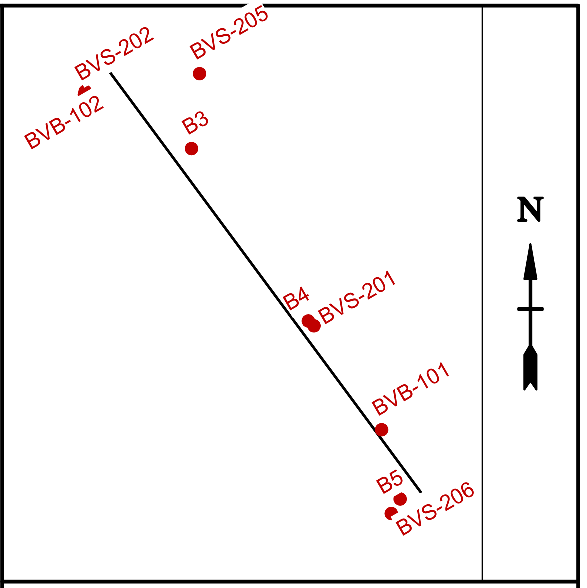
Lithology Graphics

- ▤ Silty Sand
- ▦ Fill
- ▨ Sandy Gravel
- ▨ Gravelly Sand
- ▨ Clayey Sand
- ▤ Sandy Silt
- ▥ Silt
- ░ Liquefiable zone
- ░ Sand
- ■ Asphalt
- ▨ Silty Clay

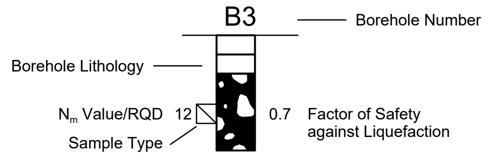
Sampler Graphics

N-value
FOS

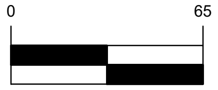
- ◸ 3" Ring-Lined Sampler (18" long)
- ◣ Standard Penetration Test (SPT)
- ■ Thin Wall/Shelby Tube (TW)



Explanation:



q_c	CPT Cone Tip Resistance
Rf	CPT Friction Ratio
u_2	CPT Generated Pore Pressure
FOS	Factor of Safety against Liquefaction



Horizontal Scale (Feet)

Vertical Exaggeration: 4.5x

Liquefaction Cross Section 1-1'

Grayson Repowering Project
Glendale, CA

PROJECT NUMBER	FIGURE NUMBER
405153	Figure 5-5

BLACK & VEATCH
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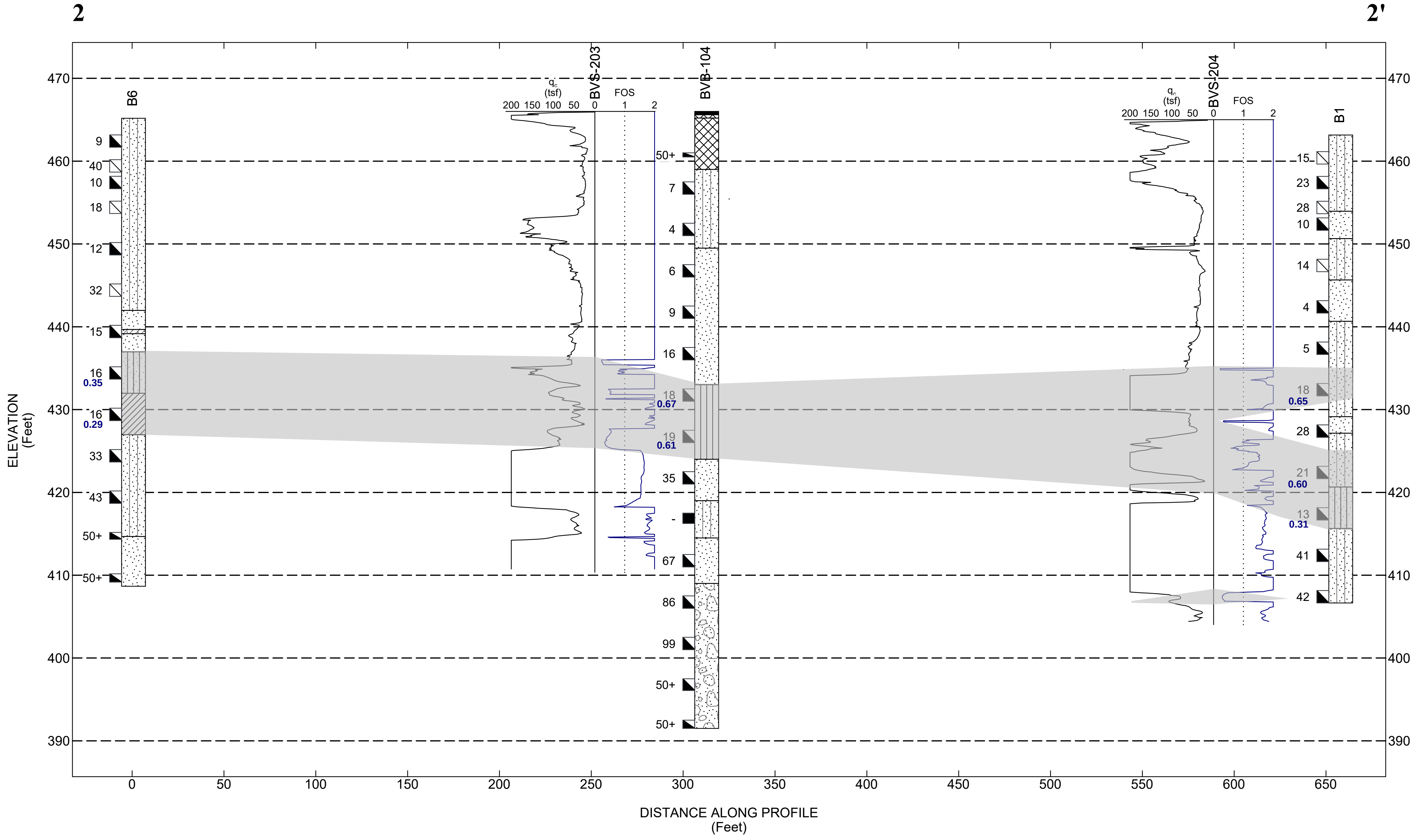
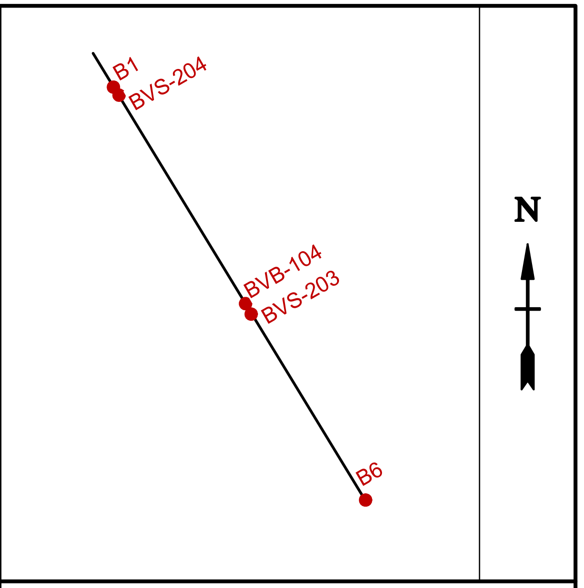
REPORT: BV GEOTECH FENCE; DATA TEMPLATE: BVE_GEO_STD_20180201.GDT; LIBRARY: BVE_GEO_STD_20180201.GLB - 10/21/20 11:54
PROJECT: \\NA\DATA\ENERGY\DEPT\GEO\DATASERVICES\POWERGENERATION\405153 - GWP GRAYSON REPOWER\GINT\405153 - GRAYSON REPOWER_FINAL.GPJ





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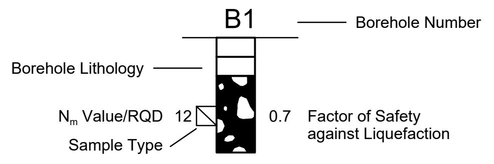


q_c	CPT Cone Tip Resistance
Rf	CPT Friction Ratio
u_2	CPT Generated Pore Pressure
FOS	Factor of Safety against Liquefaction

0 65

Horizontal Scale (Feet)

Vertical Exaggeration: 4.5x

Lithology Graphics

▥ Silty Sand	⁘ Sand	▥ Sandy Silt
▨ Clayey Sand	▨ Clay	■ Asphalt
▩ Fill	▥ Silt	⁘ Gravelly Sand
▒ Liquefiable zone		

Sampler Graphics

N-value
FOS

◸ 3" Ring-Lined Sampler (18" long)

◣ Standard Penetration Test (SPT)

■ Thin Wall/Shelby Tube (TW)

Liquefaction Cross Section 2-2'

Grayson Repowering Project
Glendale, CA

PROJECT NUMBER	FIGURE NUMBER
405153	Figure 5-6

BLACK & VEATCH
Building a world of difference.

REPORT: BV GEOTECH FENCE; DATA TEMPLATE: BVE_GEO_STD_20180201.GDT; LIBRARY: BVE_GEO_STD_20180201.GLB - 10/21/20 14:45
PROJECT: \\NA\DATA\ENERGY\DEPT\GEO\DATASERVICES\POWERGENERATION\405153 - GWP GRAYSON REPOWER\GINT\405153 - GRAYSON REPOWER_FINAL.GPJ

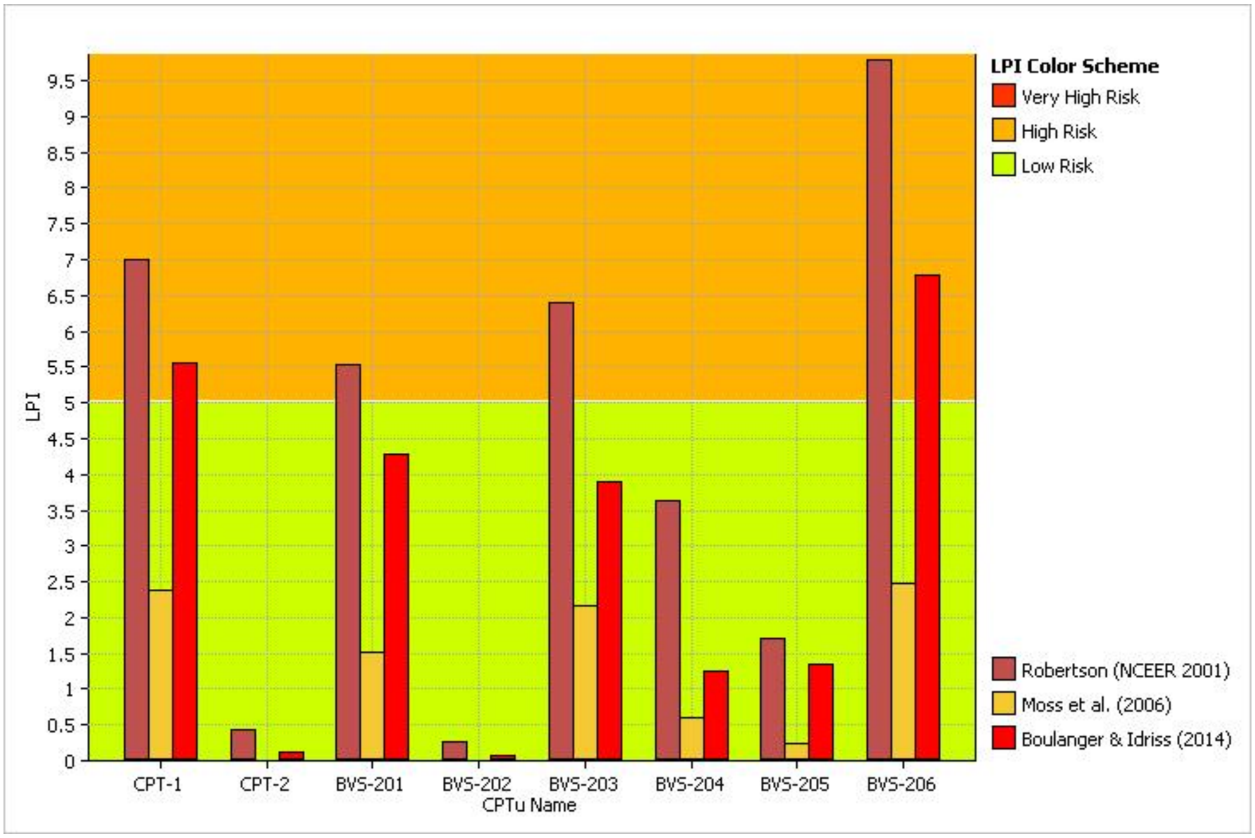


Figure 5-7 Calculated Liquefaction Potential Index (LPI) based on All CPT Data

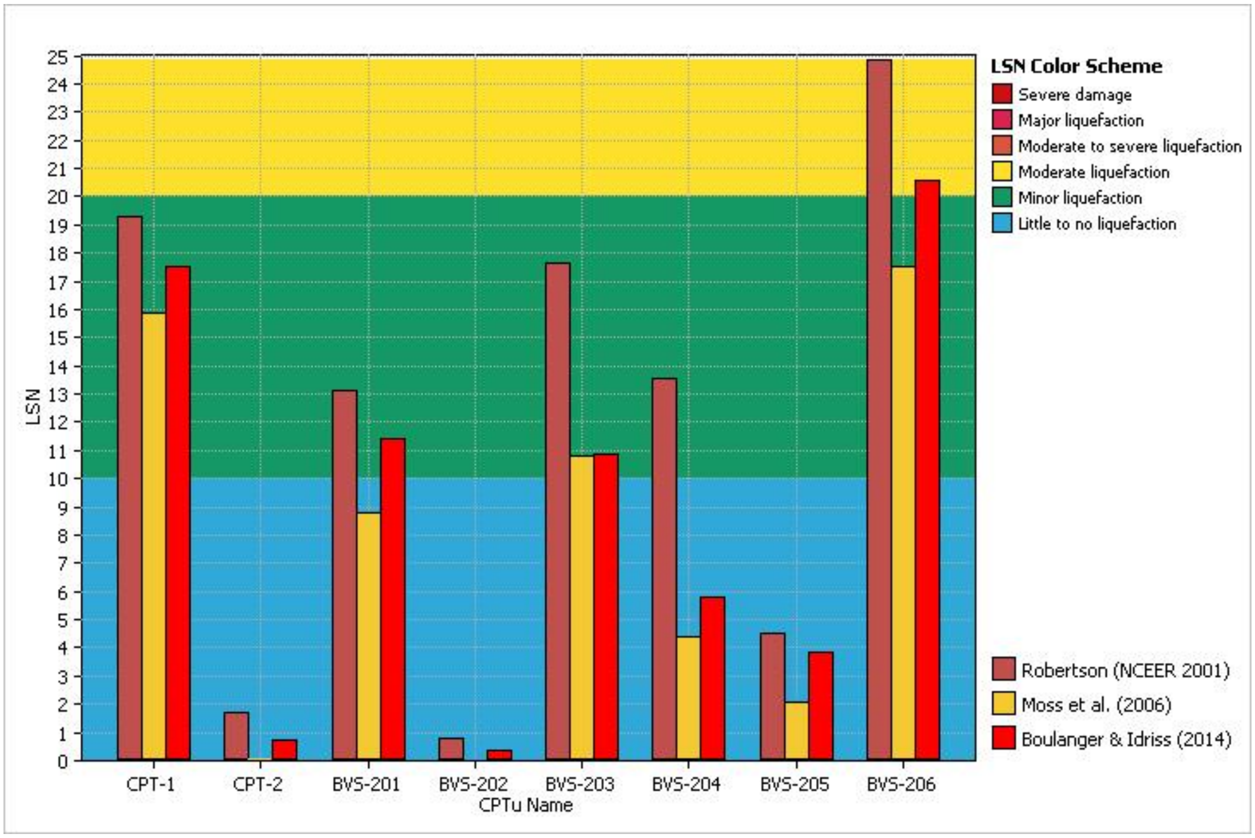


Figure 5-8 **Calculated Liquefaction Severity Number (LSN) based on All CPT Data**

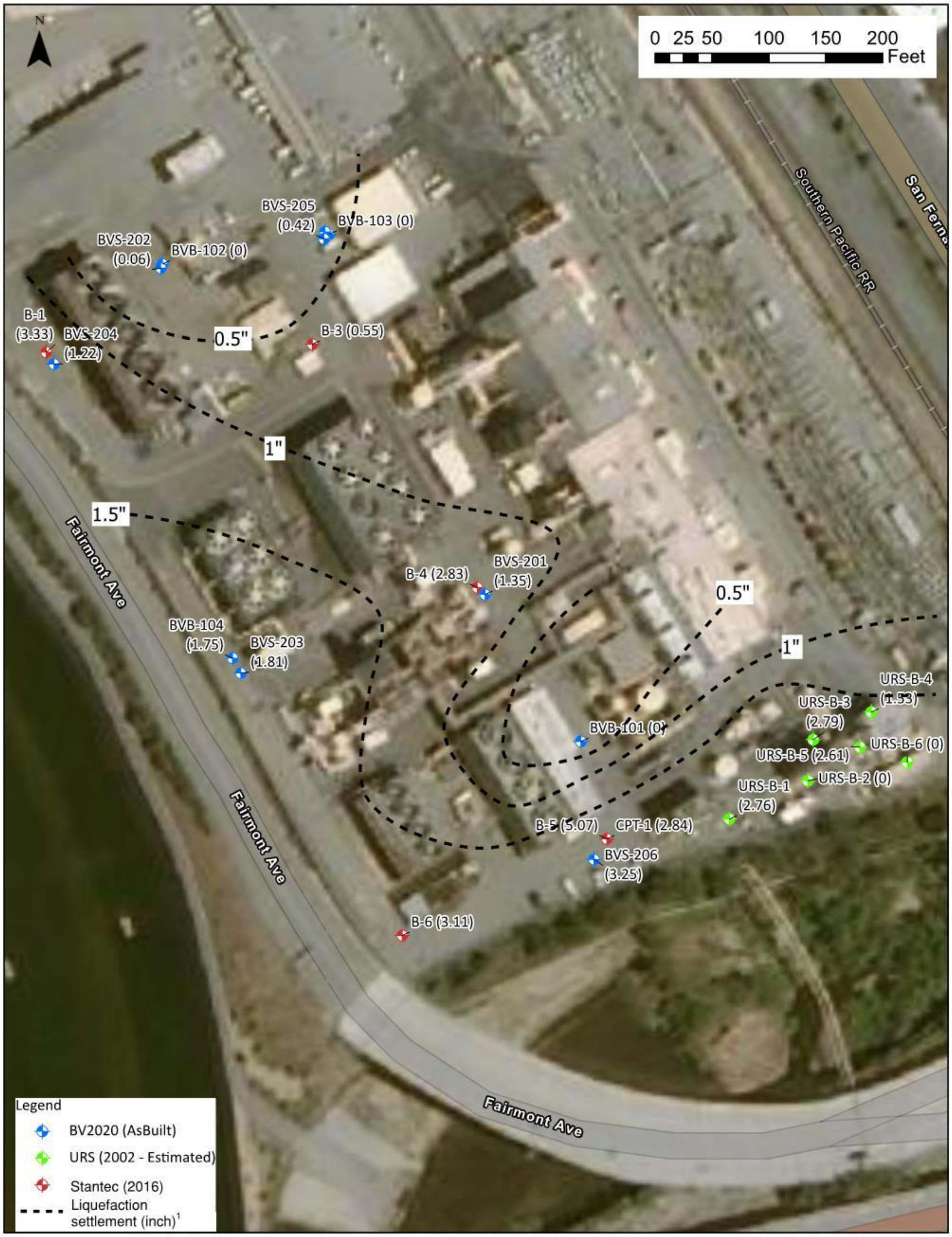


Figure 5-9 **Liquefaction Settlement Contour Map**

Note:

1. Black dashed lines denote the liquefaction settlement contours in inches based on the average of the calculated liquefaction settlement from multiple methods from the CPT and SPT data as discussed in Section 5.2.

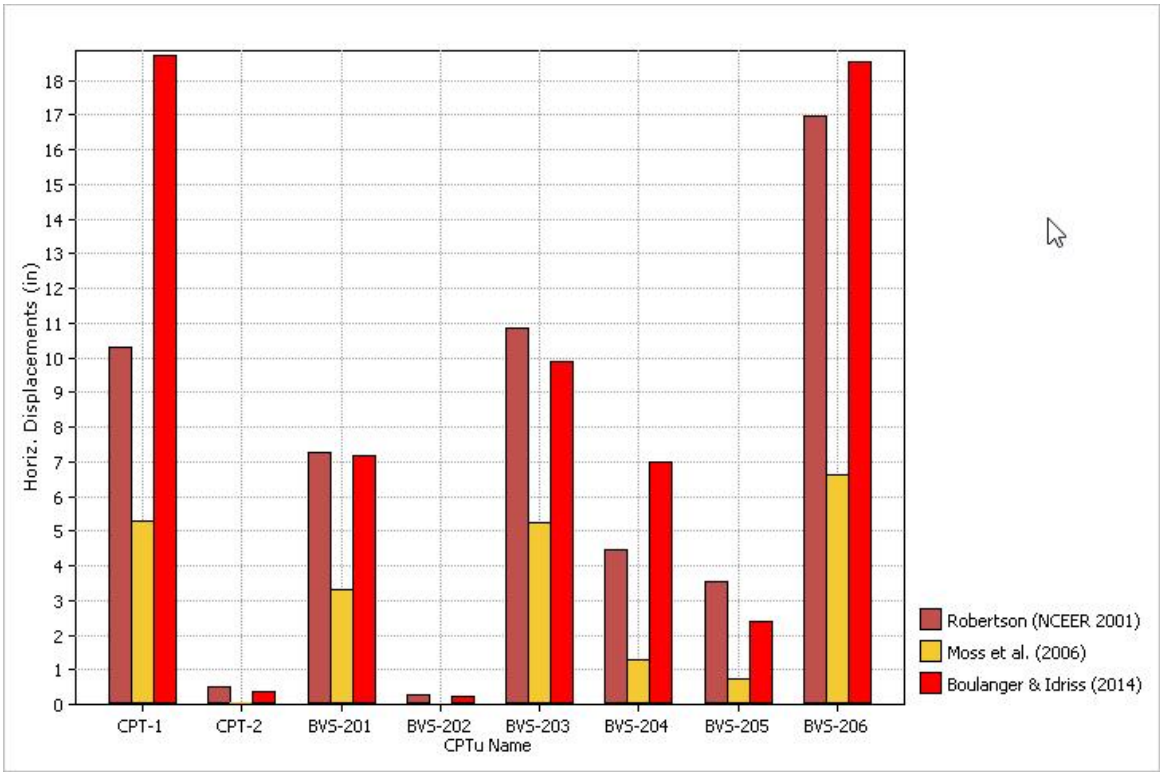
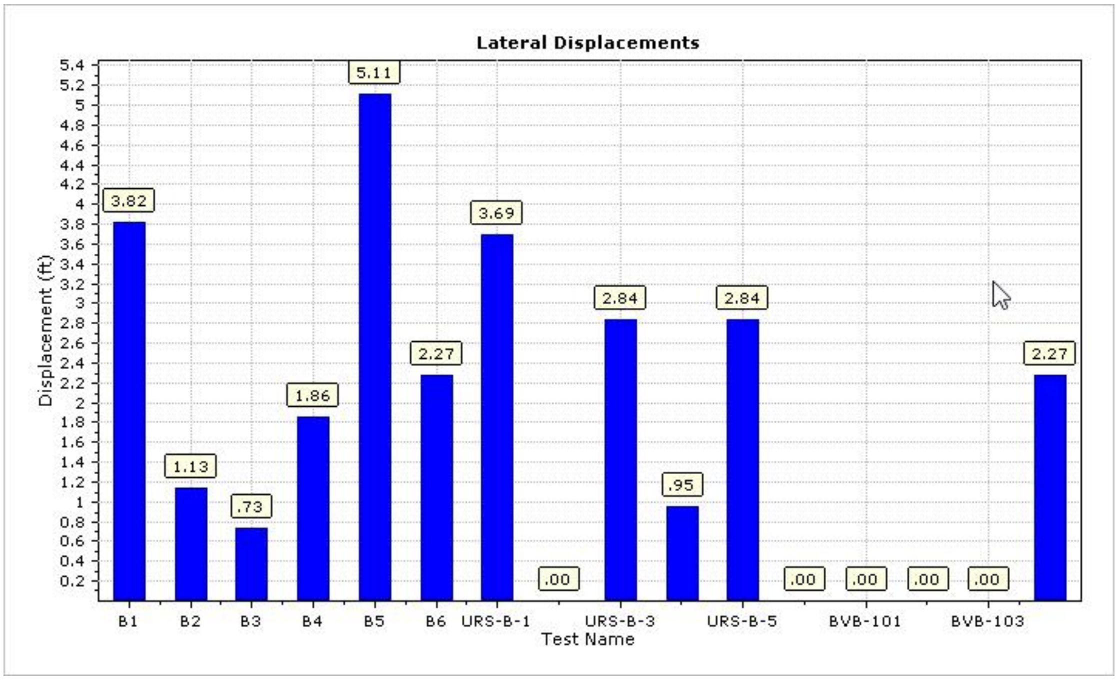
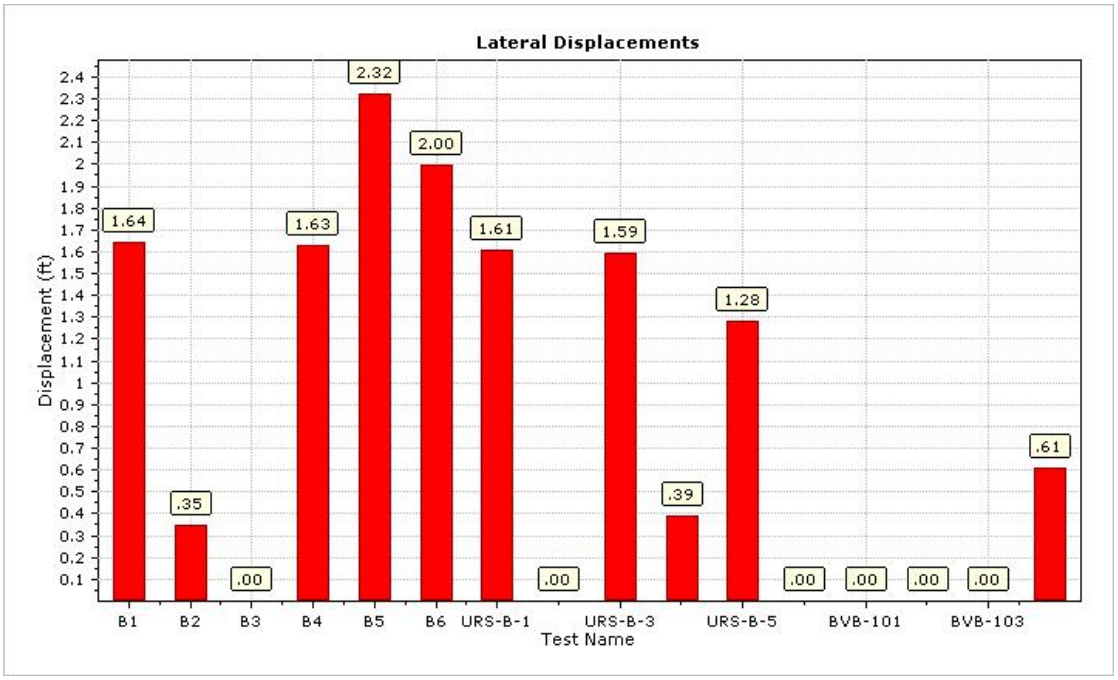


Figure 5-10 Comparison of Estimated Horizontal Displacement due to Lateral Spreading based on Gently Slope Ground Analysis using CPT Data

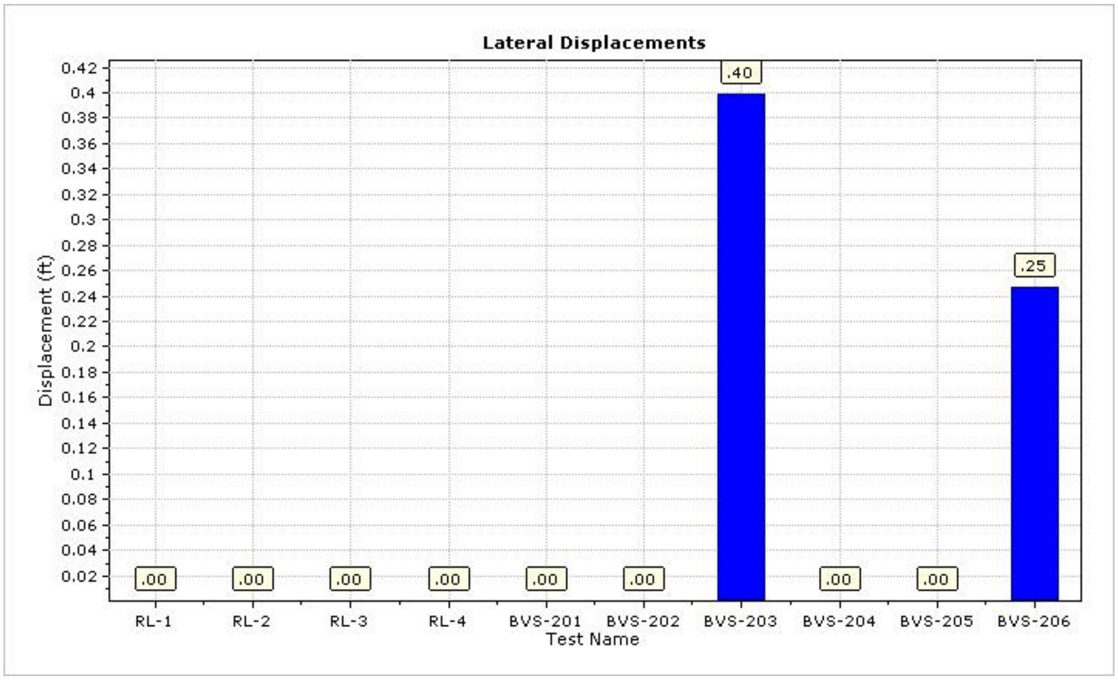


(a) NCEER (1998)

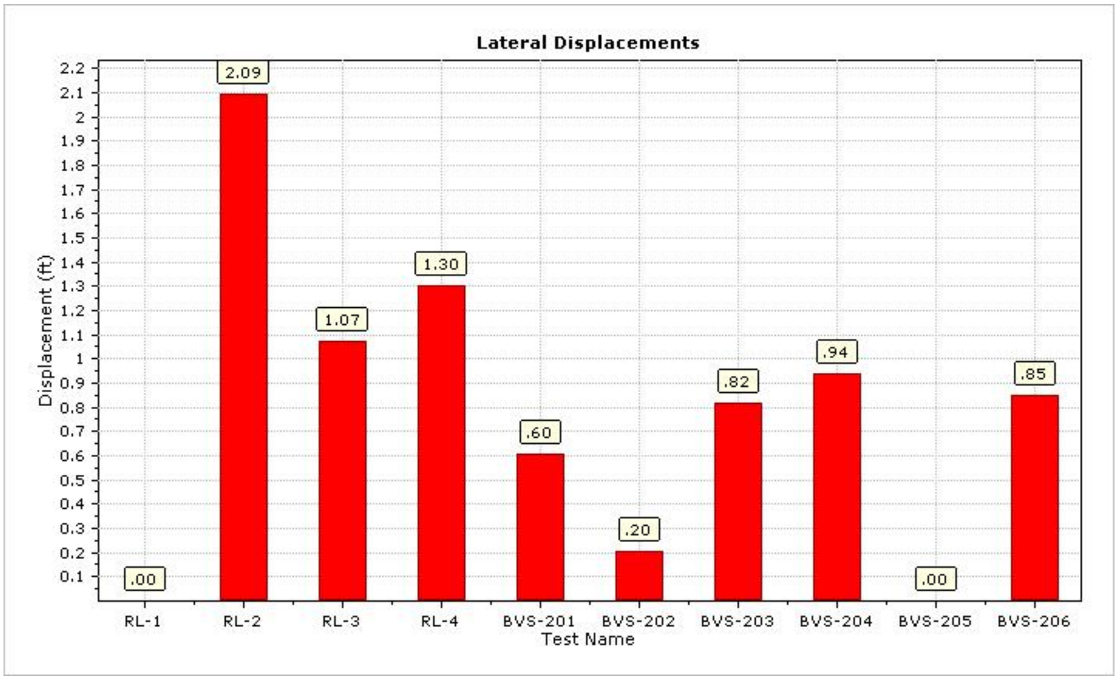


(b) Boulanger and Idriss (2014)

Figure 5-11 **Comparison of Estimated Horizontal Displacement due to Lateral Spreading based on Gently Slope Ground Analysis using SPT Data**



(a) NCEER (1998)



(b) Kayen et al. (2013)

Figure 5-12 Comparison of Estimated Horizontal Displacement due to Lateral Spreading based on Gently Slope Ground Analysis using Shear Wave Velocity Data

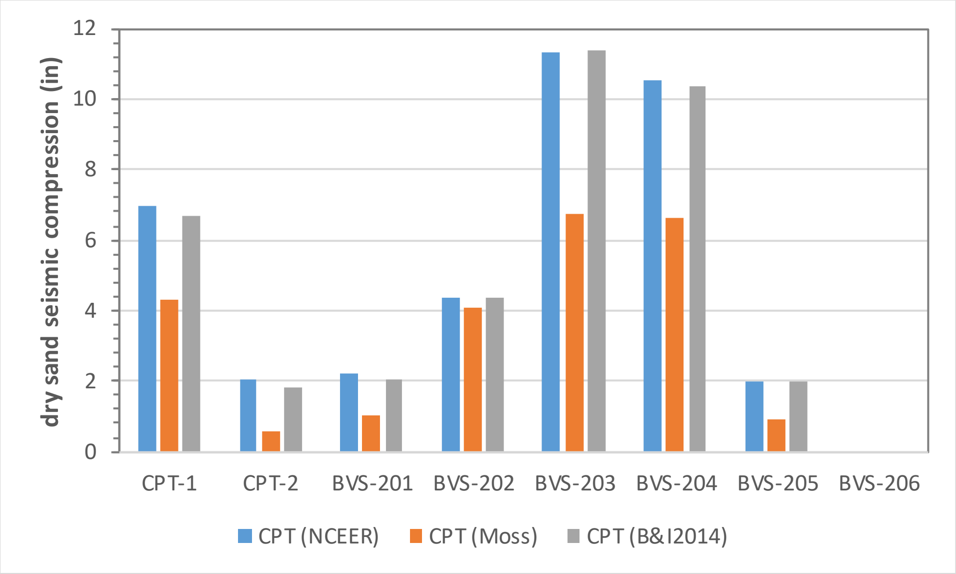


Figure 5-13 Comparison of Estimated Seismic Compression of Unsaturated Soils above Groundwater using CPT Data

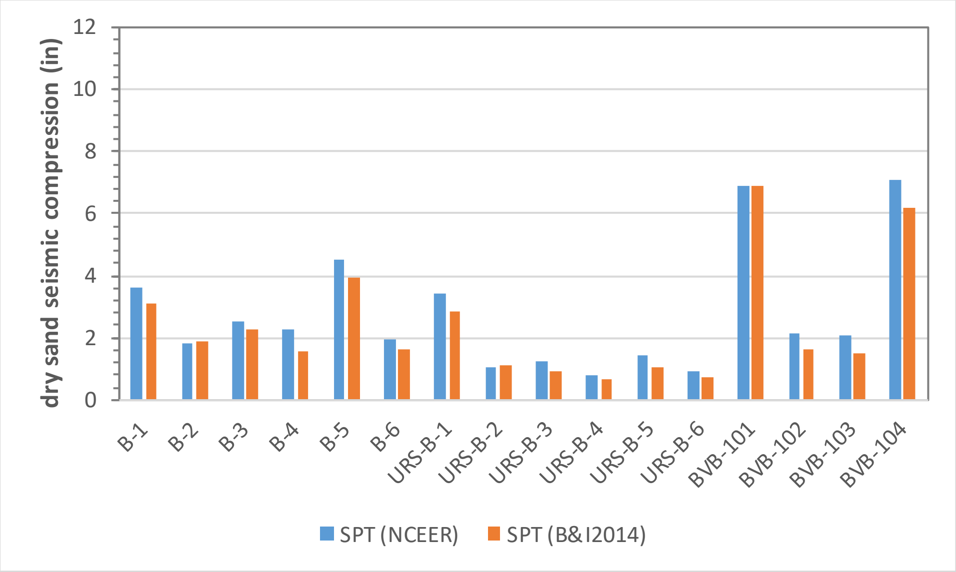


Figure 5-14 Comparison of Estimated Seismic Compression of Unsaturated Soils above Groundwater using SPT Data

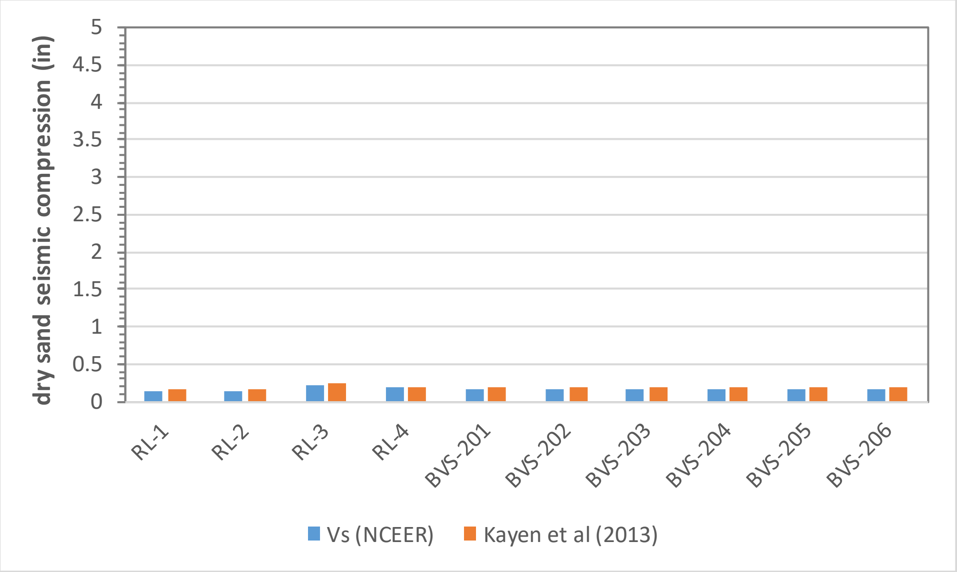


Figure 5-15 Comparison of Estimated Seismic Compression of Unsaturated Soils above Groundwater using Shear Wave Velocity Data

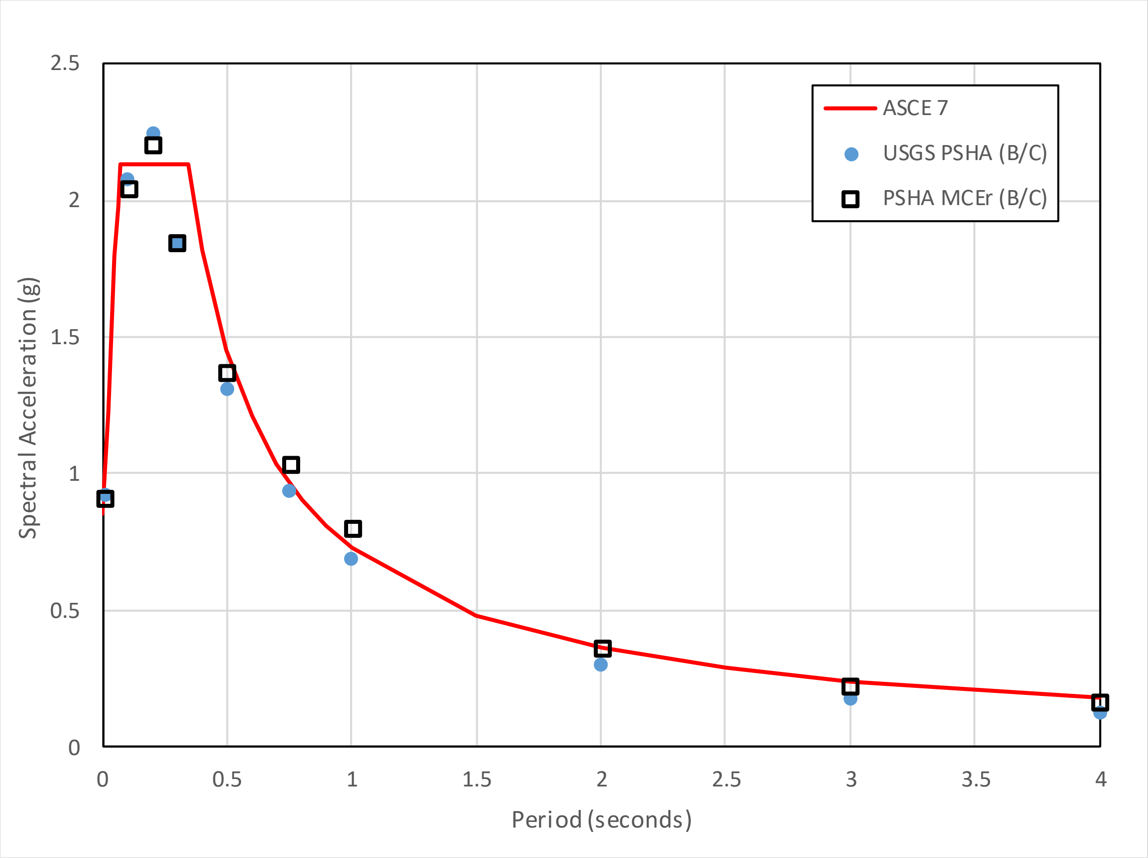


Figure 6-1 Comparison of Bedrock MCE Spectra

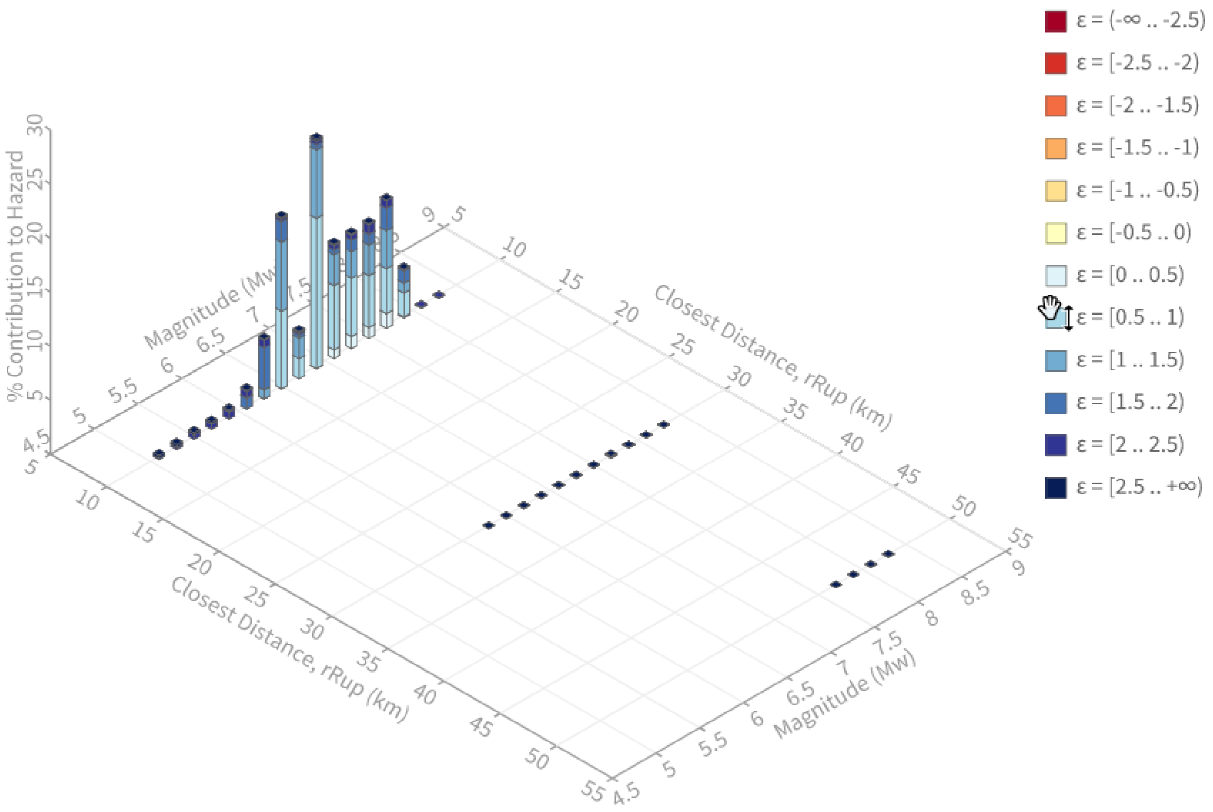


Figure 6-2 **Deaggregation Analysis Plot for PGA for MCE (2475 Year Return Period) at the Site Class B/C Boundary**

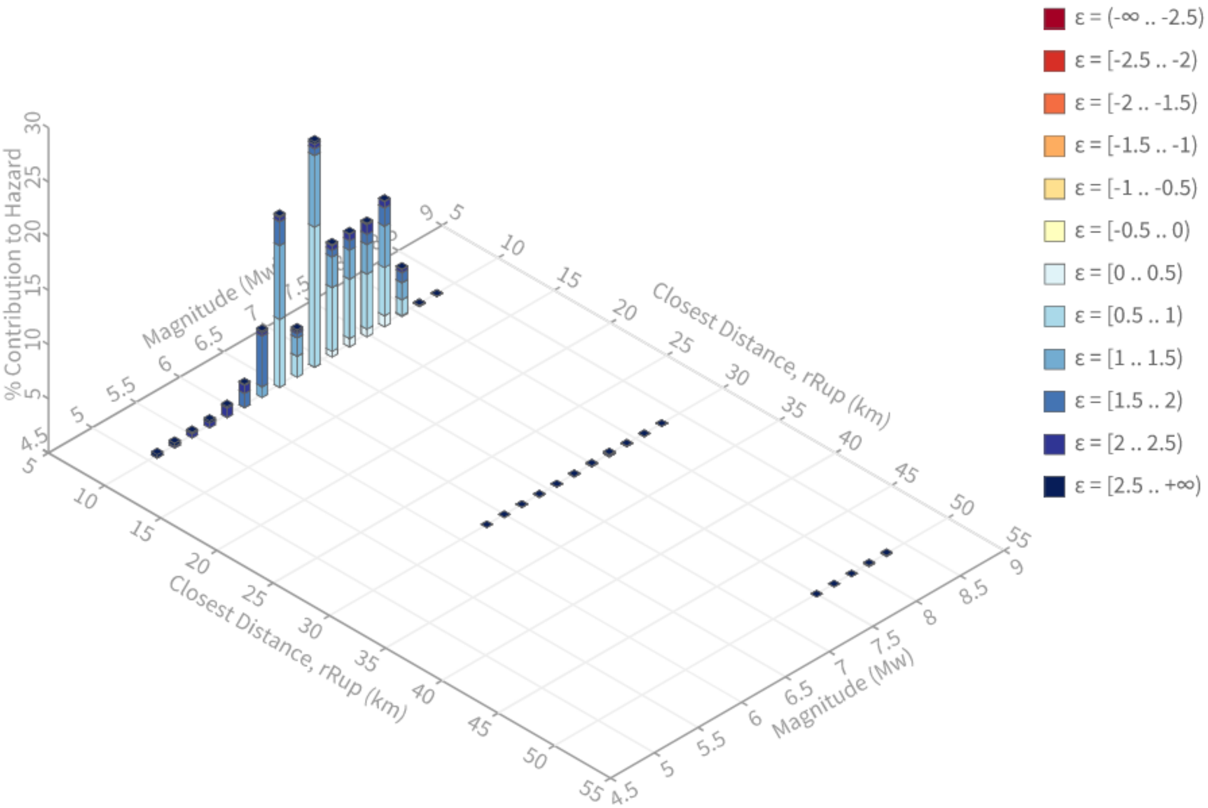


Figure 6-3 **Deaggregation Analysis Plot for Period of 0.2 Second for MCE (2475 Year Return Period) at the Site Class B/C Boundary**

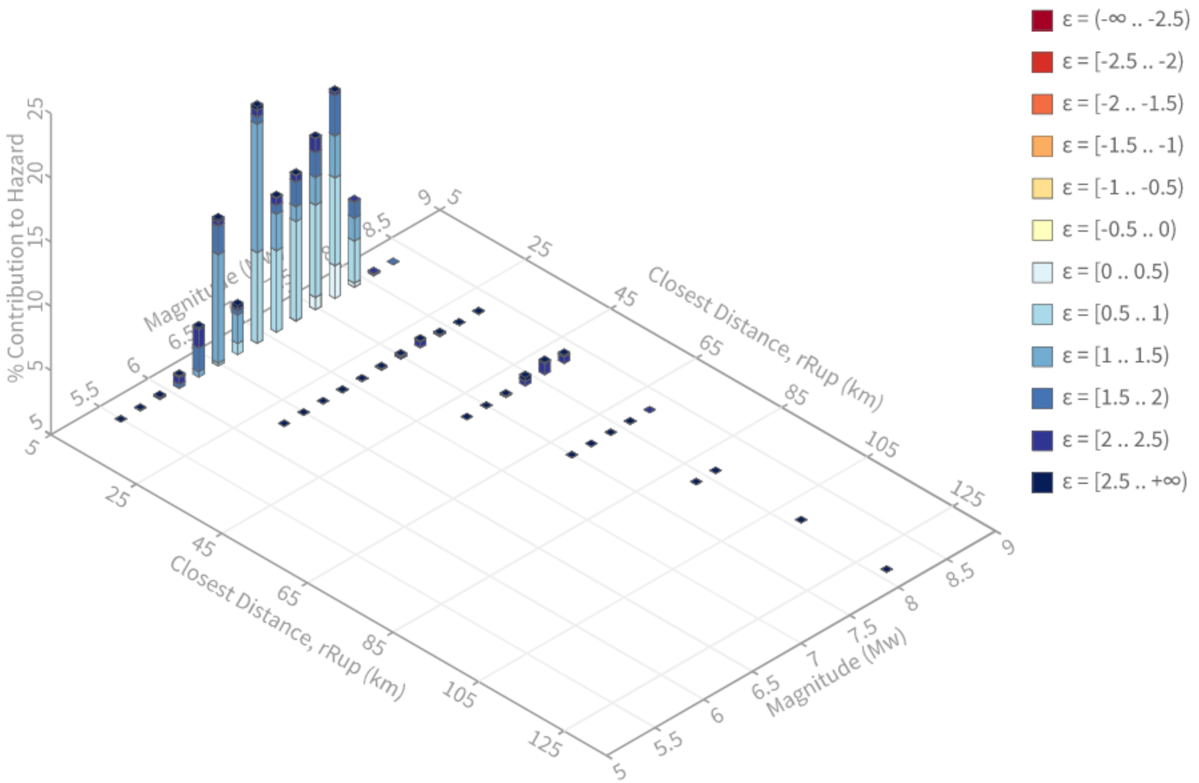


Figure 6-4 Deaggregation Analysis Plot for Period of 1.0 Second for MCE (2475 Year Return Period) at the Site Class B/C Boundary

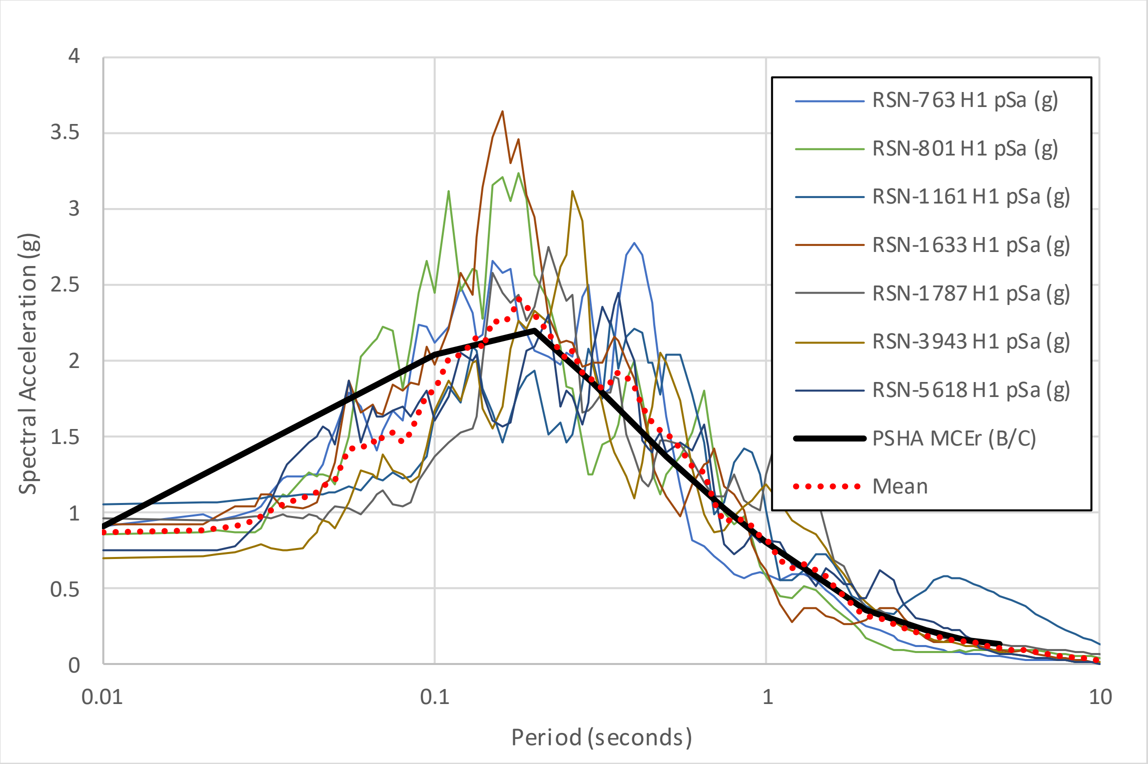


Figure 6-5 **Risk-Targeted Maximum Considered Earthquake (MCE$_R$) Target Spectrum (Solid Black) and the Mean Spectrum (Dotted Red) of the scaled spectra of selected ground motions (thin dash lines) – 5% Damping**

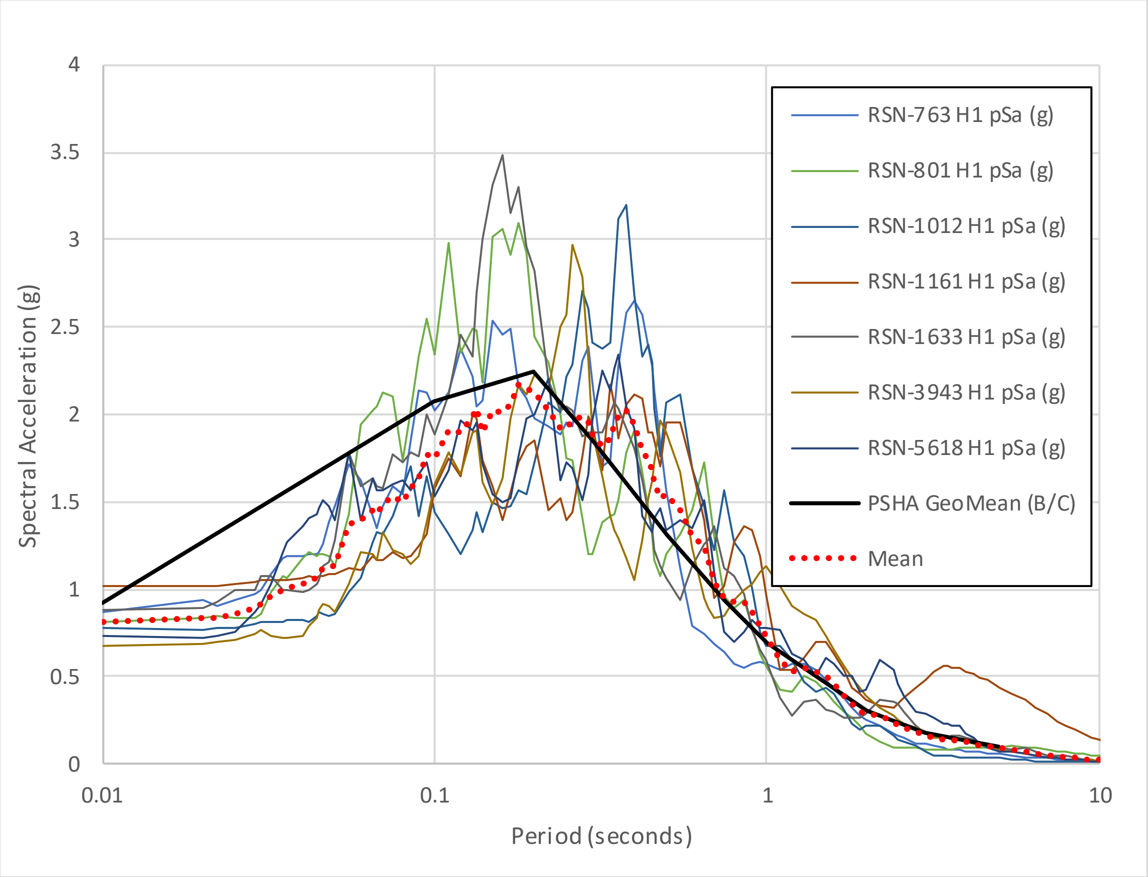


Figure 6-6 **Maximum Considered Earthquake Geometric Mean (MCE_G) Target Spectrum (Solid Black) and the Mean Spectrum (Dotted Red) of the scaled spectra of selected ground motions (thin dash lines) – 5% Damping**

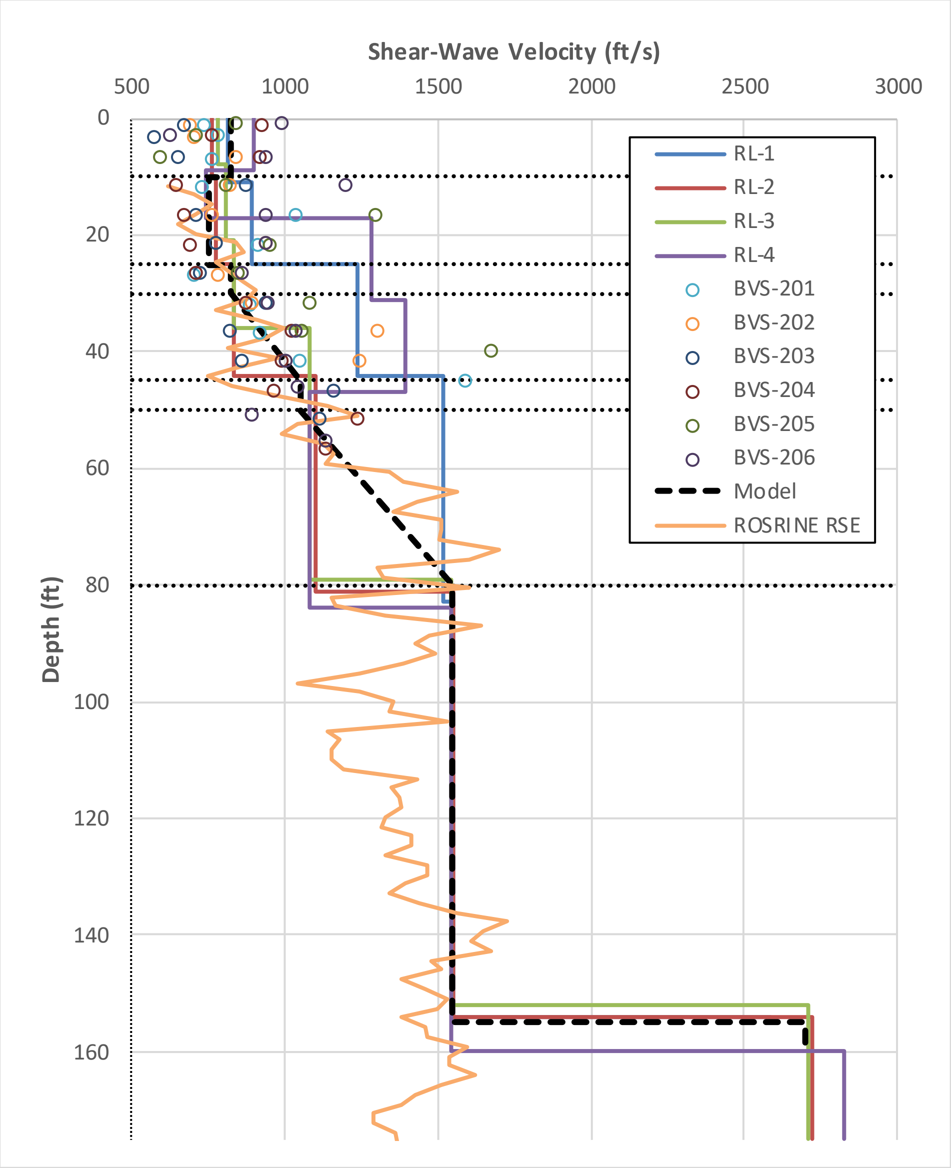


Figure 6-7 Measured Shear Wave Velocities from the Project Site and the Shear Wave Profile Modified based on the ROSRINE RSE Shear Wave Velocity Data

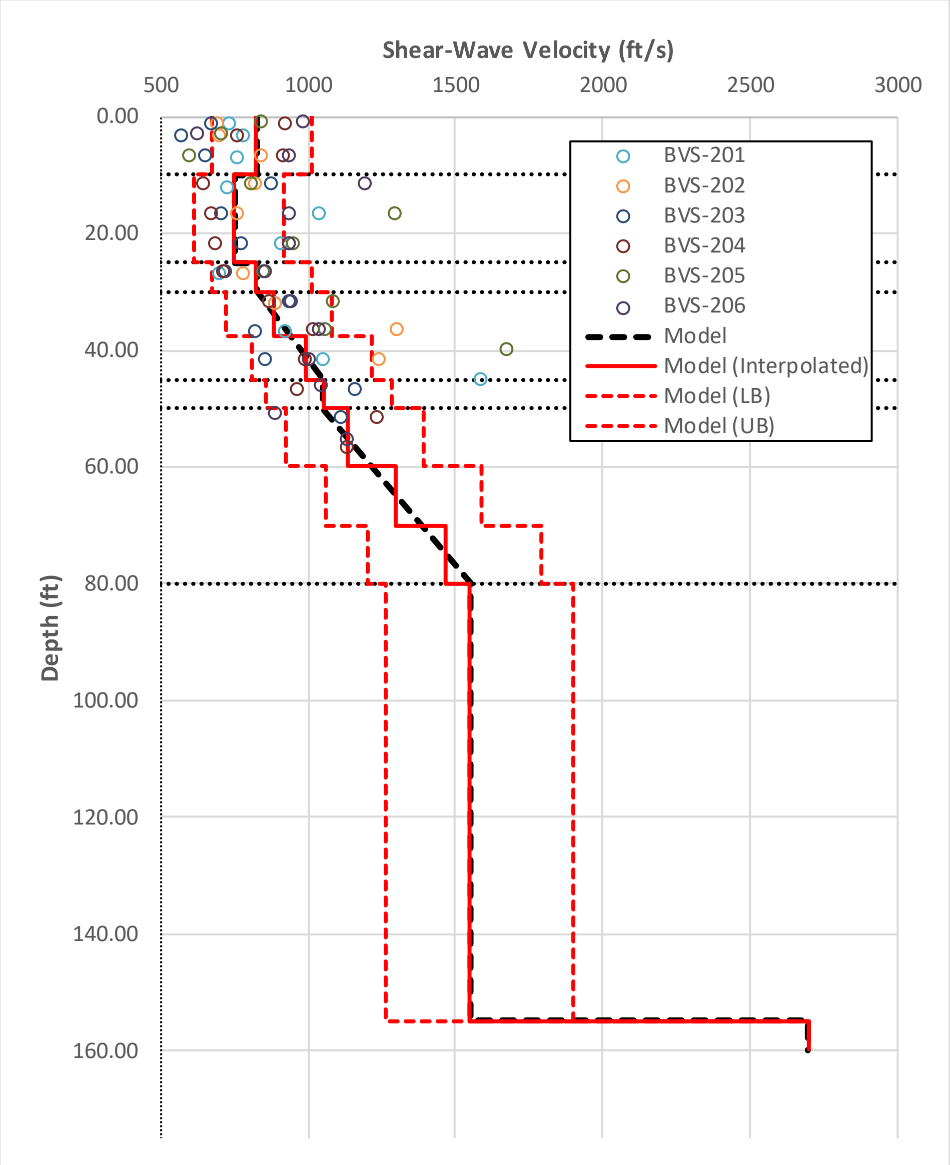


Figure 6-8 Measured Seismic CPT Shear Wave Velocities from the Project Site and the BE, LB, and UB Shear Wave Velocity Profiles

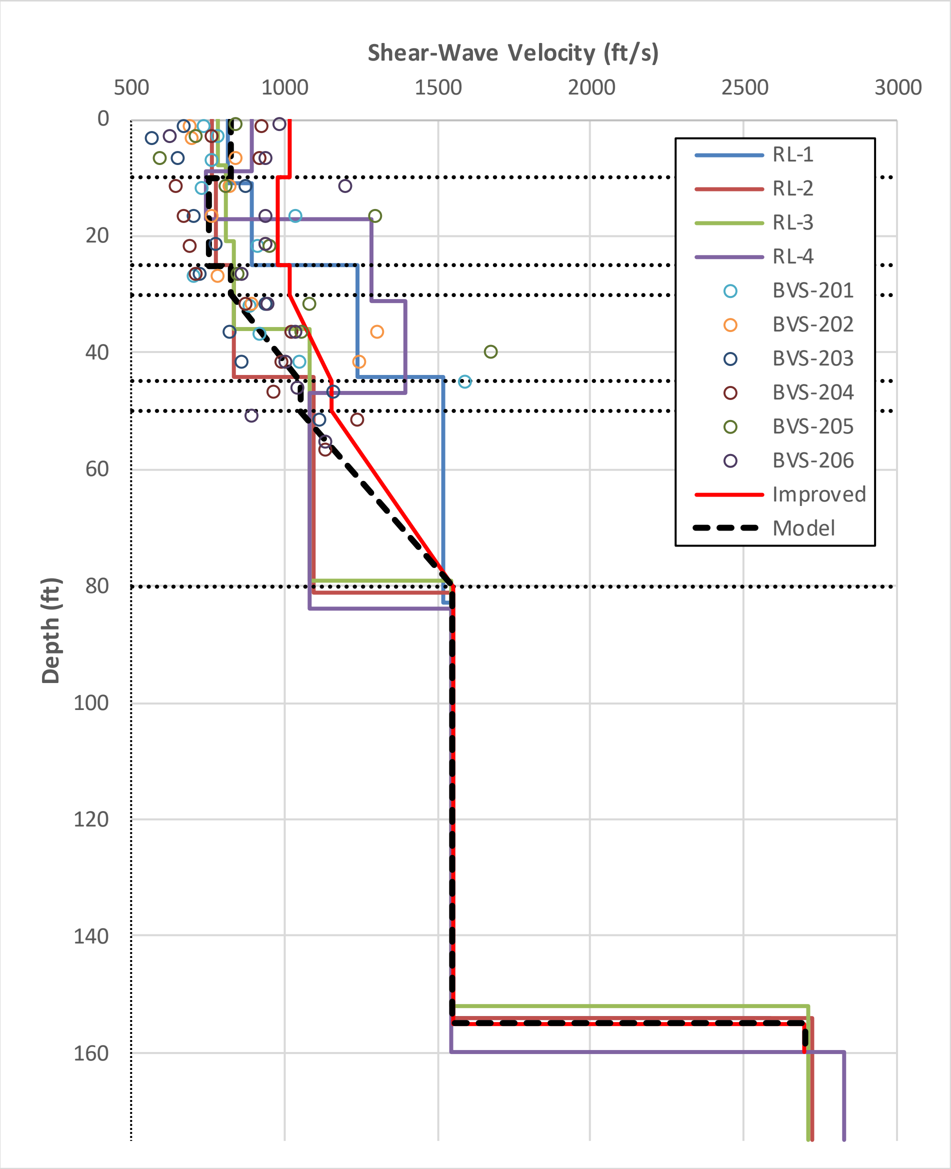


Figure 6-9 Measured Shear Wave Velocities from the Project Site and the BE Shear Wave Profile under Existing and Post-Improvement Conditions using VSCs with A_r of 40%

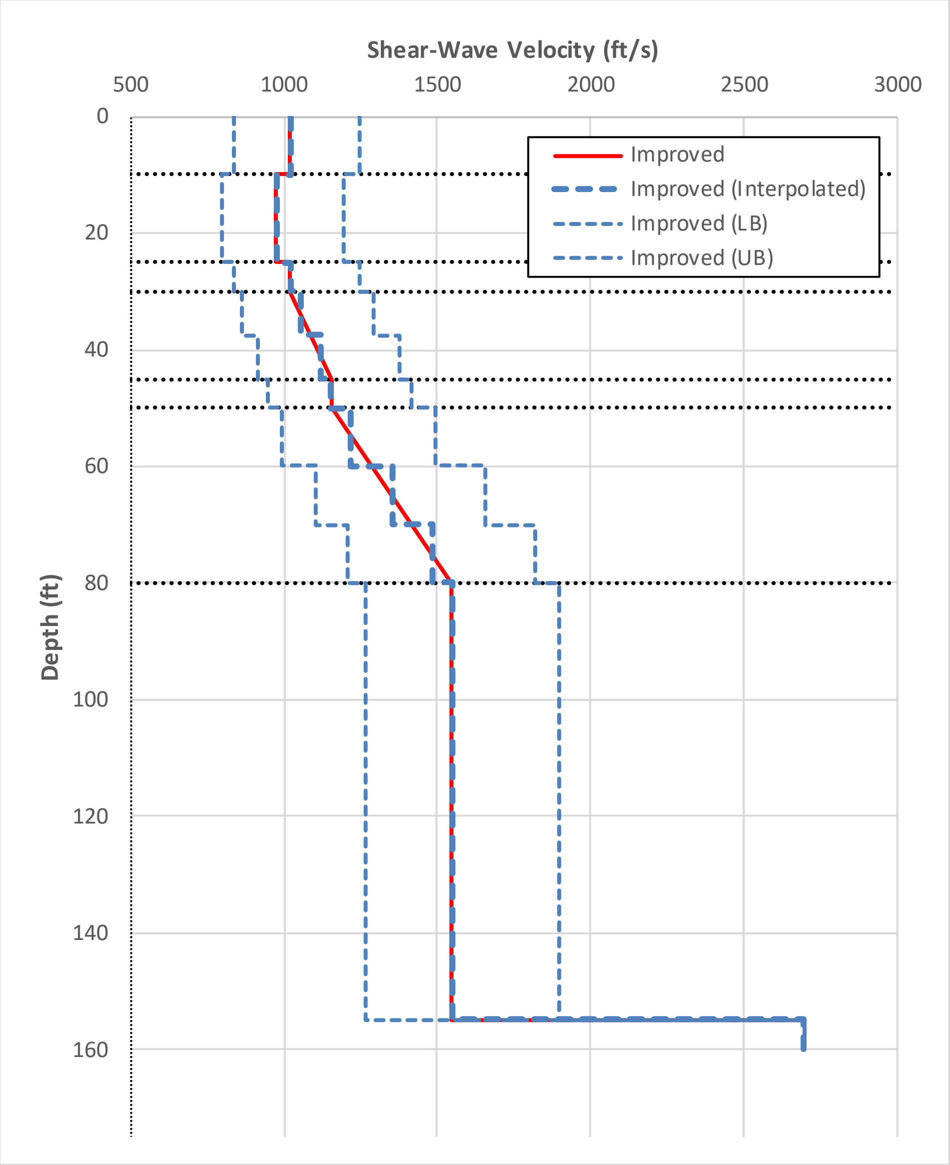


Figure 6-10 Improved Model Shear Wave Velocities with LB and UB Profiles for the Project Site

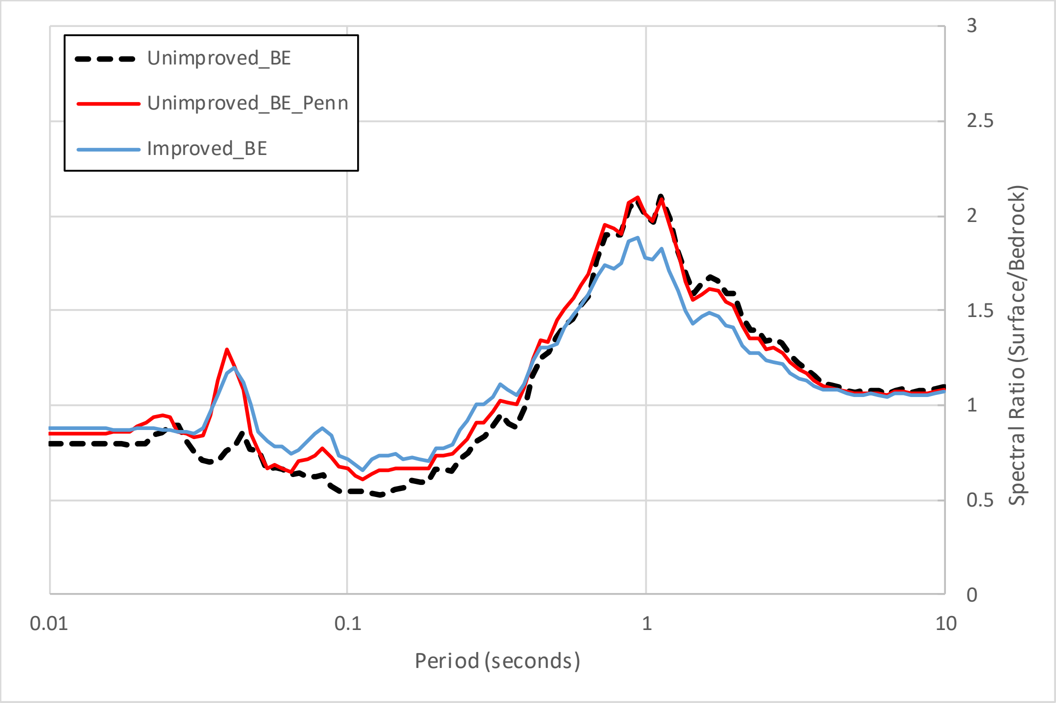


Figure 6-11 **Amplification Functions for Sensitivity Analysis using the EPRI and Peninsular Range Modulus Reduction and Damping Curves**

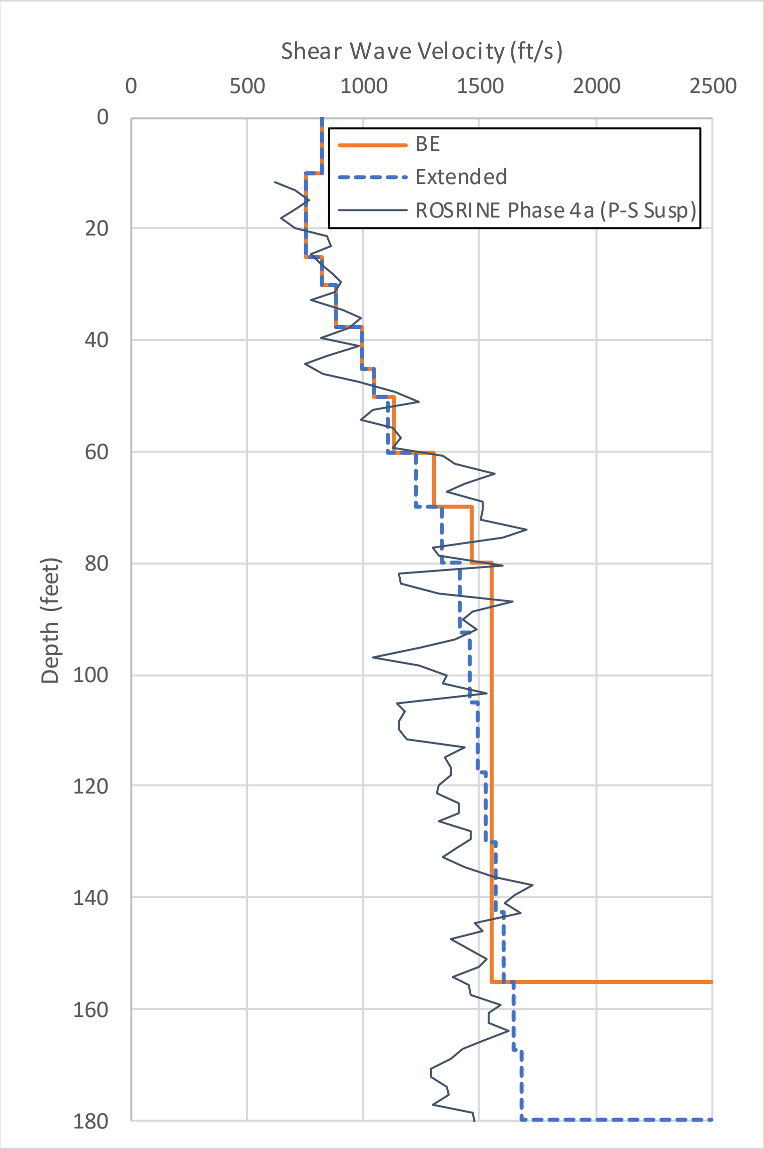


Figure 6-12 Comparison of the Extended Profile Used in the Sensitivity Analysis with the Unimproved BE Profile and the Measured ROSRINE Data

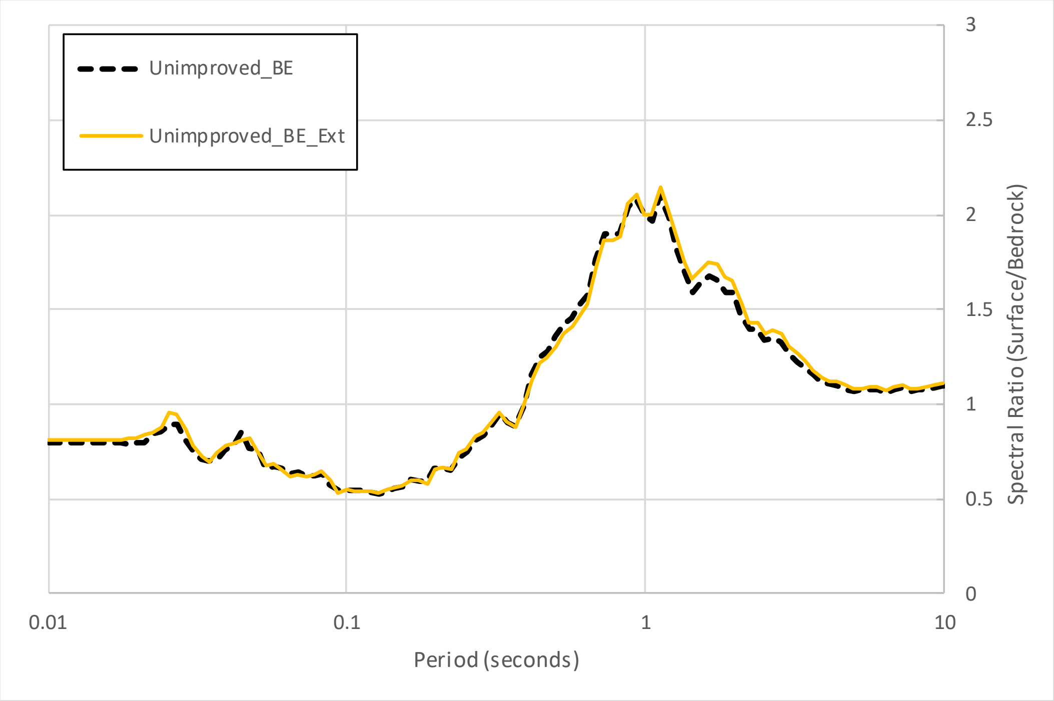


Figure 6-13 Comparison of the Amplification Functions from the Extended Profile Used in the Sensitivity Analysis and the Unimproved BE Profile

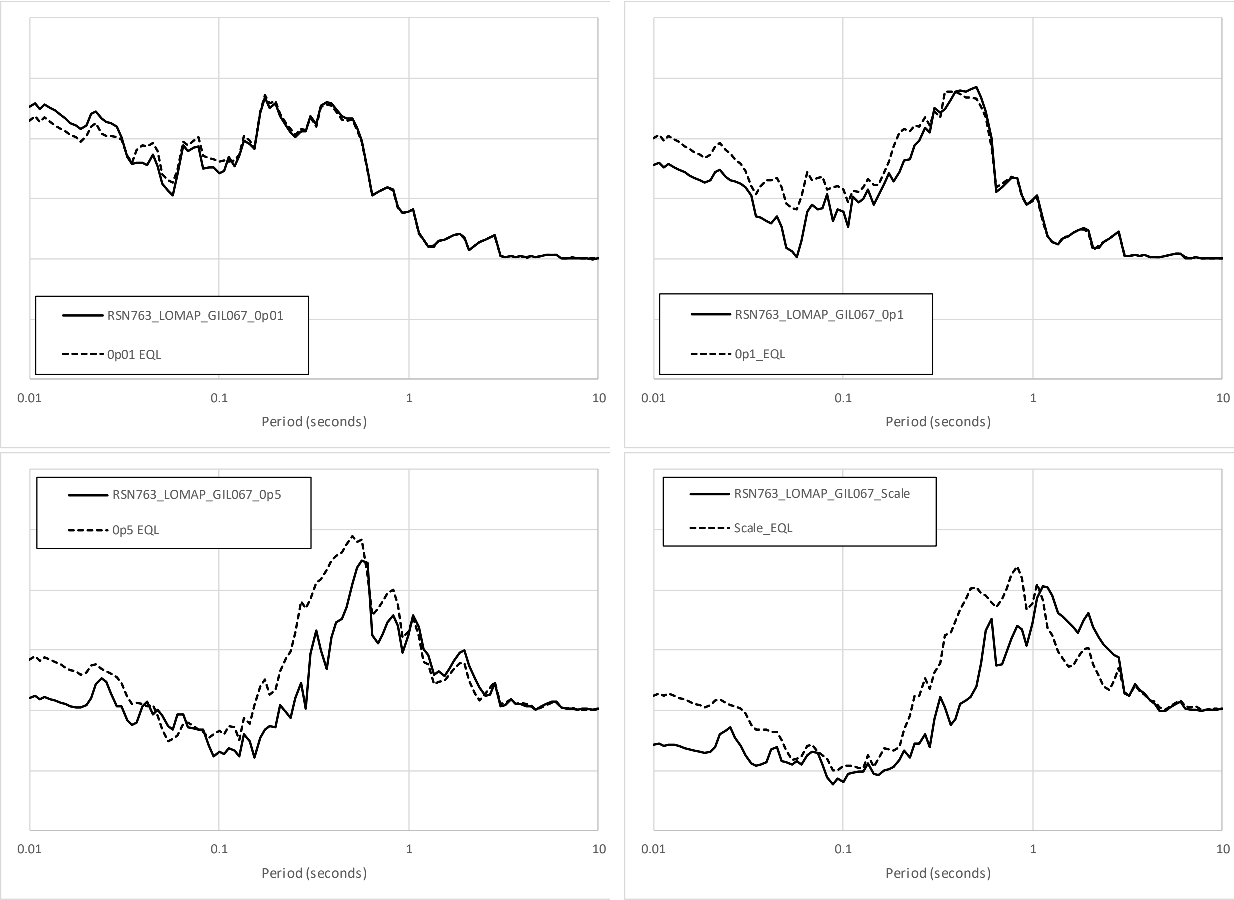


Figure 6-14 Comparison of the Amplification Functions for the Unimproved BE Profile with Different Ground Motion Levels (PGA=0.01g – Upper Left, PGA=0.1g – Upper Right, PGA=0.5g – Lower Left, and the Scaled Time History at About 0.9g – Lower Right) and Analysis Types (NL Using the Fitted GQ/H Model and EQL Using the Discrete Points)

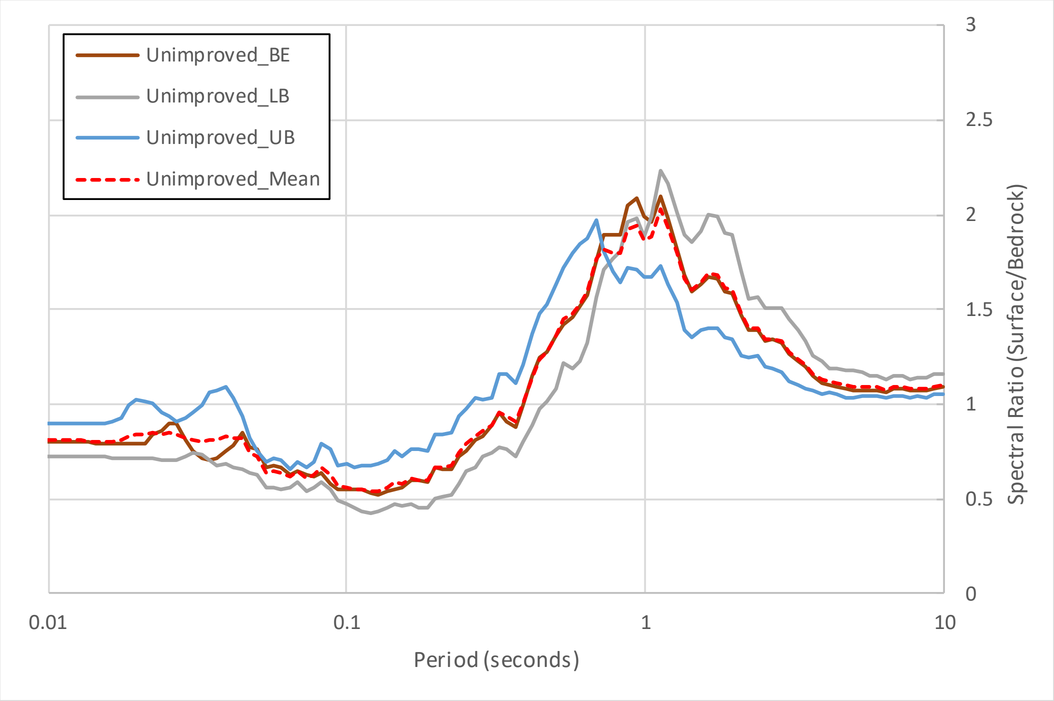


Figure 6-15 Spectral Ratios for the Unimproved Site Response Profiles and MCE$_R$ Ground Motions

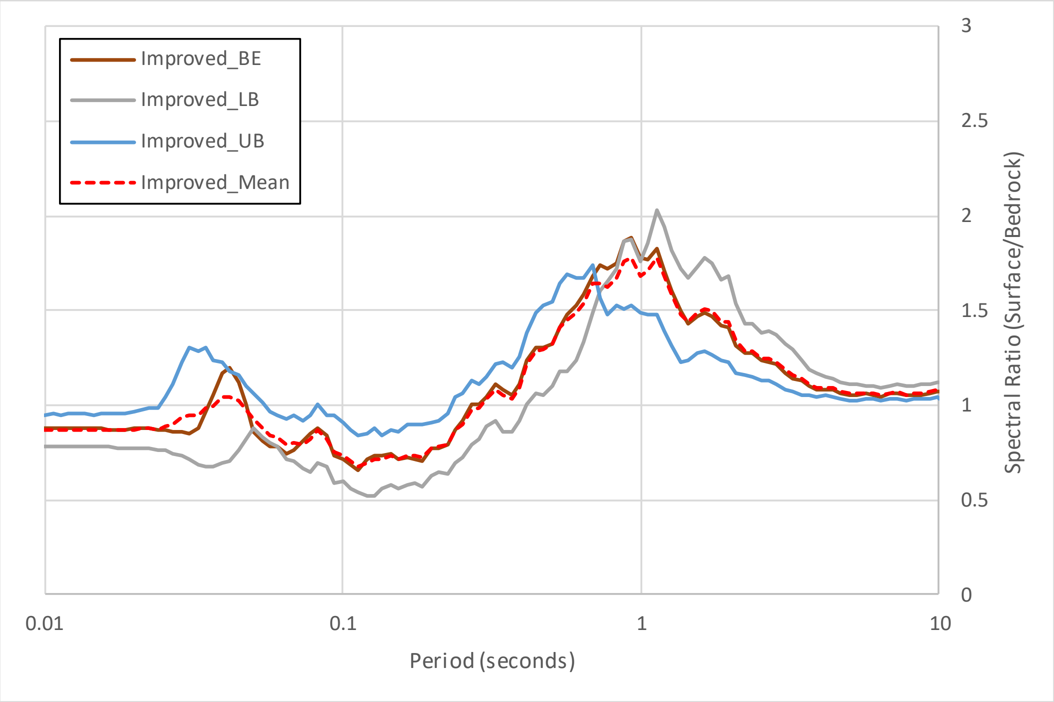


Figure 6-16 Spectral Ratios for the Improved Site Response Profiles and MCE$_R$ Ground Motions

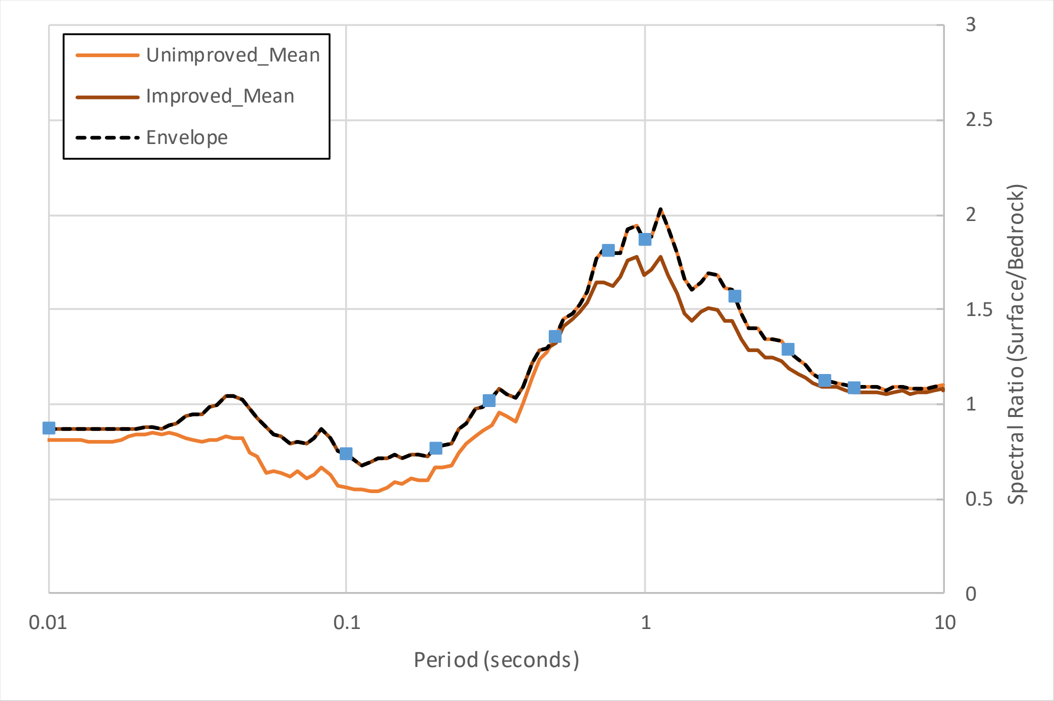


Figure 6-17 Comparison of the Mean Spectral Ratios for the Unimproved and Improved Site Response Profiles for MCE_R Ground Motions (Blue Squares Represent Interpolated Points to Calculate Ground Surface Spectrum Period by Period)

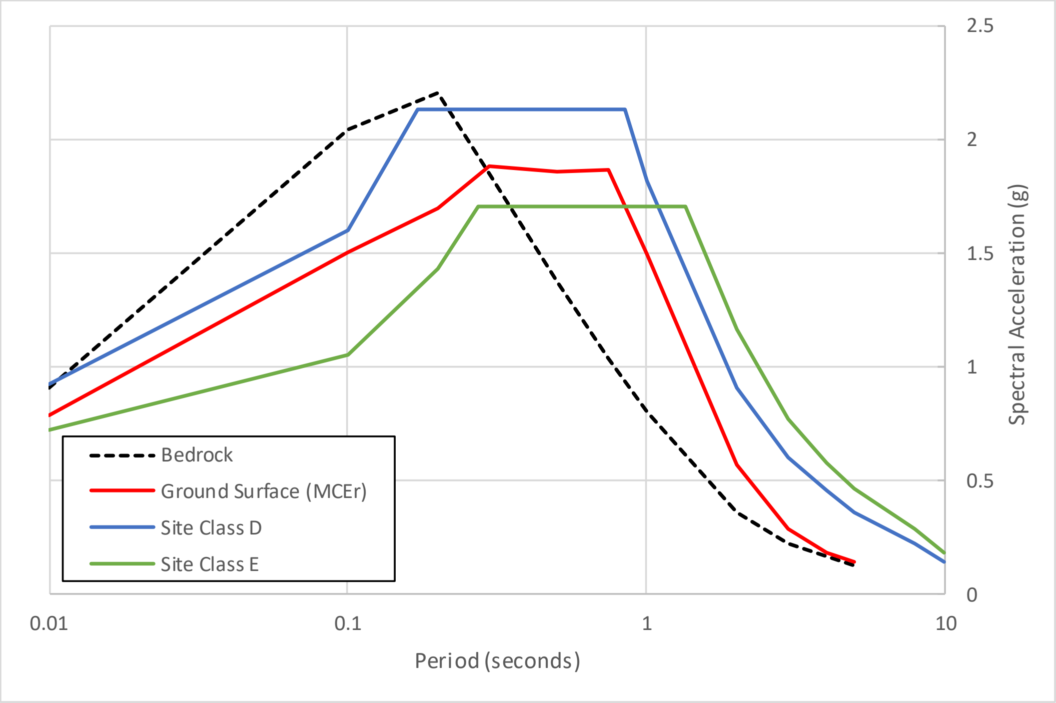


Figure 6-18 Comparison of the Site-Specific Bedrock and Ground Surface Spectra (MCE$_R$ Ground Motion Level) with the Site Class D and E Code-Based Spectra

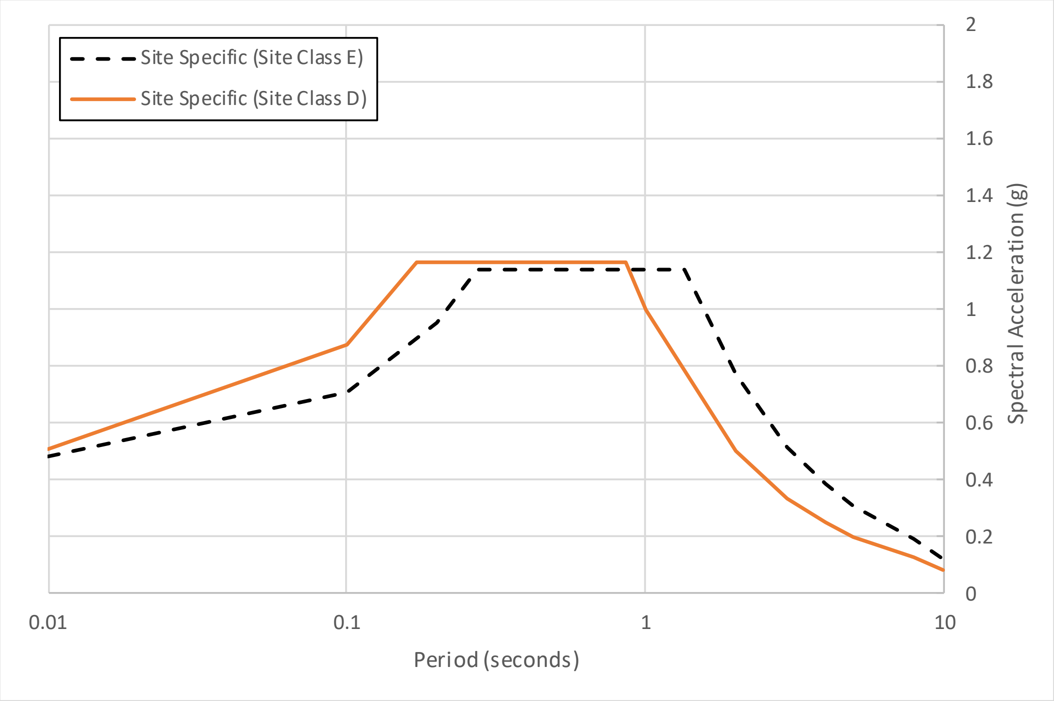


Figure 6-19 Site-Specific Design Response Spectra for Site Classes D and E with 80 Percent Code Requirements

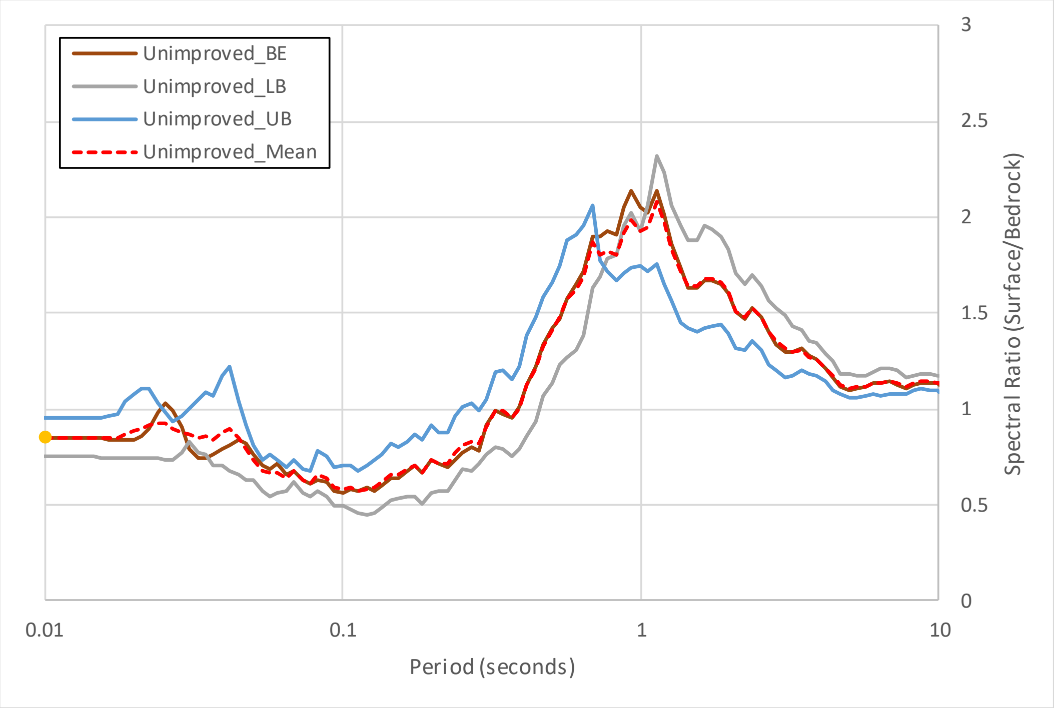


Figure 6-20 Spectral Ratios for the Unimproved Site Response Profiles and MCE_G Ground Motions (Yellow Circle Represents Point Used to Estimate PGA_M)

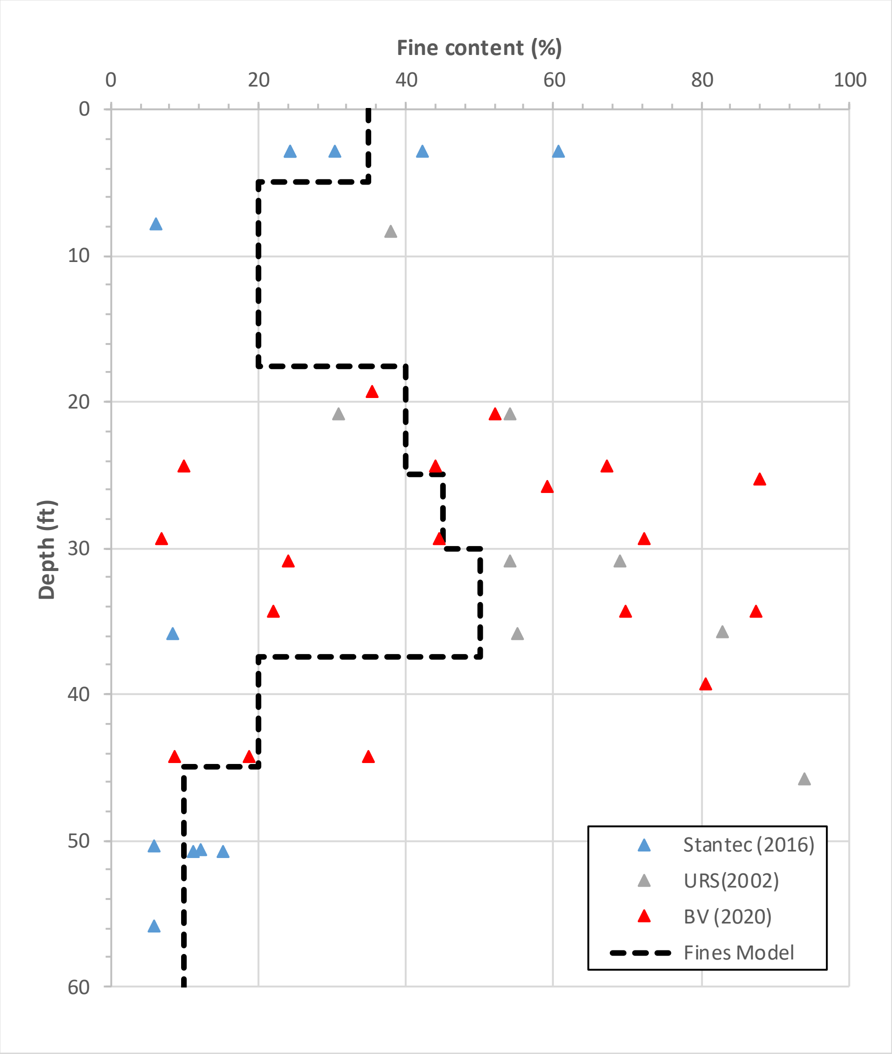


Figure 7-1 Fines Content Data and Model

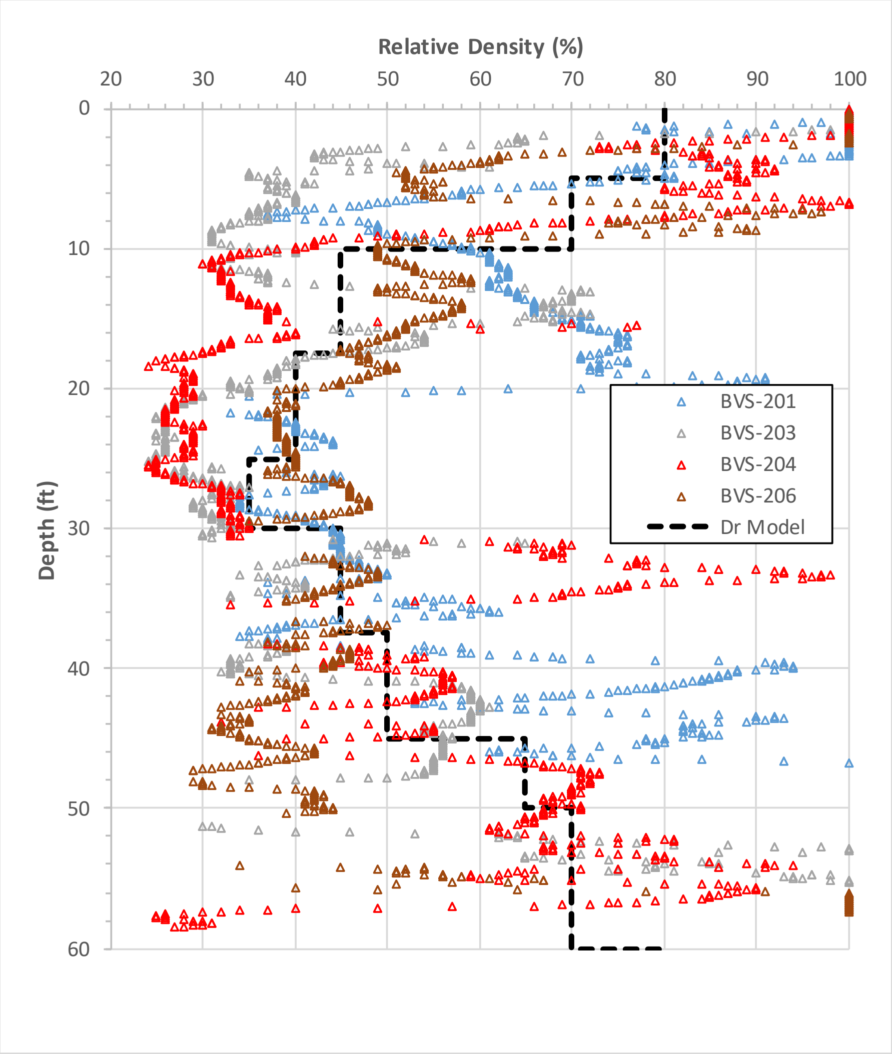


Figure 7-2 Relative Density Estimates and Model

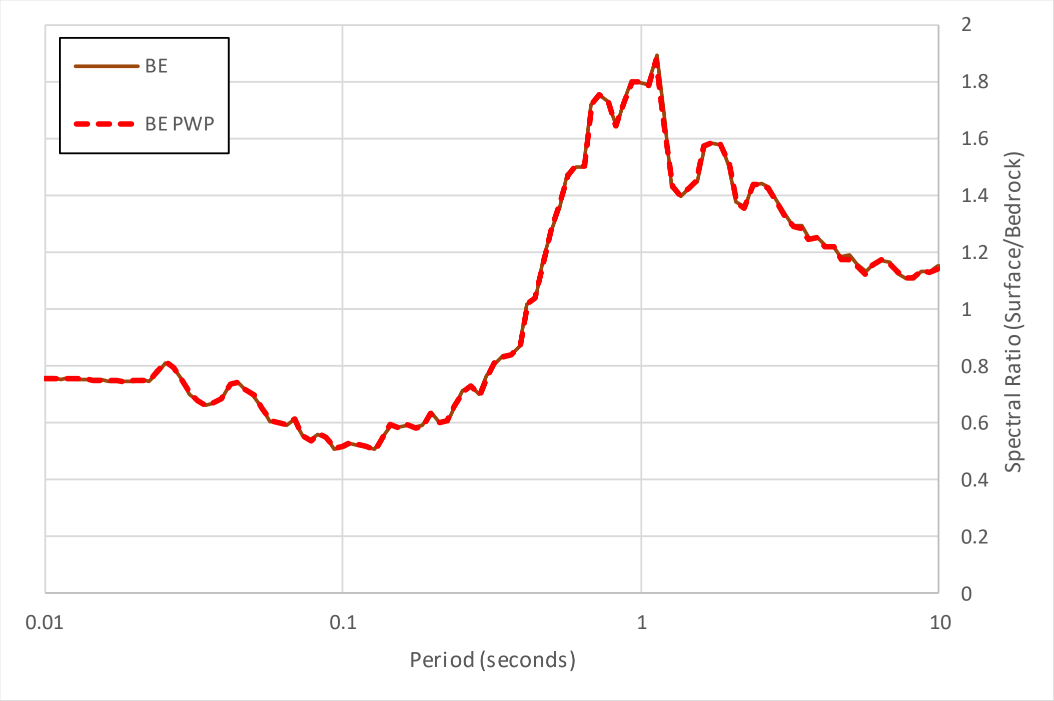


Figure 7-3 Spectral Ratios from the Sensitivity Analysis that Considered the Best Estimate Site Response Profile With (BE PWP) and Without (BE) Pore-Water Pressure Dissipation Using the MCE_G Ground Motions

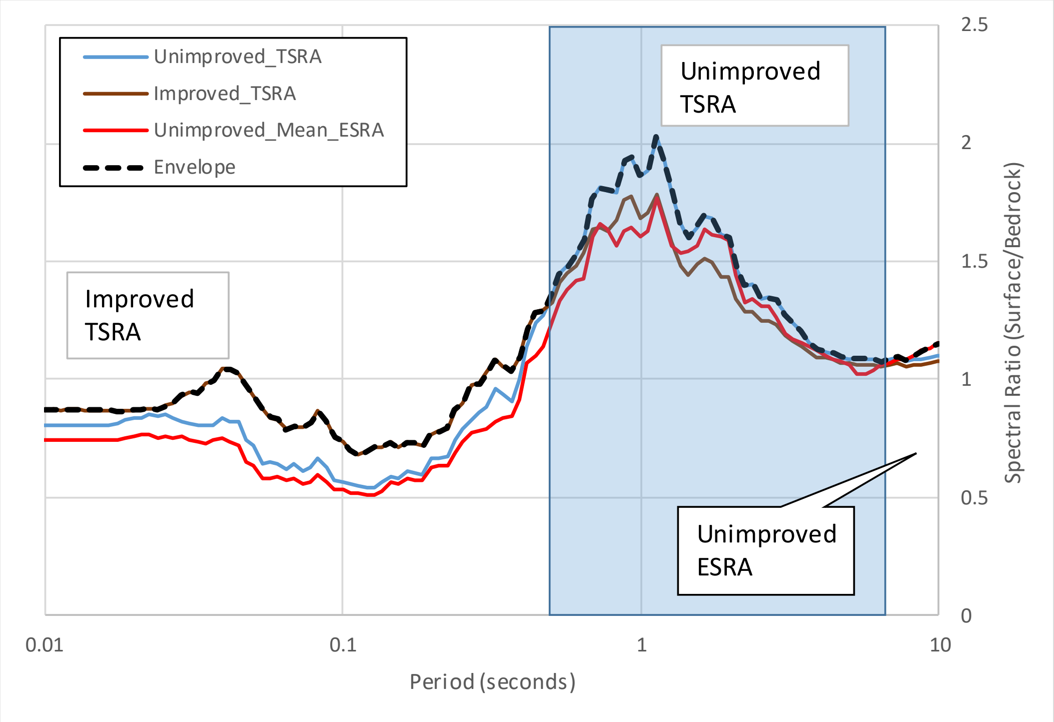


Figure 7-4 Mean Spectral Ratios from Improved and Unimproved TS-NL SRA (TSRA) and the Unimproved ES-N SRA (ESRA) and the Envelope Spectral Ratio with Ranges of Periods Where Each Analysis Controls the Envelope Using the MCE$_R$ Ground Motions

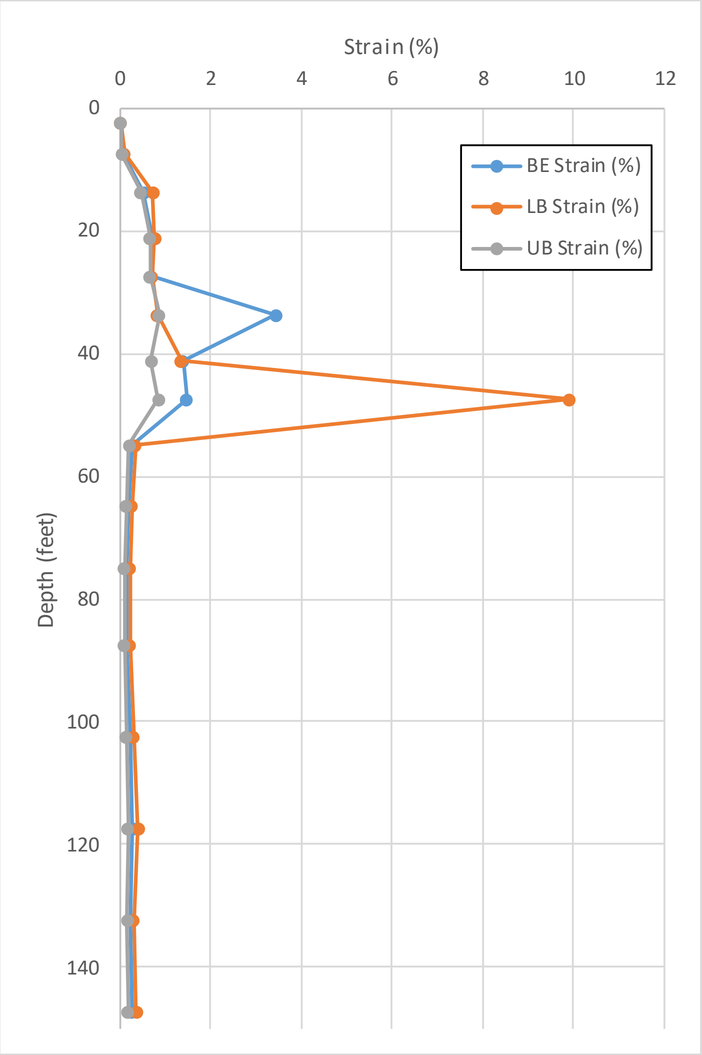


Figure 7-5 Average Shear Strain Profiles for the BE, LB, and UB Site Response Profiles from the ES-NL SRA Using the MCE$_G$ Ground Motions

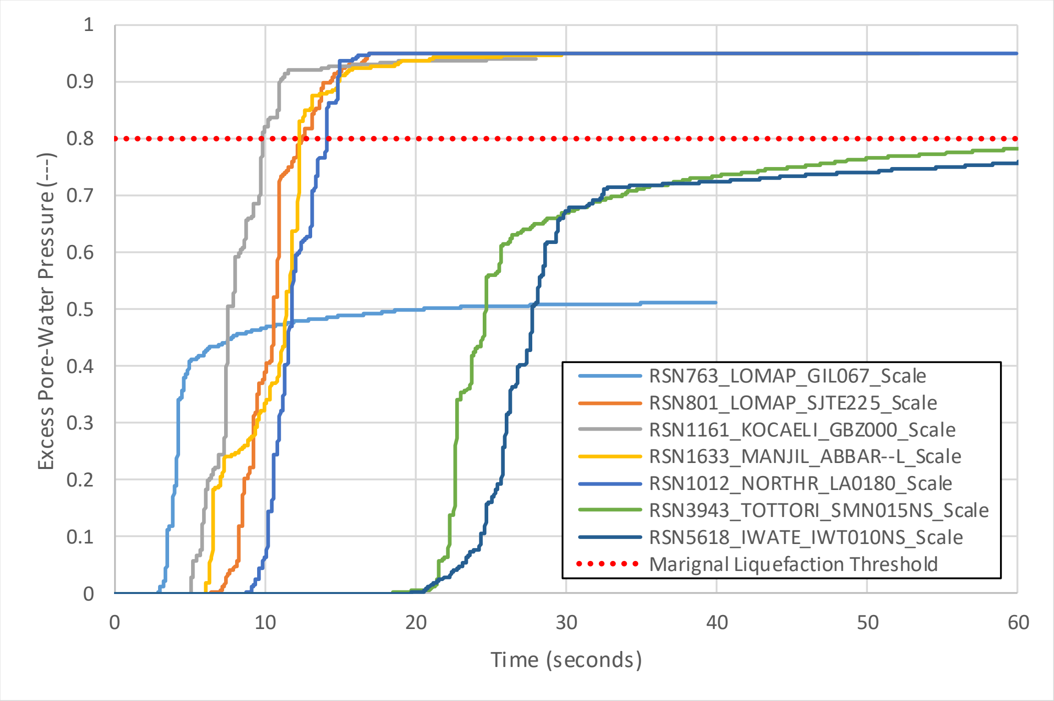


Figure 7-6 **Excess Pore-Water Pressure (r_u) for the Seven Time Histories and the Unimproved BE Site Response Profile in Layer 6 Where the Threshold of Marginal Liquefaction (red dashed line at r_u = 0.8) is Exceeded**

Appendix A. Boring Logs

LEGEND & KEY TO SYMBOLS
SOIL SAMPLES & TESTING

BLACK & VEATCH
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CLIENT Glendale Water & Power
PROJECT NAME Grayson Repowering Project
PROJECT NUMBER 405153
PROJECT LOCATION Glendale, CA

STRATIGRAPHY SYMBOLS

■	Asphalt	▨	Clay
▨	Silty Clay	▨	Sandy Clay
▦	Fill	⁘	Sandy Gravel
▥	Silt	▥	Sandy Silt
⁘	Sand	▨	Clayey Sand
⁘	Gravelly Sand	⁘	Silty Sand

SOIL SAMPLER SYMBOLS

▯	Auger Sample (AS)	◺	3" Ring-Lined Sampler (18" long)
◩	Standard Penetration Test (SPT)	▮	Thin Wall/Shelby Tube (TW)

IN SITU TEST SYMBOLS

SOIL MODIFIERS

Main (e.g., SAND)	Primary constituent by percent weight
Adjective (e.g., Silty)	20+ percent by weight (but not main constituent)
Some	10 to 20 percent by weight
Trace	5 to 10 percent by weight

PARTICLE SIZES

Boulders	9+ inches in diameter
Cobbles	3 to 9 inches in diameter
Gravel	0.25 to 3 inches in diameter
Coarse	0.75 to 3 inches in diameter
Fine	0.25 to 0.75 inches in diameter
Sand	0.0029 to 0.25 inches in diameter
Coarse	0.08 to 0.25 inches in diameter
Medium	0.017 to 0.08 inches in diameter
Fine	0.0029 to 0.017 inches in diameter
Silt	<0.0029 inches in diameter, low to nonplastic, cohesionless when dry
Clay	<0.0029 inches in diameter, cohesion and plasticity at all moisture contents

STRATIFICATION & FREQUENCY TERMS

Parting	< 1/8 inches thick
Seam	1/8 to 3 inches thick
Layer	> 3 inches thick
Pocket	Small erratic deposits less than 12 inches thick
Laminated	Alternating partings or seams of different soil types thinner than 0.25 inches
Stratified	Alternating partings or seams of different soil types thicker than 0.25 inches
Interlayered	Layers of soil lying between or alternating with other layers of soil
Intermixed	Random mixture of soil types
Occasional	One per 6 inches or more of sample thickness
Frequent	More than one per 6 inches of sample thickness

ADDITIONAL ABBREVIATIONS & SYMBOLS

Date Started	Date boring was started
Date Finished	Date boring backfilled or completed as piezometer/well
SPT	Standard Penetration Test
TW	Thin Walled Sample
CA	California Sample (3 inch split spoon sampler)
PP	Pocket penetrometer reading (tsf)
TV	Torvane reading (tsf)
N_m Value	Measured number of blows required to drive a standard split spoon sampler 12 inches with a 140-pound weight falling 30 inches
- - - - - - -	Approximate or gradational change in material classification
@	At
w/	With
&	And
WOR	Weight of rods
WOH	Weight of hammer
I.D.	Inside diameter
O.D.	Outside diameter
N/A	Not applicable
N/R	Not recorded

▽	Water Level at Time Drilling
▼	Water Level at End of Drilling
▼	Water Level After 24 Hours, or as Shown

LL	Liquid limit
PI	Plasticity Index
W	Moisture content (%)
DD	Dry unit weight (pcf)
NP	Nonplastic
Fines	Percent passing a No. 200 sieve

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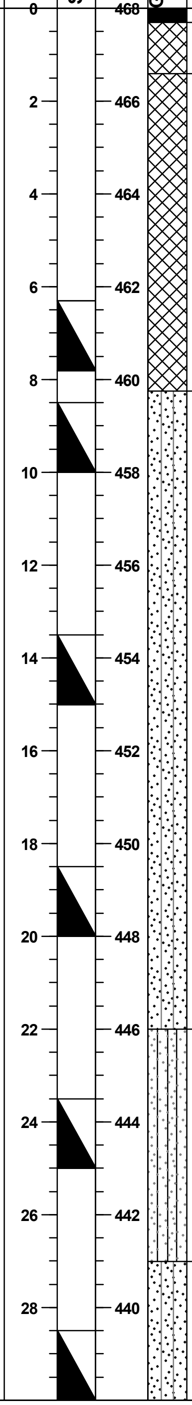
BORING LOG

BORING NO. BVB-101
SHEET 1 OF 3

CLIENT Glendale Water & Power
PROJECT Grayson Repowering Project
PROJECT NO. 405153
PROJECT LOCATION Glendale, CA
COORDINATES (State Plane) N 1878878 E 6477542
GROUND ELEVATION (NAVD88) 468 ft
TOTAL DEPTH 74.5 ft
SURFACE CONDITIONS Level ground on asphalt roadway
START DATE 09/18/2020
END DATE 09/18/2020
LOGGED BY Brandon Gomer
CHECKED BY Brandon Gomer
APPROVED BY Brian Christensen
DRILLING CONTRACTOR Terracon
DRILL RIG Diedrich D-90
HAMMER TYPE Automatic hammer (175 lbs) using 24" drop (94.8% Efficiency)

SAMPLING						
SAMPLE TYPE	SAMPLE NUMBER	1ST 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N_m VALUE	SAMPLE RECOVERY
SPT	1	2	1	2	3	0.5
SPT	2	2	1	1	2	0.5
SPT	3	4	6	6	12	1.2
SPT	4	5	5	5	10	1.3
SPT	5	6	7	9	16	1.3
SPT	6	10	12	13	25	0.4

CORING						
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD



	CLASSIFICATION OF MATERIALS	REMARKS
0.3	ASPHALT; black (Fill)	Boring advanced w/3" hand auger and breaker bar to 6.3'.
1.4	Gravelly SAND; grayish brown; fine to coarse grained; well graded; subangular; w/ some silt (Fill)	
	Silty SAND; brown; dry; fine to coarse grained; poorly graded; w/ some gravel; trace construction debris; frequent cobbles (Fill)	
	grading very loose	Below 6.3' continued w/3-7/8" tricone roller bit using bentonite mud as drilling fluid.
8.3	Silty SAND; yellowish brown; very loose; dry; fine to medium grained; poorly graded (Alluvium)	
	grading medium dense; fine grained	
	grading loose	
22.0	Sandy SILT; dark brown; very stiff; dry; non plastic (Alluvium)	
27.0	Silty SAND; dark brown; medium dense; dry; fine grained; poorly graded (Alluvium)	

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BORING LOG

BORING NO. BVB-101
SHEET 2 OF 3

CLIENT	**PROJECT**	**PROJECT NO.**
Glendale Water & Power	Grayson Repowering Project	405153

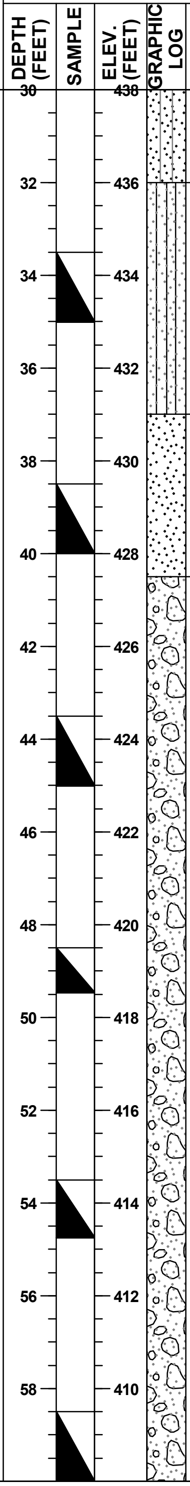
PROJECT LOCATION	**COORDINATES (State Plane)**	**GROUND ELEVATION (NAVD88)**	**TOTAL DEPTH**
Glendale, CA	N 1878878 E 6477542	468 ft	74.5 ft

SURFACE CONDITIONS	**START DATE**	**END DATE**
Level ground on asphalt roadway	09/18/2020	09/18/2020

LOGGED BY	**CHECKED BY**	**APPROVED BY**
Brandon Gomer	Brandon Gomer	Brian Christensen

DRILLING CONTRACTOR	**DRILL RIG**
Terracon	Diedrich D-90

HAMMER TYPE
Automatic hammer (175 lbs) using 24" drop (94.8% Efficiency)



SAMPLING: SAMPLE TYPE	SAMPLE NUMBER	1ST 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N_m VALUE	SAMPLE RECOVERY	CLASSIFICATION OF MATERIALS	REMARKS
CORING: CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD		
							32.0	
SPT	7	9	10	13	23	1.3	Sandy SILT; dark brown; very stiff; moist; non plastic (Alluvium)	
							37.0	
SPT	8	16	20	26	46	1.2	SAND; yellowish brown; dense; dry; fine to medium grained; poorly graded; subrounded; w/ trace silt (Alluvium)	
							40.5	Rig chatter from 40.5 to 58.5'.
SPT	9	23	23	25	48	1.1	Gravelly SAND; reddish brown; dense; moist; fine to coarse grained; well graded; subangular; w/ trace silt; iron oxidation staining (Alluvium)	Slowly losing drilling fluid below 43.5'.
SPT	10	40	50/6"	-	50+	0.8	grading very dense; wet; subrounded	Boring collapsed 38.5' after drilling to 48.5'. Redrill caved in material. Gravel clast near end of SPT-10 tip.
SPT	11	18	49	50/3"	50+	1.1	3" thick seam of clayey sand w/gravel @ 53.5' @53.8' grading w/ some silt	
SPT	12	29	39	50	89	1.3	grading w/ trace silt	Gravel near tip of SPT-12.

REPORT: BV ENERGY BORING; DATA TEMPLATE: BVE_GEO_STD_20180201.GDT; LIBRARY: BVE_GEO_STD_20180201.GLB - 10/27/20 18:12
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BORING LOG

BORING NO. BVB-101
SHEET 3 OF 3

CLIENT Glendale Water & Power	**PROJECT** Grayson Repowering Project	**PROJECT NO.** 405153

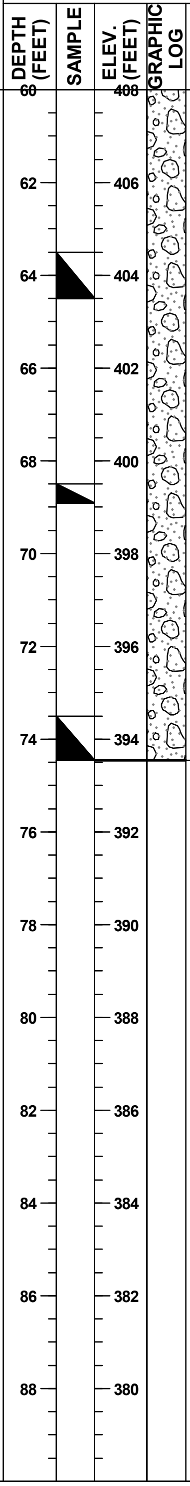
PROJECT LOCATION Glendale, CA	**COORDINATES (State Plane)** N 1878878 E 6477542	**GROUND ELEVATION (NAVD88)** 468 ft	**TOTAL DEPTH** 74.5 ft

SURFACE CONDITIONS Level ground on asphalt roadway	**START DATE** 09/18/2020	**END DATE** 09/18/2020

LOGGED BY Brandon Gomer	**CHECKED BY** Brandon Gomer	**APPROVED BY** Brian Christensen

DRILLING CONTRACTOR Terracon
DRILL RIG Diedrich D-90
HAMMER TYPE Automatic hammer (175 lbs) using 24" drop (94.8% Efficiency)

SAMPLING						
SAMPLE TYPE	SAMPLE NUMBER	1ST 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N_m VALUE	SAMPLE RECOVERY
CORING						
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD
SPT	13	50	50/6"	-	50+	0.8
SPT	14	50/5"	-	-	50+	0.3
SPT	15	40	50/6"	-	50+	0.8



CLASSIFICATION OF MATERIALS

REMARKS

Rig chatter from 64.5 to 68.5'.

Tip of sampler damaged on SPT-14. Replace tip.

Bottom of boring at 74.5' on 09/18/2020. Drilling fluid @14.0' at 0.25 hours after completion of drilling. Boring backfilled w/ cement-bentonite grout on 09/18/2020.

REPORT: BV ENERGY BORING; DATA TEMPLATE: BVE_GEO_STD_20180201.GDT; LIBRARY: BVE_GEO_STD_20180201.GLB - 10/27/20 18:12
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BORING NO. BVB-102
SHEET 1 OF 3

BORING LOG

CLIENT Glendale Water & Power	**PROJECT** Grayson Repowering Project	**PROJECT NO.** 405153

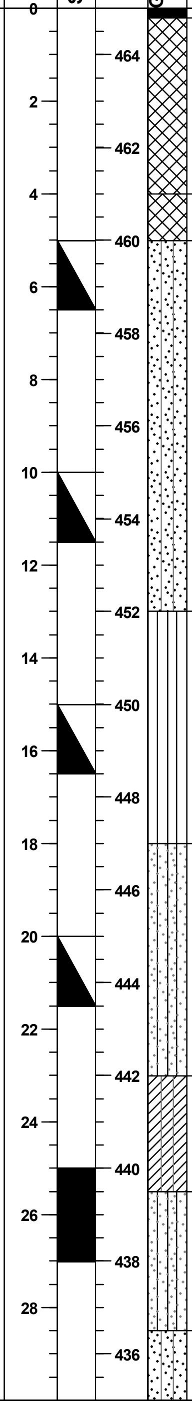
PROJECT LOCATION Glendale, CA	**COORDINATES (State Plane)** N 1879298 E 6477174	**GROUND ELEVATION (NAVD88)** 465 ft	**TOTAL DEPTH** 74.5 ft

SURFACE CONDITIONS Level ground on asphalt roadway	**START DATE** 09/15/2020	**END DATE** 09/18/2020

LOGGED BY Brandon Gomer	**CHECKED BY** Brandon Gomer	**APPROVED BY** Brian Christensen

DRILLING CONTRACTOR Terracon
DRILL RIG Diedrich D-90
HAMMER TYPE Automatic hammer (175 lbs) using 24" drop (94.8% Efficiency)

SAMPLING						
SAMPLE TYPE	**SAMPLE NUMBER**	**1ST 6 INCHES**	**2ND 6 INCHES**	**3RD 6 INCHES**	**N_m VALUE**	**SAMPLE RECOVERY**
CORING						
CORE SIZE	**RUN NUMBER**	**RUN LENGTH**	**RUN RECOVERY**	**RQD RECOVERY**	**PERCENT RECOVERY**	**RQD**
SPT	1	4	4	4	8	1.3
SPT	2	4	5	3	8	1.4
SPT	3	4	6	6	12	1.5
SPT	4	4	5	8	13	1.4
TW	5	-	-	-	-	2.0



CLASSIFICATION OF MATERIALS		**REMARKS**
ASPHALT; black (Fill)	0.2	Boring advanced w/3" hand auger and breaker bar to 5'.
Silty SAND; brownish gray; dry; fine to coarse grained; poorly graded; subrounded; w/ trace gravel; trace construction debris (Fill)	4.0	
Gravelly SAND; dark brown; dry; fine to coarse grained; poorly graded; subrounded; w/ some silt (Fill)	5.0	
Silty SAND; brown; loose; dry; fine to medium grained; poorly graded; subrounded; w/ trace gravel (Alluvium)	13.0	Below 5' continued w/4-1/4" I.D. & 8-1/4" O.D. hollow stem augers.
SILT; pale brown; stiff; dry; low plasticity; w/ some sand; trace clay; frequent roots (Floodplain)	18.0	
Sandy SILT; brown; stiff; dry; non plastic (Alluvium) @20.8' 1/8" sand seam	23.0	
Silty CLAY; yellowish black; moist; low plasticity; w/ trace sand (Floodplain)	25.5	
Sandy SILT; dark brown; very stiff; moist; low plasticity; w/ some clay (Floodplain)	28.5	PP: 4.5 tsf TV: 1.25 tsf

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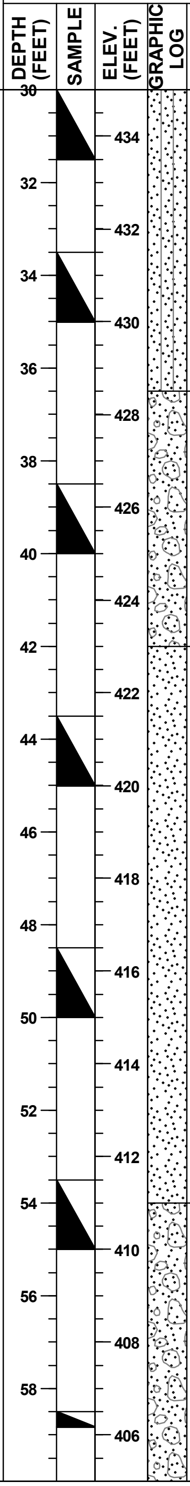
BORING LOG

BORING NO. BVB-102
SHEET 2 OF 3

CLIENT Glendale Water & Power		**PROJECT** Grayson Repowering Project	**PROJECT NO.** 405153
PROJECT LOCATION Glendale, CA	**COORDINATES (State Plane)** N 1879298 E 6477174	**GROUND ELEVATION (NAVD88)** 465 ft	**TOTAL DEPTH** 74.5 ft
SURFACE CONDITIONS Level ground on asphalt roadway		**START DATE** 09/15/2020	**END DATE** 09/18/2020
LOGGED BY Brandon Gomer	**CHECKED BY** Brandon Gomer	**APPROVED BY** Brian Christensen	
DRILLING CONTRACTOR Terracon	**DRILL RIG** Diedrich D-90		
HAMMER TYPE Automatic hammer (175 lbs) using 24" drop (94.8% Efficiency)			



SAMPLING: SAMPLE TYPE CORING: CORE SIZE	SAMPLE NUMBER RUN NUMBER	1ST 6 INCHES RUN LENGTH	2ND 6 INCHES RUN RECOVERY	3RD 6 INCHES RQD RECOVERY	N_m VALUE PERCENT RECOVERY	SAMPLE RECOVERY RQD	CLASSIFICATION OF MATERIALS	REMARKS
SPT	6	9	12	15	27	1.5	Silty SAND; reddish brown; medium dense; moist; fine to coarse grained; poorly graded; subangular; w/ trace gravel; iron oxidation (Alluvium)	Below 30' continued w/3-7/8" tricone roller bit using bentonite mud as drilling fluid. Slight rig chatter from 32 to 35'.
SPT	7	28	37	36	73	1.3	grading very dense; wet; well graded; w/ some gravel; trace silt	
							36.5	
SPT	8	15	26	30	56	1.1	Gravelly SAND; grayish brown; very loose; wet; fine to coarse grained; well graded; subangular; w/ some silt (Alluvium) @39.6' ~1" thick silty sand seam	
							42.0	
SPT	9	24	30	27	57	1.1	SAND; grayish brown; very dense; wet; fine to coarse grained; well graded; subrounded; w/ trace silt; iron oxidation (Alluvium) @44.7' ~3/4" thick clay seam	
SPT	10	30	32	40	72	1.0	grading w/ some gravel; trace silt @49.5' 1" thick clay seams at 49.5' & 49.9'	
							54.0	
SPT	11	32	30	28	58	0.9	Gravelly SAND; grayish brown; very dense; wet; fine to coarse grained; well graded; subangular; w/ trace silt; iron oxidation (Alluvium)	Drill rig chatter from 54' to 68.5'.
SPT	12	50/4"	-	-	50+	0.3		

REPORT: BV ENERGY BORING; DATA TEMPLATE: BVE_GEO_STD_20180201.GDT; LIBRARY: BVE_GEO_STD_20180201.GLB - 10/27/20 18:12
PROJECT: \\NA\DATA\ENERGY\DEPT\GEO\DATA\SERVICES\POWERGENERATION\405153 - GWP GRAYSON REPOWER\GINT\405153 - GRAYSON REPOWER_FINAL.GPJ

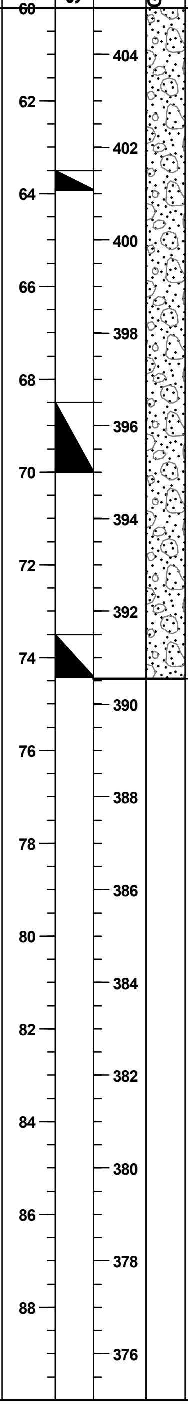
BORING LOG

BORING NO. BVB-102
SHEET 3 OF 3

CLIENT Glendale Water & Power
PROJECT Grayson Repowering Project
PROJECT NO. 405153
PROJECT LOCATION Glendale, CA
COORDINATES (State Plane) N 1879298 E 6477174
GROUND ELEVATION (NAVD88) 465 ft
TOTAL DEPTH 74.5 ft
SURFACE CONDITIONS Level ground on asphalt roadway
START DATE 09/15/2020
END DATE 09/18/2020
LOGGED BY Brandon Gomer
CHECKED BY Brandon Gomer
APPROVED BY Brian Christensen
DRILLING CONTRACTOR Terracon
DRILL RIG Diedrich D-90
HAMMER TYPE Automatic hammer (175 lbs) using 24" drop (94.8% Efficiency)

SAMPLING						
SAMPLE TYPE	SAMPLE NUMBER	1ST 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N_m VALUE	SAMPLE RECOVERY
CORING						
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD
SPT	13	50/5"	-	-	50+	0.3
SPT	14	33	40	47	87	1.2
SPT	15	50	50/5"	-	50+	0.8

DEPTH (FEET) **SAMPLE** **ELEV. (FEET)** **GRAPHIC LOG**



CLASSIFICATION OF MATERIALS

REMARKS

1" diameter gravel piece in tip of SPT-13.

Lost 25% circulation while cleaning to sample. Modified drilling fluid and regained 100% circulation before sampling. Boring collapsed @20' before backfilling. Redrilled prior to backfilling.

Bottom of boring at 74.5' on 09/16/2020. Drilling fluid @10.0' at 0.25 hours after completion of drilling. Boring backfilled w/ cement-bentonite grout on 09/18/2020.

REPORT: BV ENERGY BORING; DATA TEMPLATE: BVE_GEO_STD_20180201.GDT; LIBRARY: BVE_GEO_STD_20180201.GLB - 10/27/20 18:12 - GRAYSON REPOWER_FINAL.GPJ
PROJECT: \\NA\DATA\ENERGY\DEPT\GEO\DATA\SERVICES\POWERGENERATION\405153 - GWP GRAYSON REPOWER\GINT\405153 - GRAYSON REPOWER_FINAL.GPJ

BORING NO. BVB-103
SHEET 1 OF 2

BORING LOG

CLIENT	**PROJECT**	**PROJECT NO.**
Glendale Water & Power	Grayson Repowering Project	405153

PROJECT LOCATION	**COORDINATES (State Plane)**	**GROUND ELEVATION (NAVD88)**	**TOTAL DEPTH**
Glendale, CA	N 1879324 E 6477321	467 ft	43.5 ft

SURFACE CONDITIONS	**START DATE**	**END DATE**
Gently sloping ground on asphalt roadway	09/14/2020	09/19/2020

LOGGED BY	**CHECKED BY**	**APPROVED BY**
Brandon Gomer	Brandon Gomer	Brian Christensen

DRILLING CONTRACTOR	**DRILL RIG**
Terracon	Diedrich D-90

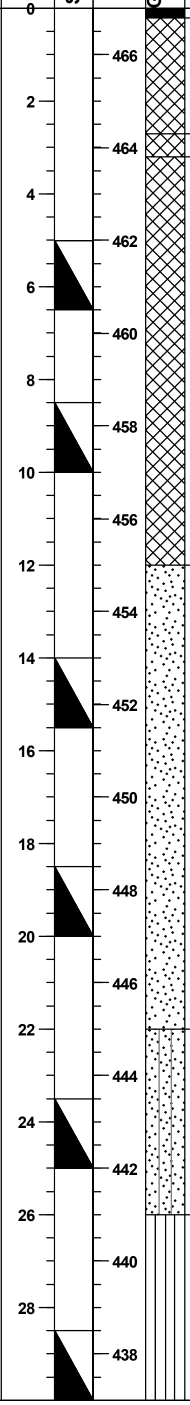
HAMMER TYPE
Automatic hammer (175 lbs) using 24" drop (94.8% Efficiency)

SAMPLING

SAMPLE TYPE	SAMPLE NUMBER	1ST 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N_m VALUE	SAMPLE RECOVERY
SPT	1	3	3	6	9	1.3
SPT	2	6	6	6	12	1.2
SPT	3	4	7	8	15	1.3
SPT	4	5	7	11	18	1.4
SPT	5	2	3	5	8	0.4
SPT	6	6	8	10	18	0.9

CORING

CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD



CLASSIFICATION OF MATERIALS	REMARKS
ASPHALT; dark gray (Fill) 0.2	Boring advanced w/3" hand auger and breaker bar to 5'.
Silty SAND; grayish brown; dry; fine to coarse grained; well graded; subangular; w/ trace gravel (Fill) 2.7	
Sandy GRAVEL; grayish brown; dry; fine to coarse grained; poorly graded; subangular; w/ some sand (Fill) 3.2	
Silty SAND; brown; dry; fine to coarse grained; poorly graded; subangular; w/ trace gravel (Fill)	
grading loose	Below 5' continued w/4-1/4" I.D. & 8-1/4" O.D. hollow stem augers.
grading medium dense; w/ trace construction debris 12.0	
SAND; yellowish brown; medium dense; dry; fine to coarse grained; well graded; subrounded; w/ trace silt (Alluvium)	Below 15' continued w/3-7/8" drag bit using bentonite mud as drilling fluid.
grading yellowish brown; dry; poorly graded (Alluvium) 22.0	
Silty SAND; brown; loose; dry; fine to medium grained; poorly graded; stratified (Alluvium) 26.0	Leak in pump hose causes loss of circulation after drilling to 23.5'. Replace hose and reclean for sample @ 23.5'.
Sandy SILT; brown; very stiff; moist; non plastic; w/ trace clay; laminated (Floodplain)	

BORING NO. BVB-103
SHEET 2 OF 2

BORING LOG

CLIENT Glendale Water & Power
PROJECT Grayson Repowering Project
PROJECT NO. 405153
PROJECT LOCATION Glendale, CA
COORDINATES (State Plane) N 1879324 E 6477321
GROUND ELEVATION (NAVD88) 467 ft
TOTAL DEPTH 43.5 ft
SURFACE CONDITIONS Gently sloping ground on asphalt roadway
START DATE 09/14/2020
END DATE 09/19/2020
LOGGED BY Brandon Gomer
CHECKED BY Brandon Gomer
APPROVED BY Brian Christensen
DRILLING CONTRACTOR Terracon
DRILL RIG Diedrich D-90
HAMMER TYPE Automatic hammer (175 lbs) using 24" drop (94.8% Efficiency)

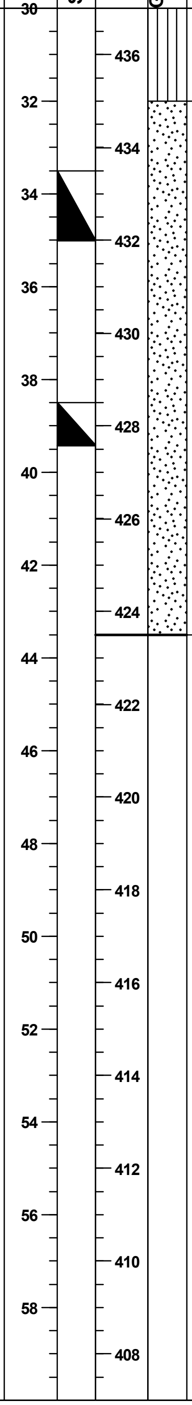
SAMPLING

SAMPLE TYPE	SAMPLE NUMBER	1ST 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N_m VALUE	SAMPLE RECOVERY
SPT	7	13	14	20	34	1.1
SPT	8	32	50/5"	-	50+	0.8

CORING

CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD

DEPTH (FEET) | **SAMPLE** | **ELEV. (FEET)** | **GRAPHIC LOG** | **CLASSIFICATION OF MATERIALS** | **REMARKS**



32.0

SAND; yellowish brown; dense; dry; fine to coarse grained; poorly graded; subrounded; w/ some silt; occasional silt pockets (Alluvium)

grading brown; very dense; wet; well graded; rounded; silt pockets grade out

Drill bit broke at end of 9/14/20 when pulling rods. Abandon boring, offset and re-drill.
Bottom of boring at 43.5' on 09/15/2020. Boring collapsed @37.0' before backfilling. Boring dry at 119 hours after completion of drilling. Boring backfilled w/ cement-bentonite grout on 09/19/2020.

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BORING LOG

BORING NO. BVB-103A
SHEET 1 OF 3

CLIENT	PROJECT	PROJECT NO.
Glendale Water & Power	Grayson Repowering Project	405153

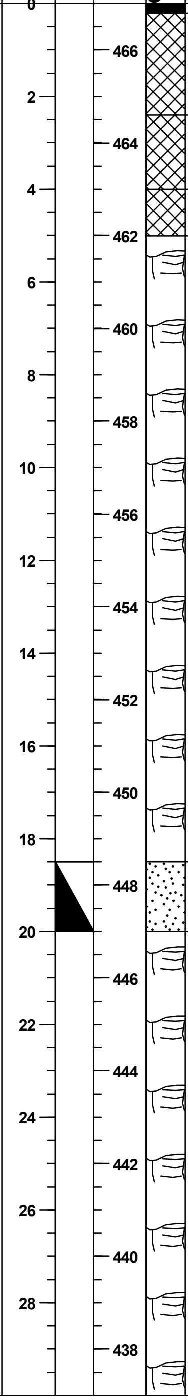
PROJECT LOCATION	COORDINATES (State Plane)	GROUND ELEVATION (NAVD88)	TOTAL DEPTH
Glendale, CA	N 1879326 E 6477317	467 ft	74.4 ft

SURFACE CONDITIONS	START DATE	END DATE
Gently sloping ground on asphalt roadway (4' northwest of BVB-103)	09/19/2020	09/19/2020

LOGGED BY	CHECKED BY	APPROVED BY
Brandon Gomer	Brandon Gomer	Brian Christensen

DRILLING CONTRACTOR	DRILL RIG
Terracon	Diedrich D-90

HAMMER TYPE
Automatic hammer (175 lbs) using 24" drop (94.8% Efficiency)



SAMPLING: SAMPLE TYPE	SAMPLE NUMBER	1ST 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N_m VALUE	SAMPLE RECOVERY	CORING: CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD	CLASSIFICATION OF MATERIALS	REMARKS
														ASPHALT; dark gray (Fill) 0.2	Boring advanced w/3" hand auger and breaker bar to 5'.
														Silty SAND; grayish brown; dry (Fill) 2.4	
														Sandy GRAVEL; grayish brown; dry; fine to coarse grained; poorly graded; subangular; w/ some silt (Fill) 4.0	
														Silty SAND; brownish gray; dry; fine to coarse grained; poorly graded; subangular; w/ some gravel 5.0	
														@5.0' Blind drill from 5' to 20' 18.5	Below 5' continued w/3-7/8" tricone roller bit using bentonite mud as drilling fluid. Blind drill to 18.5'. Rig chatter from 16 to 18.5'.
SPT	1	10	13	21	34	1.3								SAND; yellowish brown; dense; dry; fine to coarse grained; poorly graded; subrounded; w/ trace silt; trace gravel (Alluvium) 20.0	
														@20.0' Blind drill from 20' to 43.5'	

BORING LOG

BORING NO. BVB-103A

SHEET 2 OF 3

CLIENT Glendale Water & Power

PROJECT Grayson Repowering Project

PROJECT NO. 405153

PROJECT LOCATION Glendale, CA

COORDINATES (State Plane) N 1879326 E 6477317

GROUND ELEVATION (NAVD88) 467 ft

TOTAL DEPTH 74.4 ft

SURFACE CONDITIONS Gently sloping ground on asphalt roadway (4' northwest of BVB-103)

START DATE 09/19/2020

END DATE 09/19/2020

LOGGED BY Brandon Gomer

CHECKED BY Brandon Gomer

APPROVED BY Brian Christensen

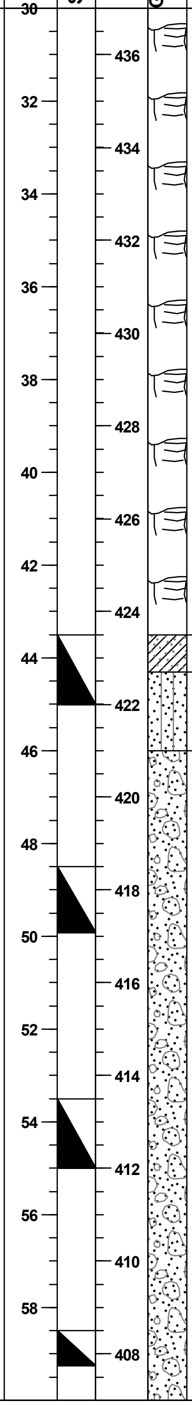
DRILLING CONTRACTOR Terracon

DRILL RIG Diedrich D-90

HAMMER TYPE Automatic hammer (175 lbs) using 24" drop (94.8% Efficiency)

SAMPLING						
SAMPLE TYPE	SAMPLE NUMBER	1ST 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N_m VALUE	SAMPLE RECOVERY
SPT	2	7	15	19	34	1.3
SPT	3	29	42	50/5"	50+	1.3
SPT	4	22	22	43	65	1.3
SPT	5	50	50/3"	-	50+	0.7

CORING						
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD



CLASSIFICATION OF MATERIALS

43.5

Sandy CLAY; grayish brown; stiff; moist; low plasticity; w/ trace gravel; iron oxide staining (Floodplain)

44.3

@44.2' 1" thick gravel seam

Silty SAND; grayish brown; dense; wet; fine to coarse grained; poorly graded; subrounded; w/ some gravel; iron-oxide staining (Alluvium)

46.0

Gravelly SAND; grayish brown; very dense; wet; fine to coarse grained; well graded; subangular; w/ trace silt; iron oxide staining; gravel is weathered & weak (Alluvium)

grading w/ some silt

@54.3' 1" clay seam

grading w/ trace silt

REMARKS

Rig chatter from 41.5' to 43.5'.

RIg chatter from 46 to 67'.

REPORT: BV ENERGY BORING; DATA TEMPLATE: BVE_GEO_STD_20180201.GDT; LIBRARY: BVE_GEO_STD_20180201.GLB - 10/27/20 18:12
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BORING NO. BVB-103A
SHEET 3 OF 3

BORING LOG

CLIENT Glendale Water & Power	**PROJECT** Grayson Repowering Project	**PROJECT NO.** 405153

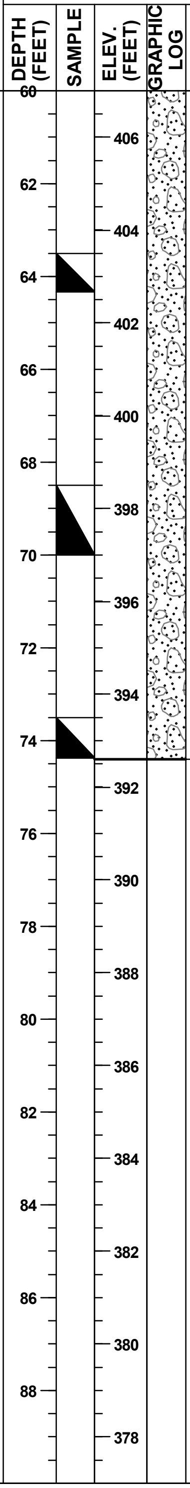
PROJECT LOCATION Glendale, CA	**COORDINATES (State Plane)** N 1879326 E 6477317	**GROUND ELEVATION (NAVD88)** 467 ft	**TOTAL DEPTH** 74.4 ft

SURFACE CONDITIONS Gently sloping ground on asphalt roadway (4' northwest of BVB-103)	**START DATE** 09/19/2020	**END DATE** 09/19/2020

LOGGED BY Brandon Gomer	**CHECKED BY** Brandon Gomer	**APPROVED BY** Brian Christensen
DRILLING CONTRACTOR Terracon	**DRILL RIG** Diedrich D-90	

HAMMER TYPE
Automatic hammer (175 lbs) using 24" drop (94.8% Efficiency)

SAMPLING: SAMPLE TYPE	SAMPLE NUMBER	1ST 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N_m VALUE	SAMPLE RECOVERY	DEPTH (FEET)	CLASSIFICATION OF MATERIALS	REMARKS
CORING: CORE SIZE	**RUN NUMBER**	**RUN LENGTH**	**RUN RECOVERY**	**RQD RECOVERY**	**PERCENT RECOVERY**	**RQD**			
SPT	6	49	50/4"	-	50+	0.8	64		
							68.7	grading w/ trace gravel	
SPT	7	27	27	37	64	1.3	69		
							72		RIg chatter from 72 to 73.5'.
SPT	8	46	50/5"	-	50+	0.8	74	grading w/ some gravel	
							74.4		Bottom of boring at 74.4' on 09/19/2020. Drilling fluid @16.0' at 0.25 hours after completion of drilling. Boring backfilled w/ cement-bentonite grout on 09/19/2020.



REPORT: BV ENERGY BORING; DATA TEMPLATE: BVE_GEO_STD_20180201.GDT; LIBRARY: BVE_GEO_STD_20180201.GLB - 10/27/20 18:12
PROJECT: \\NA\DATA\ENERGY\DEPT\GEO\DATA\SERVICES\POWERGENERATION\405153 - GWP GRAYSON REPOWER\GINT\405153 - GRAYSON REPOWER_FINAL.GPJ

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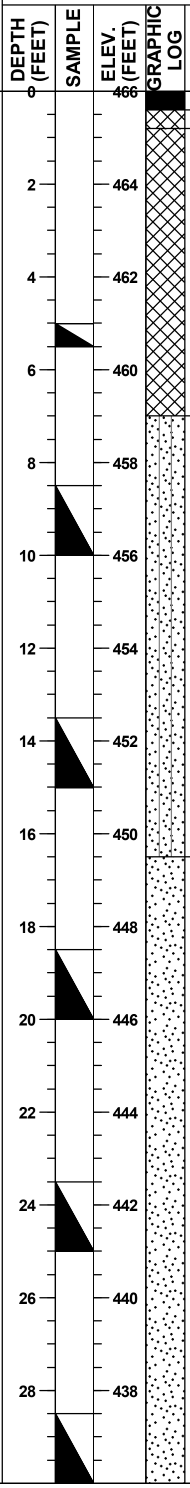
BORING LOG

BORING NO. BVB-104
SHEET 1 OF 3

CLIENT Glendale Water & Power
PROJECT Grayson Repowering Project
PROJECT NO. 405153
PROJECT LOCATION Glendale, CA
COORDINATES (State Plane) N 1878951 E 6477236
GROUND ELEVATION (NAVD88) 466 ft
TOTAL DEPTH 74.5 ft
SURFACE CONDITIONS Gently sloping ground on asphalt roadway
START DATE 09/16/2020
END DATE 09/18/2020
LOGGED BY Brandon Gomer
CHECKED BY Brandon Gomer
APPROVED BY Brian Christensen
DRILLING CONTRACTOR Terracon
DRILL RIG Diedrich D-90
HAMMER TYPE Automatic hammer (175 lbs) using 24" drop (94.8% Efficiency)

SAMPLING						
SAMPLE TYPE	SAMPLE NUMBER	1ST 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N_m VALUE	SAMPLE RECOVERY
CORING						
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD
SPT	1	20/6"	-	-	50+	0.5
SPT	2	3	3	4	7	0.5
SPT	3	2	2	2	4	0.7
SPT	4	3	3	3	6	0.8
SPT	5	4	4	5	9	0.8
SPT	6	6	6	10	16	0.6



CLASSIFICATION OF MATERIALS

ASPHALT; black; dry (Fill) 0.4

Sandy GRAVEL; gray; dry; fine to coarse grained; well graded; angular; w/ some silt; road base (Fill) 0.8

Silty SAND; dark brown; dry; fine to coarse grained; poorly graded; subrounded; w/ trace gravel (Fill)
@1.0' grading w/ some gravel; trace construction debris

7.0

Silty SAND; grayish brown; loose; moist; fine to coarse grained; poorly graded; subrounded; w/ trace gravel (Alluvium)

16.5

SAND; grayish brown; loose; moist; fine to coarse grained; poorly graded; subrounded; w/ some gravel; trace silt (Alluvium)

grading medium dense

REMARKS

Boring advanced w/hand auger and 6" solid stem augers in hard layers.

Stopped SPT-1 early due to sampler bouncing on hard material. Coarse gravel in sampler tip, but not observation of a hard layer or obstruction in boring. Below 5' continued w/3-7/8" tricone roller bit using bentonite mud as drilling fluid. Hard drilling st about 5' due to an apparent cobble.

REPORT: BV ENERGY BORING; DATA TEMPLATE: BVE_GEO_STD_20180201.GDT; LIBRARY: BVE_GEO_STD_20180201.GLB - 10/27/20 18:12
PROJECT: \\NA\DATA\ENERGY\DEPT\GEO\DATA\SERVICES\POWERGENERATION\405153 - GWP GRAYSON REPOWER\GINT\405153 - GRAYSON REPOWER_FINAL.GPJ

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BORING NO. BVB-104
SHEET 2 OF 3

BORING LOG

CLIENT	**PROJECT**	**PROJECT NO.**
Glendale Water & Power	Grayson Repowering Project	405153

PROJECT LOCATION	**COORDINATES (State Plane)**	**GROUND ELEVATION (NAVD88)**	**TOTAL DEPTH**
Glendale, CA	N 1878951 E 6477236	466 ft	74.5 ft

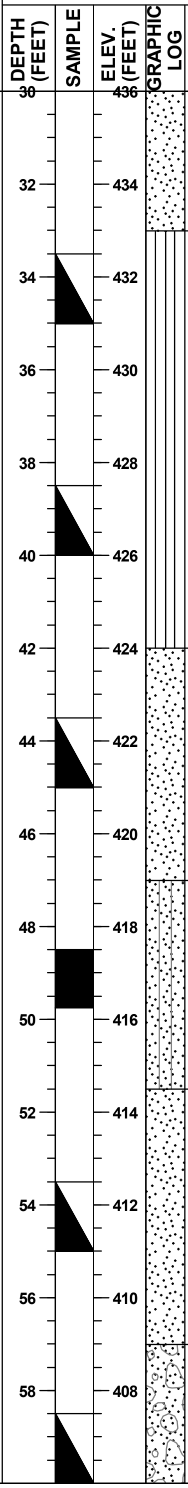
SURFACE CONDITIONS	**START DATE**	**END DATE**
Gently sloping ground on asphalt roadway	09/16/2020	09/18/2020

LOGGED BY	**CHECKED BY**	**APPROVED BY**
Brandon Gomer	Brandon Gomer	Brian Christensen

DRILLING CONTRACTOR	**DRILL RIG**
Terracon	Diedrich D-90

HAMMER TYPE
Automatic hammer (175 lbs) using 24" drop (94.8% Efficiency)

SAMPLING: SAMPLE TYPE	SAMPLE NUMBER	1ST 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N_m VALUE	SAMPLE RECOVERY	CLASSIFICATION OF MATERIALS	REMARKS
CORING: CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD		
							33.0	Rig charter from 31' to 33'.
SPT	7	10	8	10	18	0.8	SILT; olive brown; very stiff; moist; low plasticity; w/ trace sand; trace clay; laminated; oxidation along root structures (Floodplain)	
SPT	8	8	8	11	19	0.9	grading brownish gray; non plastic; w/ some sand; root structures grade out 42.0	
SPT	9	17	17	18	35	0.9	SAND; grayish brown; dense; moist; fine to medium grained; poorly graded; subrounded; w/ some silt (Alluvium) 47.0	
TW	10	-	-	-	-	1.1	Silty SAND; yellowish brown; moist; fine grained 51.5	
SPT	11	36	34	33	67	0.9	SAND; reddish brown; very dense; moist; fine to coarse grained; well graded; subrounded; w/ some gravel; trace silt (Alluvium) 57.0	Rig chatter from 51.5' to 58.5.
SPT	12	24	36	50	86	1.0	Gravelly SAND; reddish brown; very dense; wet; fine to coarse grained; well graded; subrounded (Alluvium)	Occasional rig chatter from 58.5' to 63.5'.



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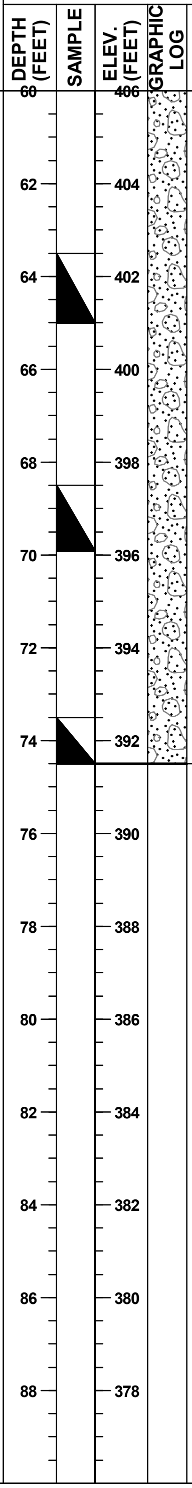
Building a world of difference.

BORING LOG

BORING NO. BVB-104
SHEET 3 OF 3

CLIENT Glendale Water & Power
PROJECT Grayson Repowering Project
PROJECT NO. 405153
PROJECT LOCATION Glendale, CA
COORDINATES (State Plane) N 1878951 E 6477236
GROUND ELEVATION (NAVD88) 466 ft
TOTAL DEPTH 74.5 ft
SURFACE CONDITIONS Gently sloping ground on asphalt roadway
START DATE 09/16/2020
END DATE 09/18/2020
LOGGED BY Brandon Gomer
CHECKED BY Brandon Gomer
APPROVED BY Brian Christensen
DRILLING CONTRACTOR Terracon
DRILL RIG Diedrich D-90
HAMMER TYPE Automatic hammer (175 lbs) using 24" drop (94.8% Efficiency)

SAMPLING: SAMPLE TYPE CORING: CORE SIZE	SAMPLE NUMBER RUN NUMBER	1ST 6 INCHES RUN LENGTH	2ND 6 INCHES RUN RECOVERY	3RD 6 INCHES RQD RECOVERY	N_m VALUE PERCENT RECOVERY	SAMPLE RECOVERY RQD	CLASSIFICATION OF MATERIALS	REMARKS
SPT	13	37	49	50	99	1.3		
								Rig chatter from 66' to 68.5'.
SPT	14	19	22	50/5"	50+	1.1	grading w/ trace silt	
SPT	15	43	50/6"	-	50+	0.7		
								Bottom of boring at 74.5' on 09/17/2020. Drilling fluid @21.0' at 13 hours after completion of drilling. Boring backfilled w/ cement-bentonite grout on 09/18/2020.



REPORT: BV ENERGY BORING; DATA TEMPLATE: BVE_GEO_STD_20180201 GDT; LIBRARY: BVE_GEO_STD_20180201 GLB - 10/27/20 18:12
PROJECT: \\NA\DATA\ENERGY\DEPT\GEO\DATA\SERVICES\POWERGENERATION\405153 - GWP GRAYSON REPOWER\GINT\405153 - GRAYSON REPOWER_FINAL.GPJ

Appendix B. Hammer Calibration

SPT AUTOMATIC HAMMER ENERGY CALIBRATION REPORT

Drill Rig Model: Diedrich D90
Serial Number: DD-358
Terracon Drill Rig Asset Number: DR508
May 14, 2019

Prepared for:
Terracon Consultants, Inc.
Lodi Exploration Services

Prepared by:
Terracon Consultants, Inc.
Exploration Services Group

terracon.com

Terracon

Environmental ■ Facilities ■ Geotechnical ■ Materials

May 14, 2019

Terracon Consultants, Inc.
902 Industrial Way
Lodi, CA 95240

Attn: Mr. Chris Congrave
E: chris.congrave@terracon.com

Re: SPT Automatic Hammer Energy Calibration Report
Terracon Drill Rig 508; Diedrich D-90
Terracon Project Number: BGXX0500

Mr. Congrave:

This report provides the Energy Transfer Ratio (ETR) for the SPT automatic hammer found on drill rig model Geoprobe; Terracon Drill Rig Asset Number DR508 (Serial Number: 358).

Table 1: Hammer Efficiency Summary

Drill Rig Model	Serial No.	Drill Rig Year	Drill Rig No.	Energy Transfer Ratio (ETR)	Hammer Efficiency Correction (C_E)
Diedrich D-90	358	2018	DR508	94.8% ± 4.5%	1.58

If you have any questions concerning this summary, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Jim Smith

James Smith
National Exploration Manager

Marie Maher

Marie A. Maher, P.G.
Regional Exploration Manager

Attachments:
Exhibit A: Calibration Information
Exhibit B: PDA SPT Analyzer Results

Exhibit A

CALIBRATION INFORMATION

CALIBRATION INFORMATION

ITEM	DESCRIPTION
Drill Rig Identification	Drill Rig Model: Diedrich D90; Drill Rig Year: 2018 Terracon Drill Rig Asset No.: DR508; Serial No. 358
Drill Rig Owner	Terracon Consultants, Inc. – Lodi, CA
Drill Rig Operator	Bill Bradberry; Lodi Exploration
Testing Date	May 08, 2019
Testing Location	Lathrop, CA
Boring Identification	B-1
Hammer Type	140 pounds (automatic)
Boring Method	Hollow-stem Auger
Drill Rods	■ AWJ ■ 1-¾” outside diameter ■ 3/16” wall thickness
Calibration Testing Equipment	■ 2 foot AWJ rod instrumented w/ 2 strain gauges and 2 accelerometers ■ Model SPT Analyzer™ (PDA)
ASTM Methods Used	**ASTM D1586-11**, Standard Test Method for Standard Penetration Test and Split-Barrel Sampling of Soils **ASTM D4633-10**, Standard Method for Energy Measurement for Dynamic Penetrometers
SPT Calibration Personnel	Jim Smith– National Manager, Terracon Consultants, Inc.

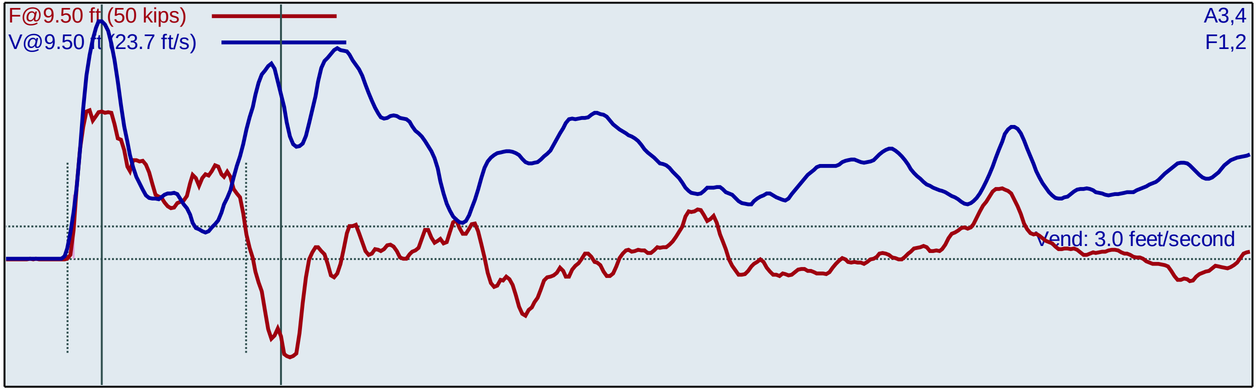
Exhibit B

PDA SPT ANALYZER RESULTS

BG-508-a 5-6.5
JPS Test date: 5/8/2019

AR: 1.18 in^2 SP: 0.492 k/ft3
LE: 9.50 ft EM: 30000 ksi
WS: 16807.9 ft/s

Depth: (5.00 - 6.50 ft], displaying BN: 8



F1 : [512AWJ1] 208.9 PDICAL (1) FF1
F2 : [512AWJ2] 207.84 PDICAL (1) FF1

A3 (PR): [K10491] 400 mv/6.4v/5000g (1) VF1
A4 (PR): [K10493] 402 mv/6.4v/5000g (1) VF1

FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows/Minute

EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	BC /6"	FMX kips	VMX ft/s	BPM bpm	EFV ft-lb	ETR %
1	2	31	22.3	1.9	291	83.0
2	2	33	23.1	54.2	326	93.2
3	4	33	23.7	54.4	322	91.9
4	4	33	23.2	54.2	335	95.8
5	4	30	22.5	54.1	338	96.5
6	4	30	22.1	54.4	315	90.1
7	5	31	22.8	55.4	329	94.0
8	5	29	22.0	53.8	317	90.6
9	5	31	23.3	53.5	336	96.0
10	5	31	23.3	54.3	339	96.9
	Average	31	22.8	54.3	329	94.0
	Std Dev	1	0.6	0.5	9	2.6
	Maximum	33	23.7	55.4	339	96.9
	Minimum	29	22.0	53.5	315	90.1

N-value: 8

Sample Interval Time: 9.94 seconds.

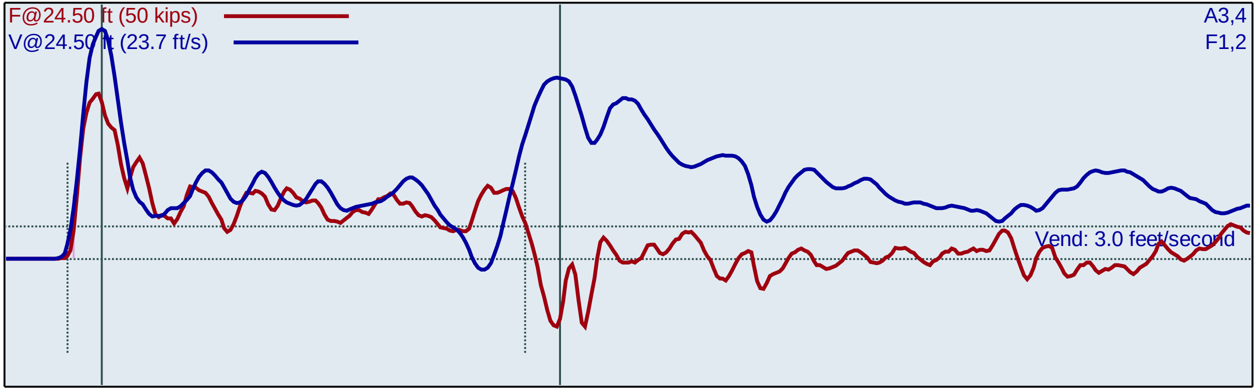
BG-508-a
JPS

5-6.5
Test date: 5/8/2019

AR: 1.18 in^2
LE: 14.50 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (10.00 - 11.50 ft], displaying BN: 22



F1 : [512AWJ1] 208.9 PDICAL (1) FF1
F2 : [512AWJ2] 207.84 PDICAL (1) FF1

A3 (PR): [K10491] 400 mv/6.4v/5000g (1) VF1
A4 (PR): [K10493] 402 mv/6.4v/5000g (1) VF1

BL#	BC	FMX	VMX	BPM	EFV	ETR
	/6"	kips	ft/s	bpm	ft-lb	%
11	3	32	20.8	1.9	252	72.0
12	3	34	21.9	54.2	288	82.3
13	3	35	22.5	53.9	323	92.2
14	3	34	22.6	54.2	325	92.8
15	3	33	22.7	54.2	347	99.1
16	3	31	22.6	54.8	342	97.7
17	3	30	22.5	55.1	326	93.2
18	3	31	23.2	53.9	332	94.9
19	3	30	22.6	55.0	338	96.7
20	3	31	20.5	1.9	282	80.5
	Average	32	22.7	54.5	335	95.7
	Std Dev	2	0.2	0.5	8	2.3
	Maximum	34	23.2	55.1	347	99.1
	Minimum	30	22.5	53.9	325	92.8

N-value: 6

Sample Interval Time: 694.83 seconds.

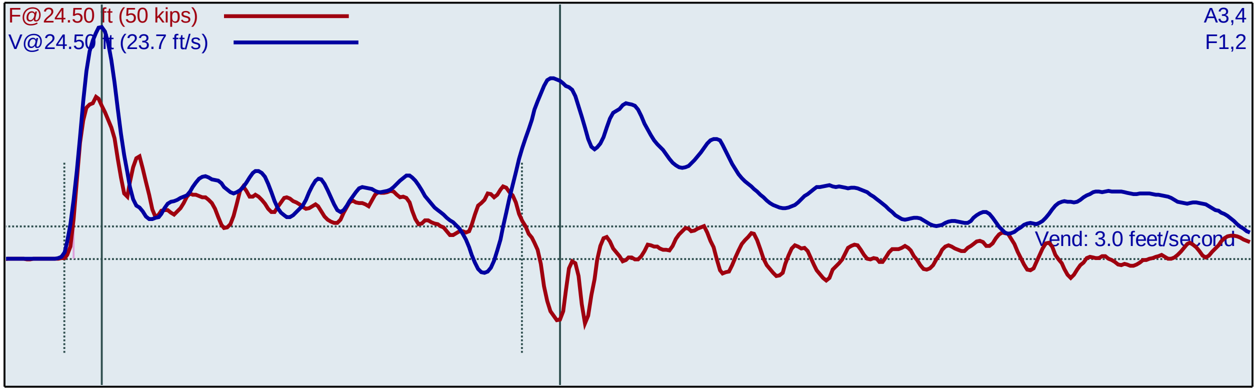
BG-508-a
JPS

5-6.5
Test date: 5/8/2019

AR: 1.18 in^2
LE: 24.50 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (15.00 - 16.50 ft], displaying BN: 26



F1 : [512AWJ1] 208.9 PDICAL (1) FF1
F2 : [512AWJ2] 207.84 PDICAL (1) FF1

A3 (PR): [K10491] 400 mv/6.4v/5000g (1) VF1
A4 (PR): [K10493] 402 mv/6.4v/5000g (1) VF1

BL#	BC	FMX	VMX	BPM	EFV	ETR
	/6"	kips	ft/s	bpm	ft-lb	%
26	4	32	21.5	55.2	335	95.6
	Average	32	21.5	55.2	335	95.6
	Std Dev	0	0.0	0.0	0	0.0
	Maximum	32	21.5	55.2	335	95.6
	Minimum	32	21.5	55.2	335	95.6

N-value: 1

Sample Interval Time: 0.00 seconds.

Summary of SPT Test Results

Project: BG-508-a, Test Date: 5/8/2019

FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows/Minute

EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

Instr. Length ft	Blows Applied /6"	**N Value**	**N60 Value**	Average FMX kips	Average VMX ft/s	Average BPM bpm	Average EFV ft-lb	Average ETR %
9.50	**2-4-5**	**9**	**14**	31	22.8	54.3	329	94.0
14.50	**3-3-3**	**6**	**9**	32	22.7	54.5	335	95.7
24.50	**3-4-3**	**7**	**11**	32	21.5	55.2	335	95.6
			Overall Average Values:	31	22.7	54.4	332	94.8
			Standard Deviation:	1	0.8	13.6	16	4.5
			Overall Maximum Value:	34	23.7	55.4	347	99.1
			Overall Minimum Value:	29	21.5	53.5	315	90.1

Certificate of Compliance

Pile Dynamics, Inc. certifies that the

Pile Driving Analyzer®, Model SPT

Serial Number: 4535 TB

has been tested and passed all final test procedures on 25 MAY 2018

Tested by:

Pile Dynamics, Inc.
30725 Aurora Road
Cleveland, Ohio 44139 USA

Appendix C. Cone Penetrometer Testing Results

SUMMARY

OF

CONE PENETRATION TEST DATA

Project:

Grayson Repowering
Glendale, CA
September 14 & 18, 2020

Prepared for:

Mr. Keith Askew
Terracon Consultants, Inc.
1355 E. Cooley Drive, Ste C
Colton, CA 92324
Office (909) 824-7311 / Fax (909) 301-6016

Prepared by:

KEHOE TESTING & ENGINEERING
5415 Industrial Drive
Huntington Beach, CA 92649-1518
Office (714) 901-7270 / Fax (714) 901-7289
www.kehoetesting.com

TABLE OF CONTENTS

SUMMARY
OF
CONE PENETRATION TEST DATA

1. INTRODUCTION

This report presents the results of a Cone Penetration Test (CPT) program carried out for the Grayson Repowering project located in Glendale, California. The work was performed by Kehoe Testing & Engineering (KTE) on September 14 & 18, 2020. The scope of work was performed as directed by Terracon Consultants, Inc. personnel.

2. SUMMARY OF FIELD WORK

The fieldwork consisted of performing CPT soundings at four locations to determine the soil lithology. A summary is provided in **TABLE 2.1**.

LOCATION	DEPTH OF CPT (ft)	COMMENTS/NOTES:
BVS-201	47	Refusal
BVS-202	46	Refusal
BVS-203	55	Refusal
BVS-204	60	Refusal
BVS-205	41	Refusal
BVS-206	57	Refusal

TABLE 2.1 - Summary of CPT Soundings

3. FIELD EQUIPMENT & PROCEDURES

The CPT soundings were carried out by **KTE** using an integrated electronic cone system manufactured by Vertek. The CPT soundings were performed in accordance with ASTM standards (D5778). The cone penetrometers were pushed using a 30-ton CPT rig. The cone used during the program was a 15 cm^2 cone and recorded the following parameters at approximately 2.5 cm depth intervals:

- Cone Resistance (qc)
- Sleeve Friction (fs)
- Dynamic Pore Pressure (u)
- Inclination
- Penetration Speed
- Pore Pressure Dissipation (at selected depths)

At locations BVS-201, BVS-202, BVS-203, BVS-204, BVS-205 & BVS-206, shear wave measurements were obtained at various depths. The shear wave is generated using an air-actuated hammer, which is located inside the front jack of the CPT rig. The cone has a triaxial geophone, which recorded the shear wave signal generated by the air hammer.

The above parameters were recorded and viewed in real time using a laptop computer. Data is stored at the KTE office for up to 2 years for future analysis and reference. A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

4. CONE PENETRATION TEST DATA & INTERPRETATION

The Cone Penetration Test data is presented in graphical form in the attached Appendix. These plots were generated using the CPeT-IT program. Penetration depths are referenced to ground surface. The soil behavior type on the CPT plots is derived from the attached CPT SBT plot (Robertson, “Interpretation of Cone Penetration Test…”, 2009) and presents major soil lithologic changes. The stratigraphic interpretation is based on relationships between cone resistance (qc), sleeve friction (fs), and penetration pore pressure (u). The friction ratio (Rf), which is sleeve friction divided by cone resistance, is a calculated parameter that is used along with cone resistance to infer soil behavior type. Generally, cohesive soils (clays) have high friction ratios, low cone resistance and generate excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing and generate little (or negative) excess pore water pressures.

The CPT data files have also been provided. These files can be imported in CPeT-IT (software by GeoLogismiki) and other programs to calculate various geotechnical parameters.

It should be noted that it is not always possible to clearly identify a soil type based on qc, fs and u. In these situations, experience, judgement and an assessment of the pore pressure data should be used to infer the soil behavior type.

If you have any questions regarding this information, please do not hesitate to call our office at (714) 901-7270.

Sincerely,

KEHOE TESTING & ENGINEERING

Steven P. Kehoe
President

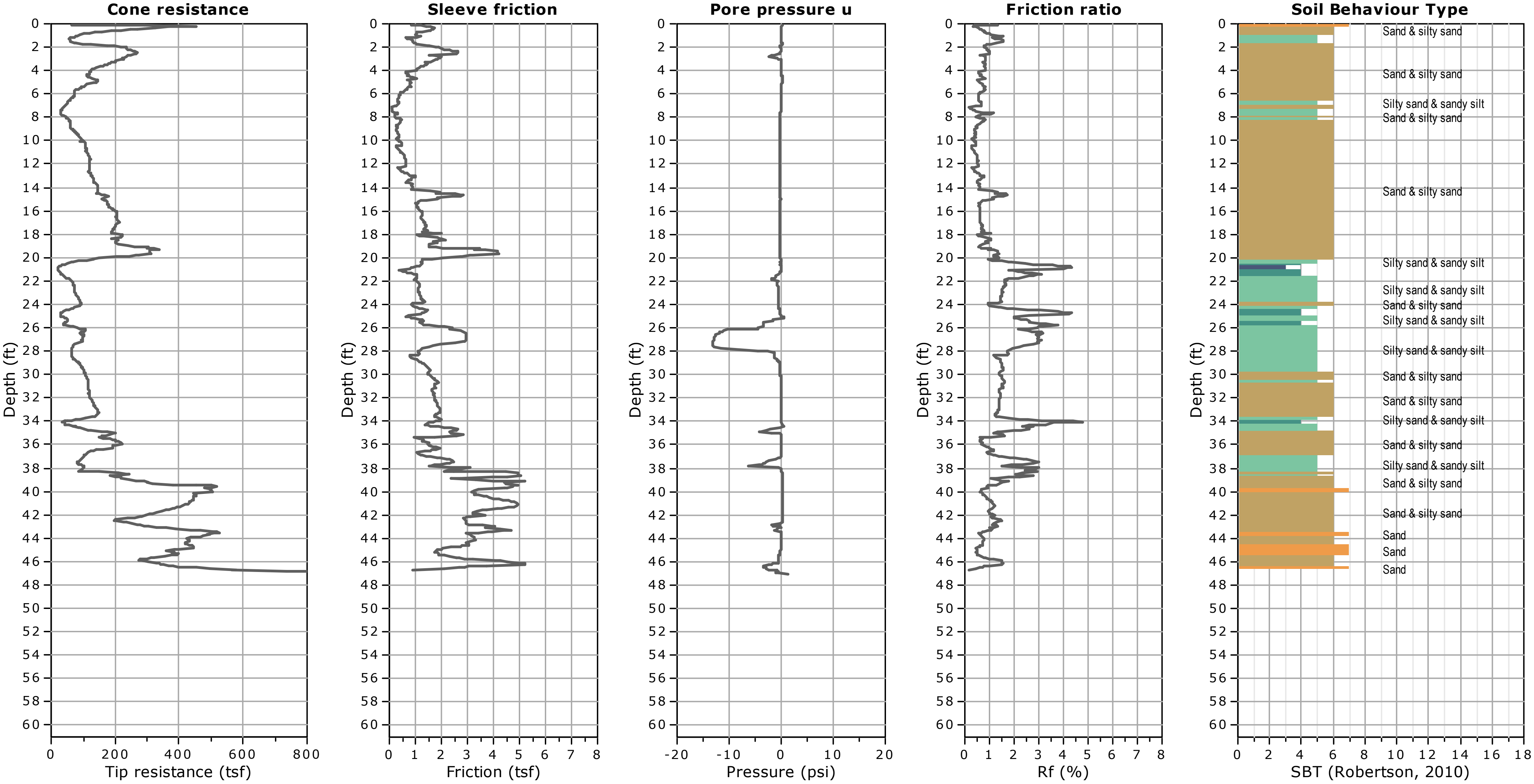
09/24/20-wt

APPENDIX

Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **Terracon Consultants / Grayson Repowering**
Location: **Glendale, CA**

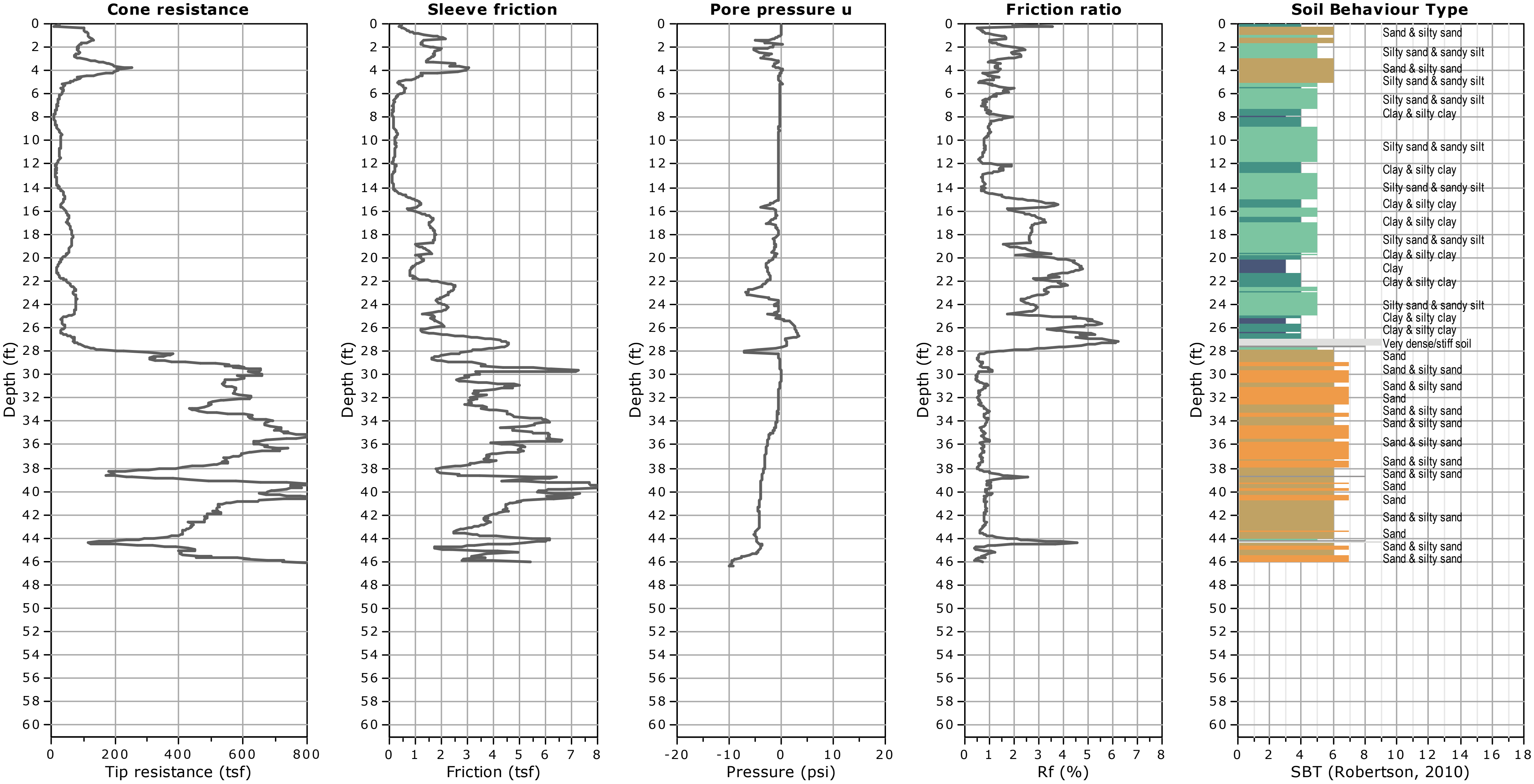
BVS-201
Total depth: 47.06 ft, Date: 9/14/2020



Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **Terracon Consultants / Grayson Repowering**
Location: **Glendale, CA**

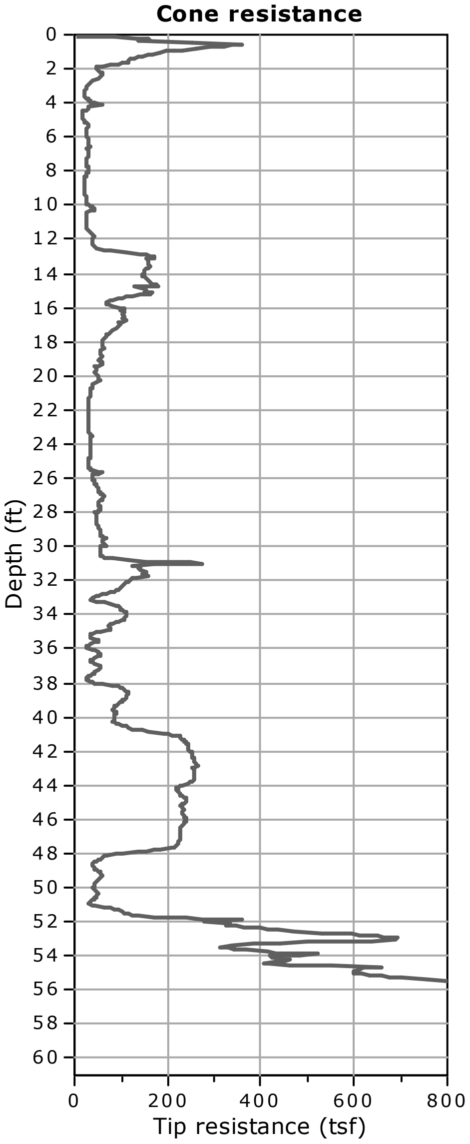
BVS-202
Total depth: 46.40 ft, Date: 9/14/2020

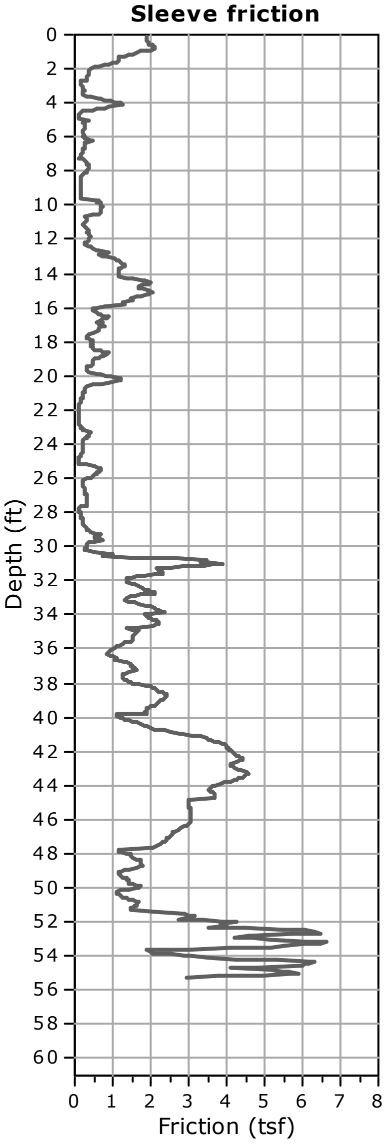


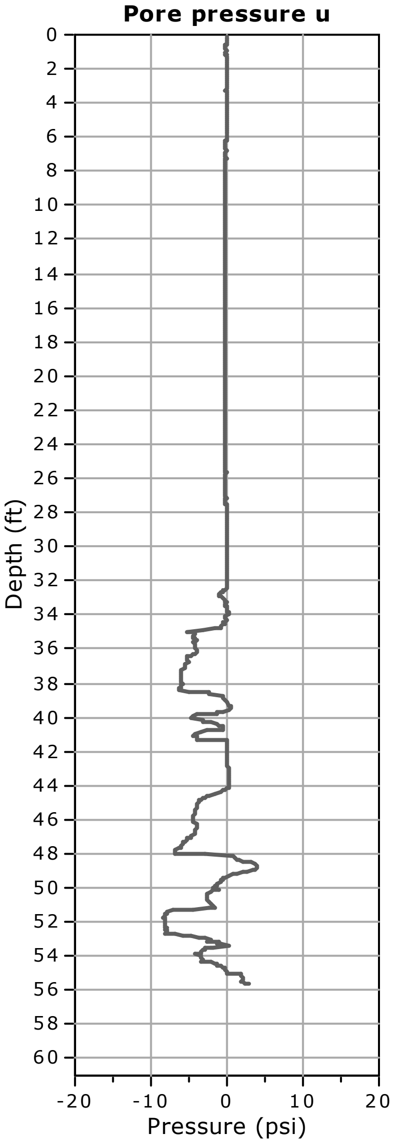
Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

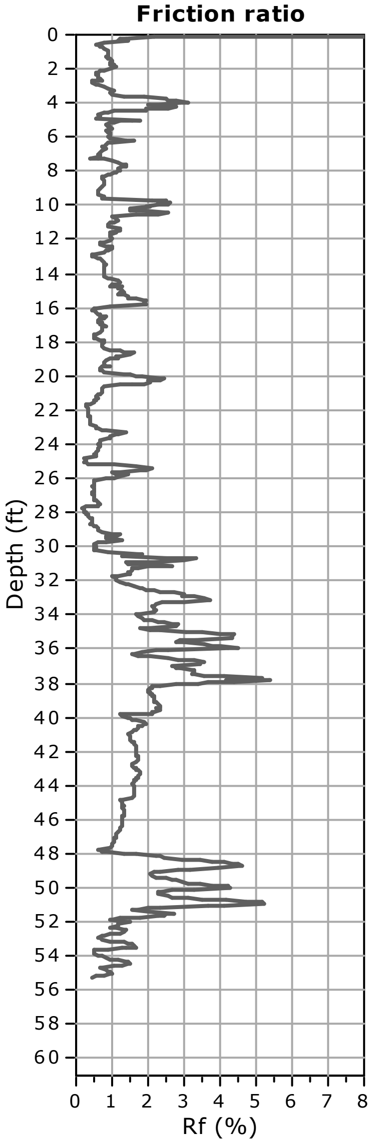
Project: **Terracon Consultants / Grayson Repowering**
Location: **Glendale, CA**

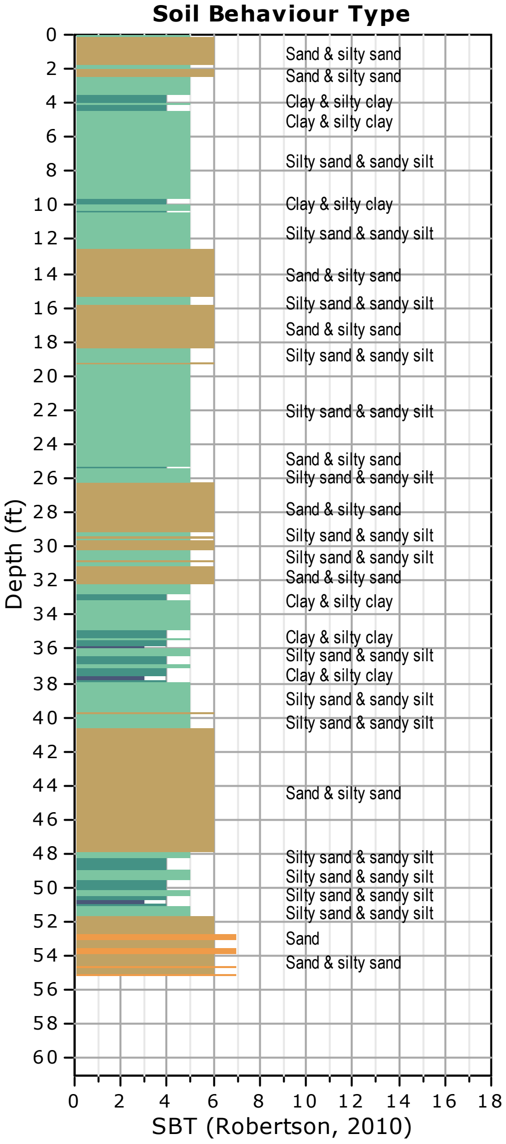
BVS-203
Total depth: 55.65 ft, Date: 9/14/2020









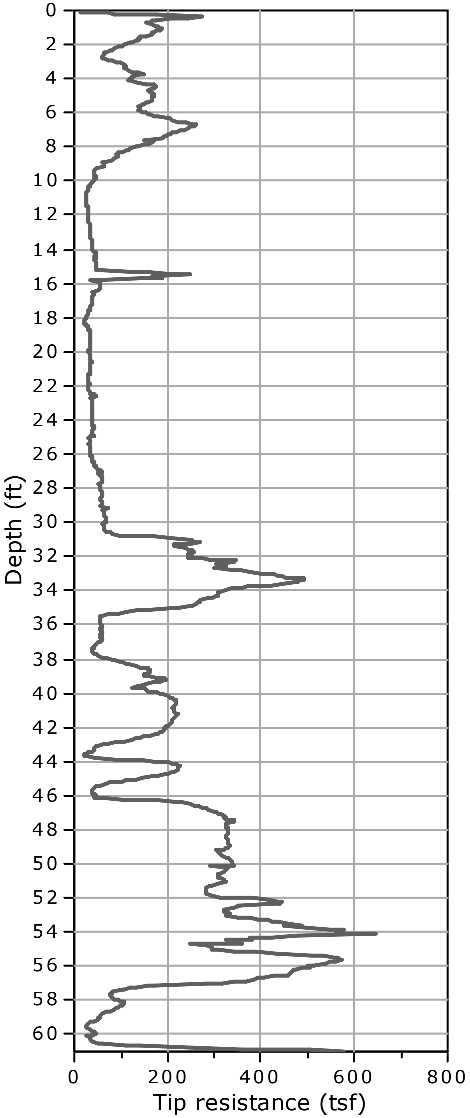


Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

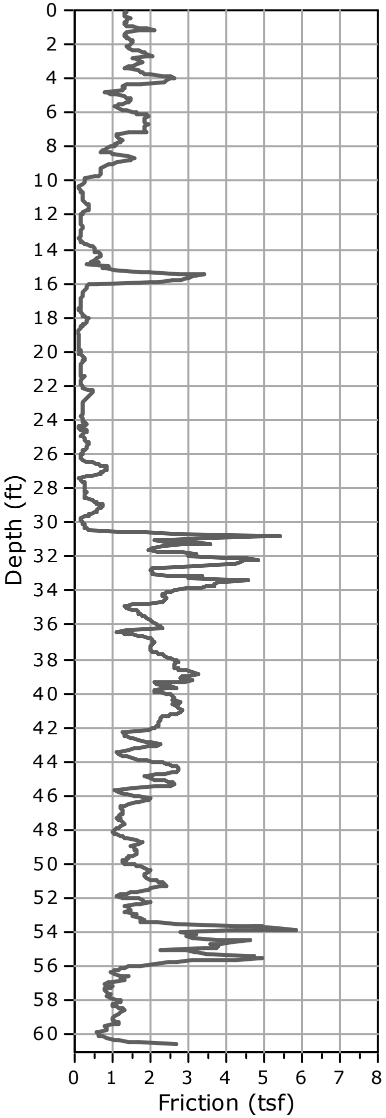
Project: **Terracon Consultants / Grayson Repowering**
Location: **Glendale, CA**

BVS-204
Total depth: 60.97 ft, Date: 9/14/2020

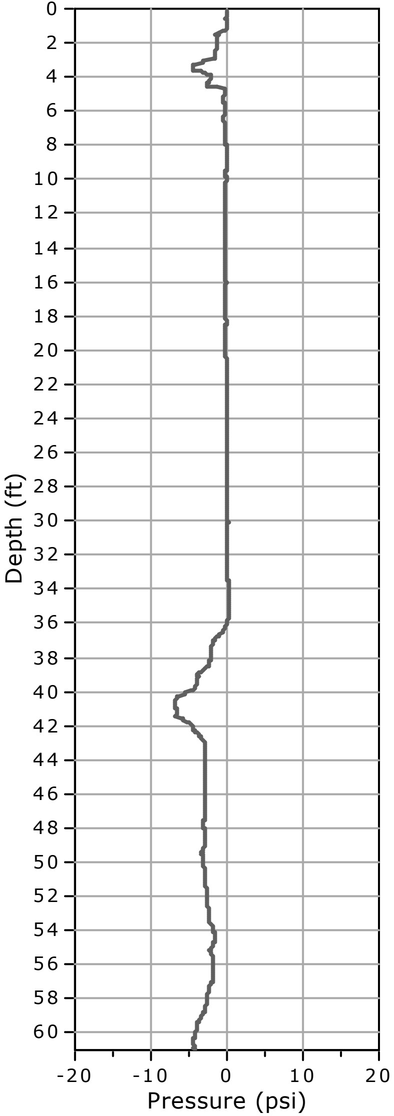
Cone resistance



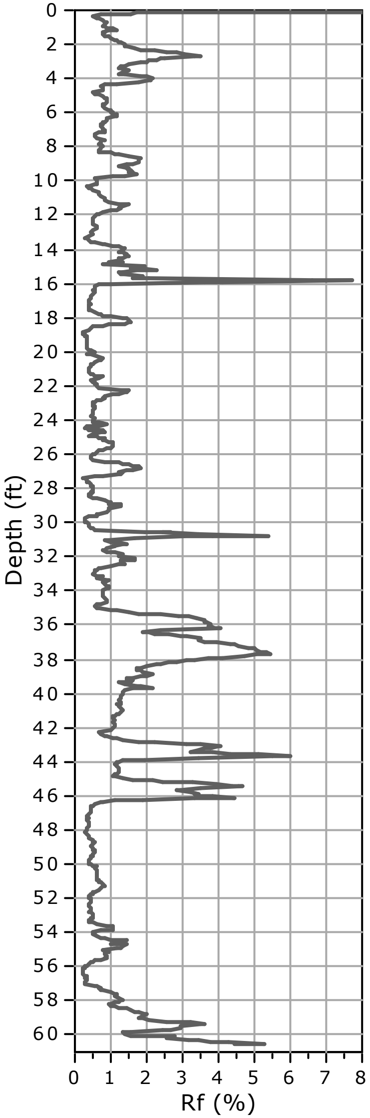
Sleeve friction



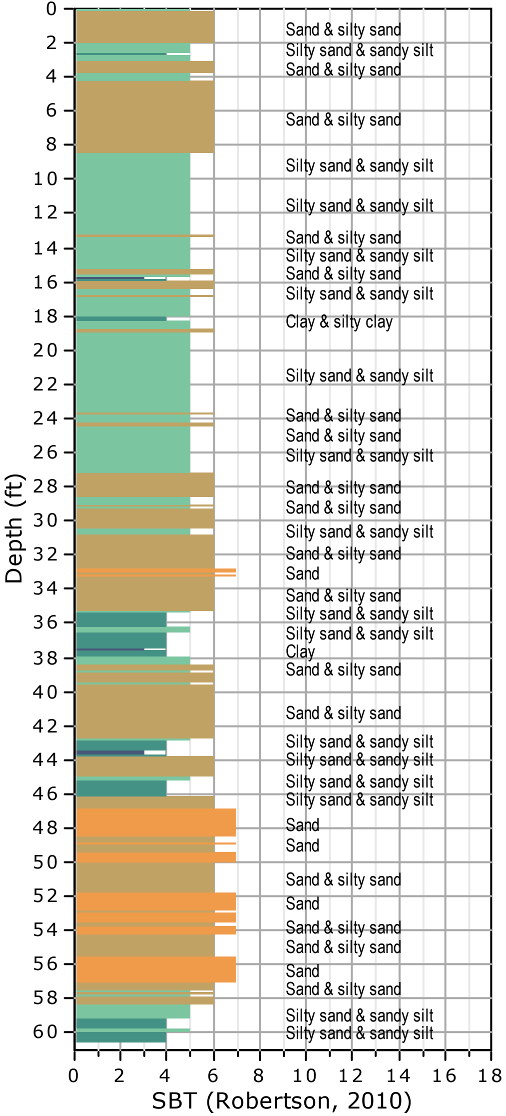
Pore pressure u



Friction ratio



Soil Behaviour Type



CPeT-IT v.2.3.1.9 - CPTU data presentation & interpretation software - Report created on: 9/14/2020, 2:24:35 PM
Project file:

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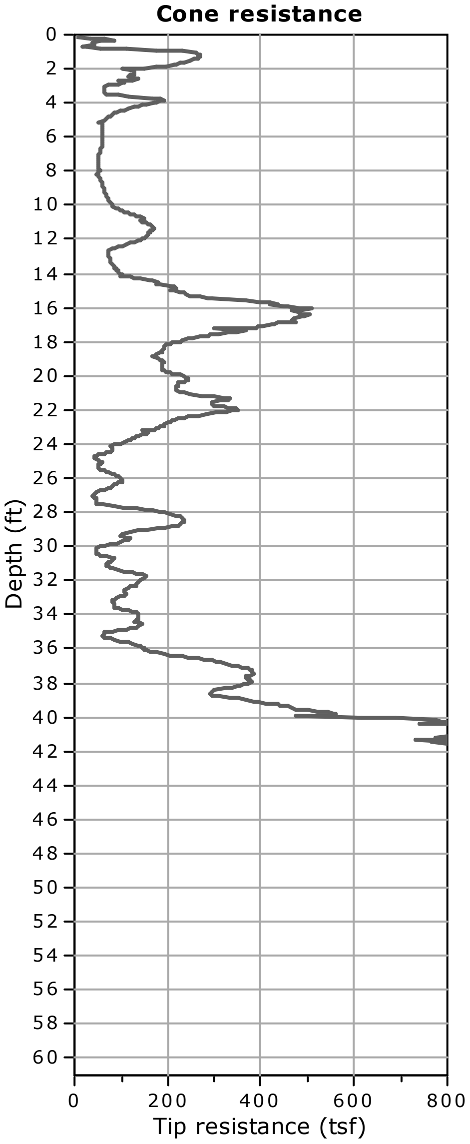
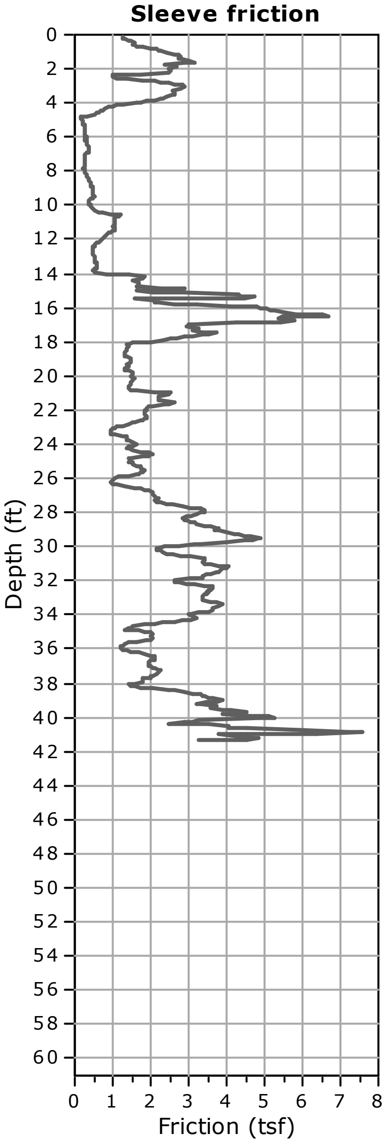
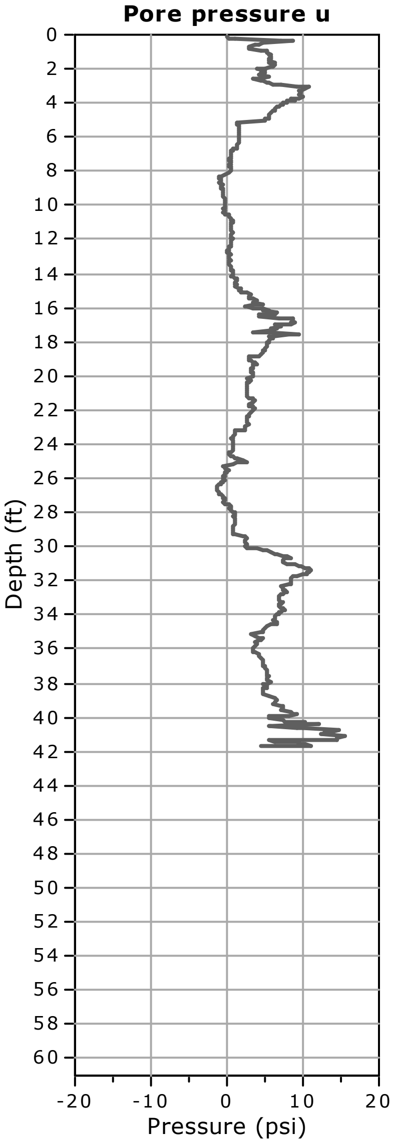
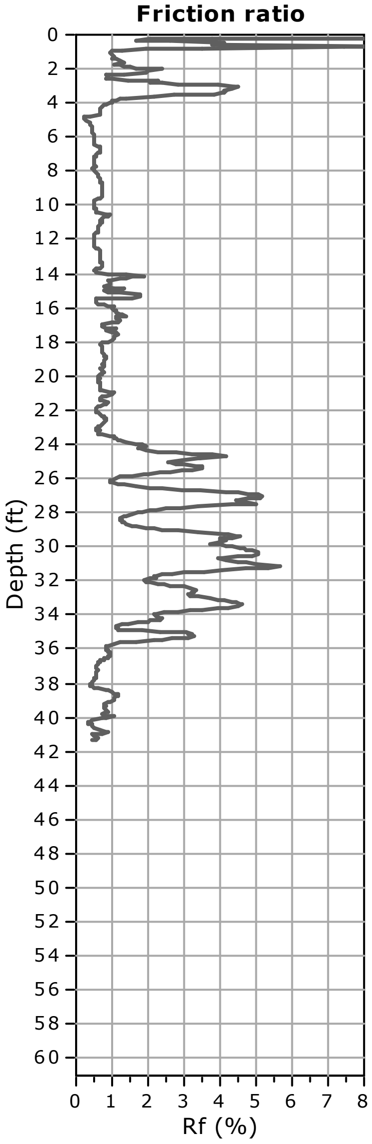
Project: **Terracon Consultants / Grayson Repowering**
Location: **Glendale, CA**

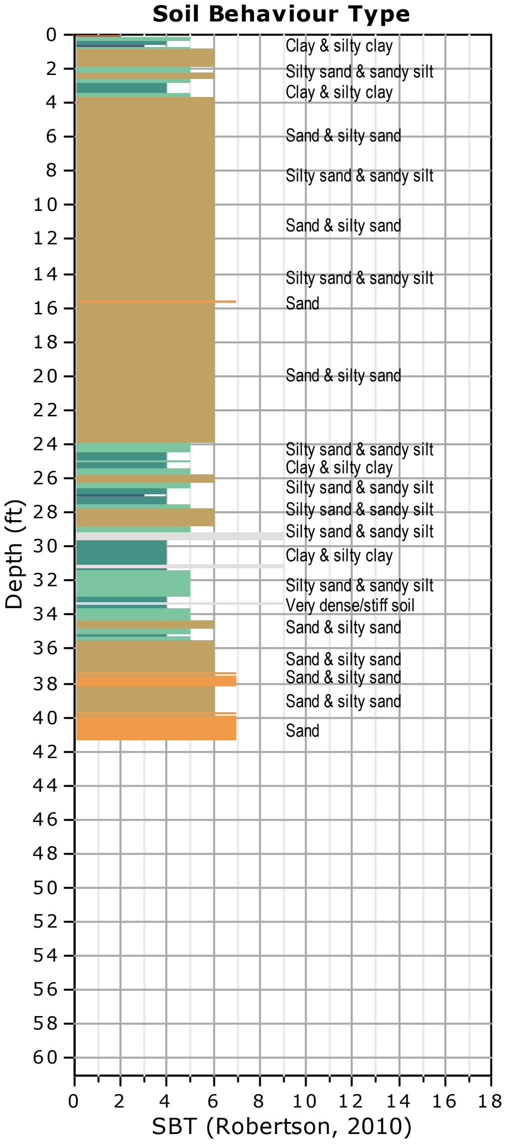
BVS-205
Total depth: 41.74 ft, Date: 9/18/2020


Cone resistance


Sleeve friction


Pore pressure u


Friction ratio


Soil Behaviour Type

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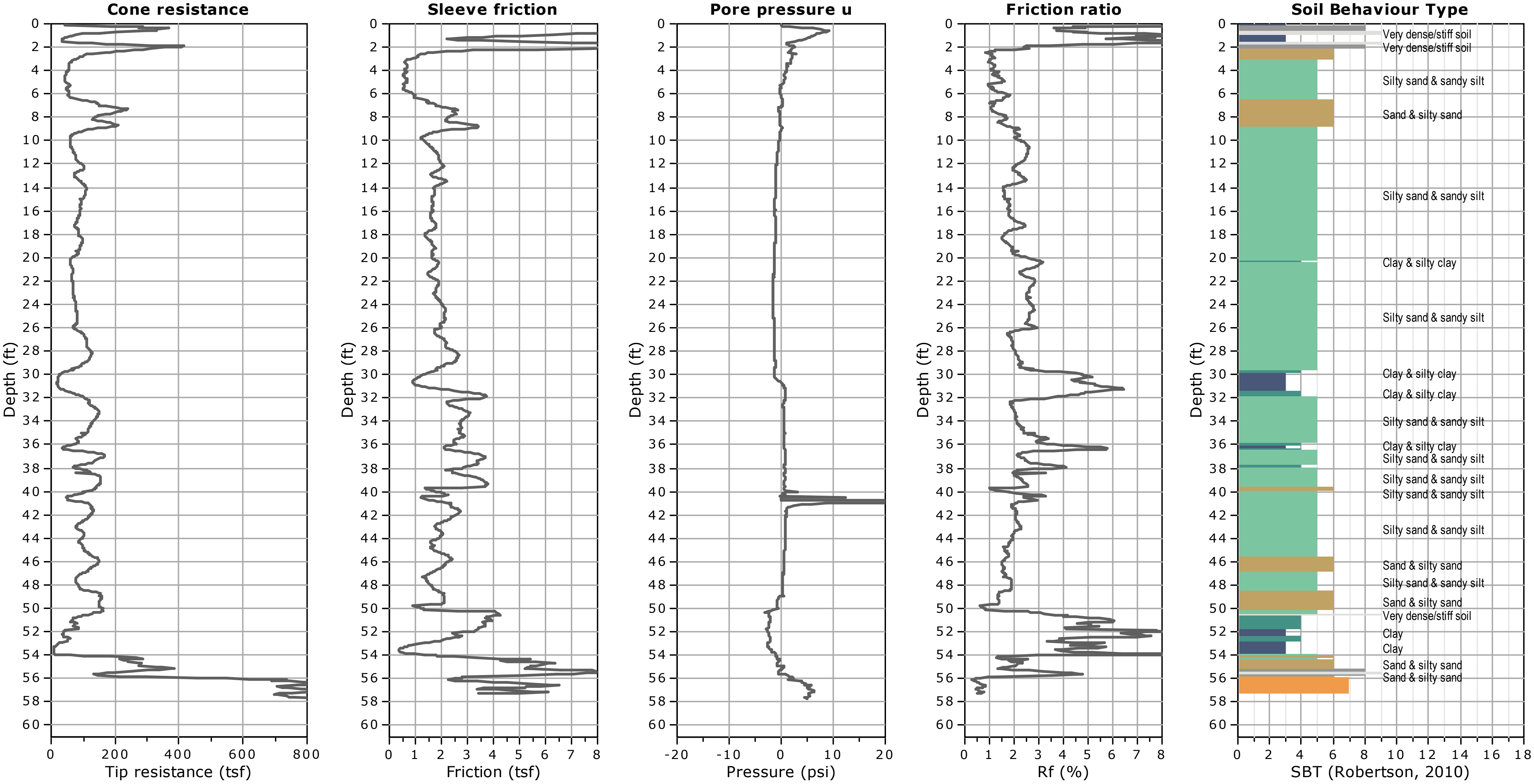
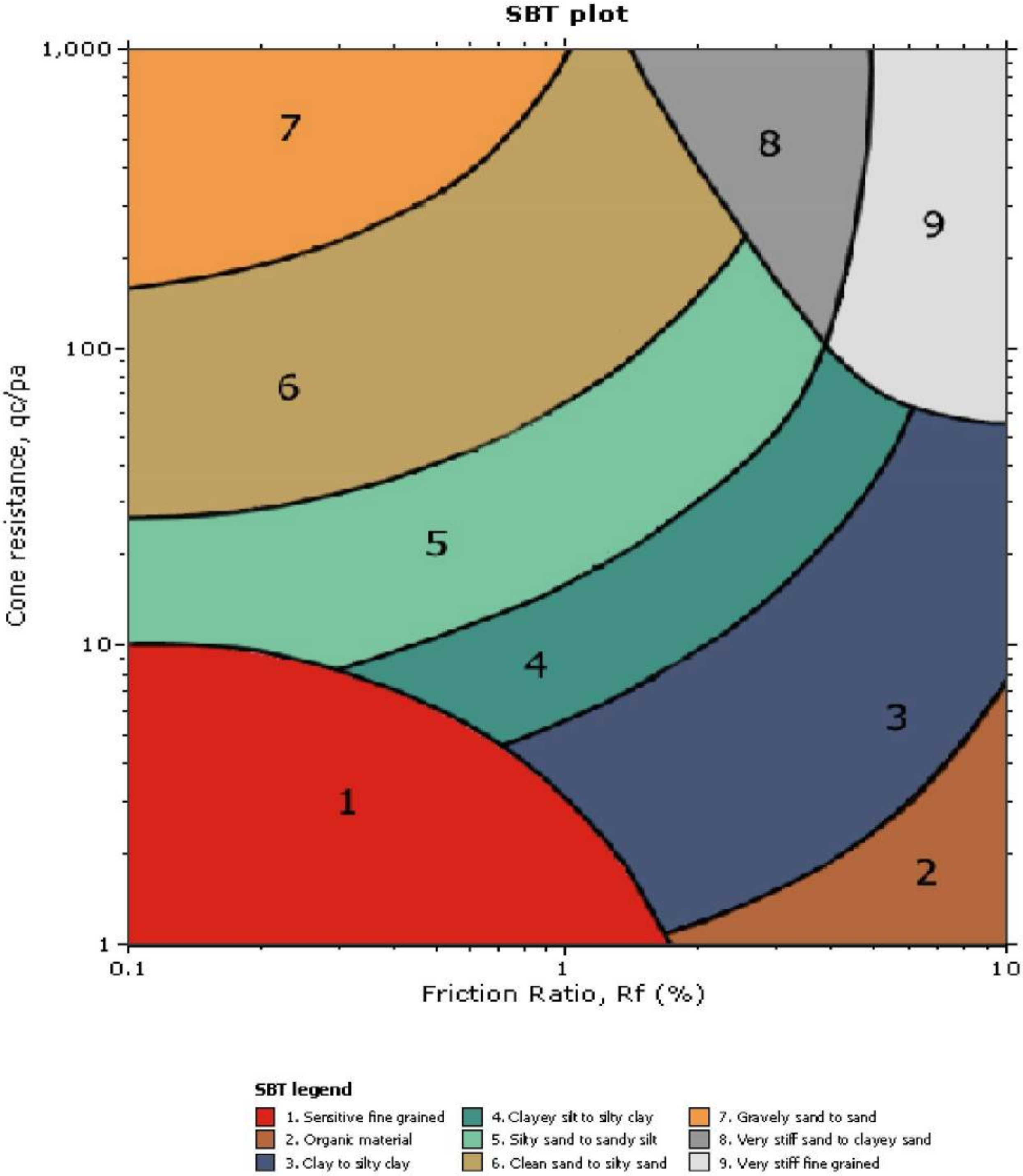
www.kehoetesting.com

Project: **Terracon Consultants / Grayson Repowering**
Location: **Glendale, CA**

BVS-206
Total depth: 57.68 ft, Date: 9/18/2020




SBT plot
1,000
100
10
1
Cone resistance, qc/pa
0.1
1
10
Friction Ratio, Rf (%)
7
6
5
4
1
8
9
3
2
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Terracon Consultants
Grayson Repowering
Glendale, CA

CPT Shear Wave Measurements

Location	Tip Depth (ft)	Geophone Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
BVS-201	3.02	2.02	2.84	3.88	733	
	5.09	4.09	4.55	6.08	749	777
	10.73	9.73	9.93	13.16	755	760
	15.16	14.16	14.30	19.18	746	725
	20.05	19.05	19.15	23.88	802	1033
	25.30	24.30	24.38	29.64	823	908
	30.09	29.09	29.16	36.48	799	698
	35.60	34.60	34.66	42.70	812	884
	40.03	39.03	39.08	47.52	822	918
	45.08	44.08	44.13	52.34	843	1047
	46.92	45.92	45.96	53.50	859	1585
BVS-202	3.05	2.05	2.86	4.16	688	
	5.12	4.12	4.58	6.62	692	697
	10.04	9.04	9.26	12.20	759	838
	15.03	14.03	14.17	18.22	778	816
	20.01	19.01	19.11	24.72	773	760
	25.03	24.03	24.11	30.08	802	932
	30.61	29.61	29.68	37.24	797	777
	35.01	34.01	34.07	42.18	808	889
	40.03	39.03	39.08	46.04	849	1299
	45.05	44.05	44.10	50.08	880	1241

Shear Wave Source Offset - 2 ft

S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival
Interval S-Wave Velocity = (Travel Dist2-Travel Dist1)/(Time2-Time1)

Terracon Consultants
Grayson Repowering
Glendale, CA

CPT Shear Wave Measurements

Location	Tip Depth (ft)	Geophone Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
BVS-203	3.05	2.05	2.86	4.28	669	
	5.09	4.09	4.55	7.26	627	567
	10.07	9.07	9.29	14.56	638	649
	14.99	13.99	14.13	20.12	702	871
	20.01	19.01	19.11	27.20	703	704
	25.07	24.07	24.15	33.72	716	773
	29.99	28.99	29.06	40.54	717	719
	35.04	34.04	34.10	45.92	743	937
	40.12	39.12	39.17	52.12	752	818
	45.08	44.08	44.13	57.92	762	854
	50.03	49.03	49.07	62.20	789	1155
	55.02	54.02	54.06	66.68	811	1113
BVS-204	3.05	2.05	2.86	3.10	924	
	5.02	4.02	4.49	5.24	857	760
	10.04	9.04	9.26	10.46	885	914
	15.09	14.09	14.23	18.20	782	642
	20.05	19.05	19.15	25.56	749	669
	25.07	24.07	24.15	32.86	735	685
	29.99	28.99	29.06	39.80	730	707
	35.04	34.04	34.10	45.60	748	869
	40.06	39.06	39.11	50.52	774	1019
	45.05	44.05	44.10	55.56	794	989
	50.10	49.10	49.14	60.80	808	963
	54.99	53.99	54.03	64.76	834	1234
	60.10	59.10	59.13	69.28	854	1130

Shear Wave Source Offset - 2 ft

S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival
Interval S-Wave Velocity = (Travel Dist2-Travel Dist1)/(Time2-Time1)

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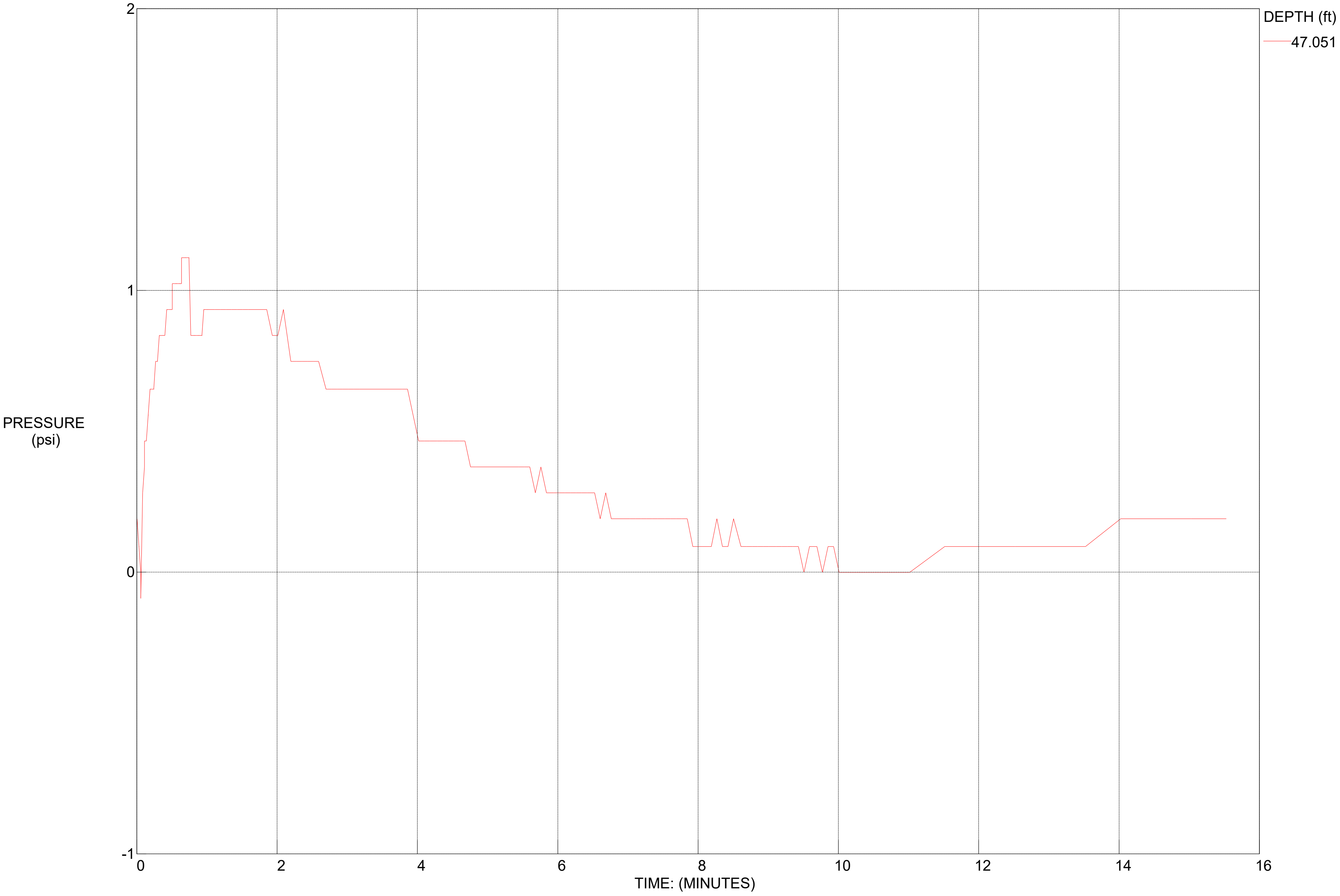
CPT Shear Wave Measurements

Location	Tip Depth (ft)	Geophone Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
BVS-205	2.53	1.53	2.52	3.00	839	
	5.02	4.02	4.49	5.80	774	704
	10.01	9.01	9.23	13.80	669	592
	14.99	13.99	14.13	19.90	710	804
	20.01	19.01	19.11	23.76	804	1291
	25.10	24.10	24.18	29.12	830	946
	30.09	29.09	29.16	35.00	833	846
	35.07	34.07	34.13	39.60	862	1080
	40.03	39.03	39.08	44.30	882	1054
	41.67	40.67	40.72	45.28	899	1671
BVS-206	2.53	1.53	2.52	2.56	984	
	5.05	4.05	4.52	5.78	781	621
	10.01	9.01	9.23	10.82	853	935
	15.03	14.03	14.17	14.96	947	1194
	20.01	19.01	19.11	20.24	944	936
	25.00	24.00	24.08	25.56	942	934
	29.99	28.99	29.06	31.38	926	855
	35.04	34.04	34.10	36.72	929	944
	39.80	38.80	38.85	41.32	940	1033
	45.05	44.05	44.10	46.56	947	1001
	48.72	47.72	47.76	50.08	954	1042
	55.02	54.02	54.06	57.16	946	889
	57.58	56.58	56.62	59.42	953	1132

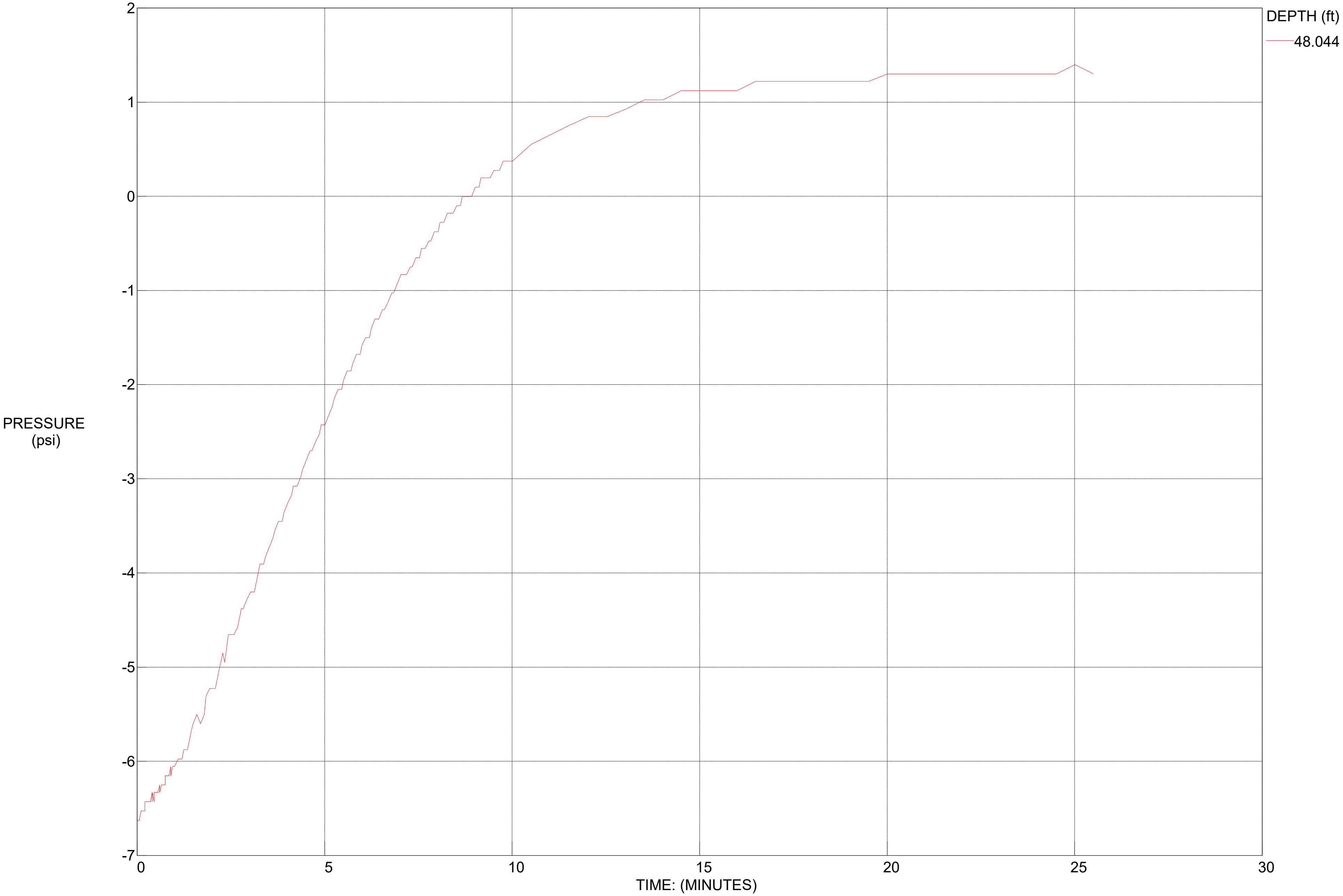
Shear Wave Source Offset - 2 ft

S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival
Interval S-Wave Velocity = (Travel Dist2-Travel Dist1)/(Time2-Time1)

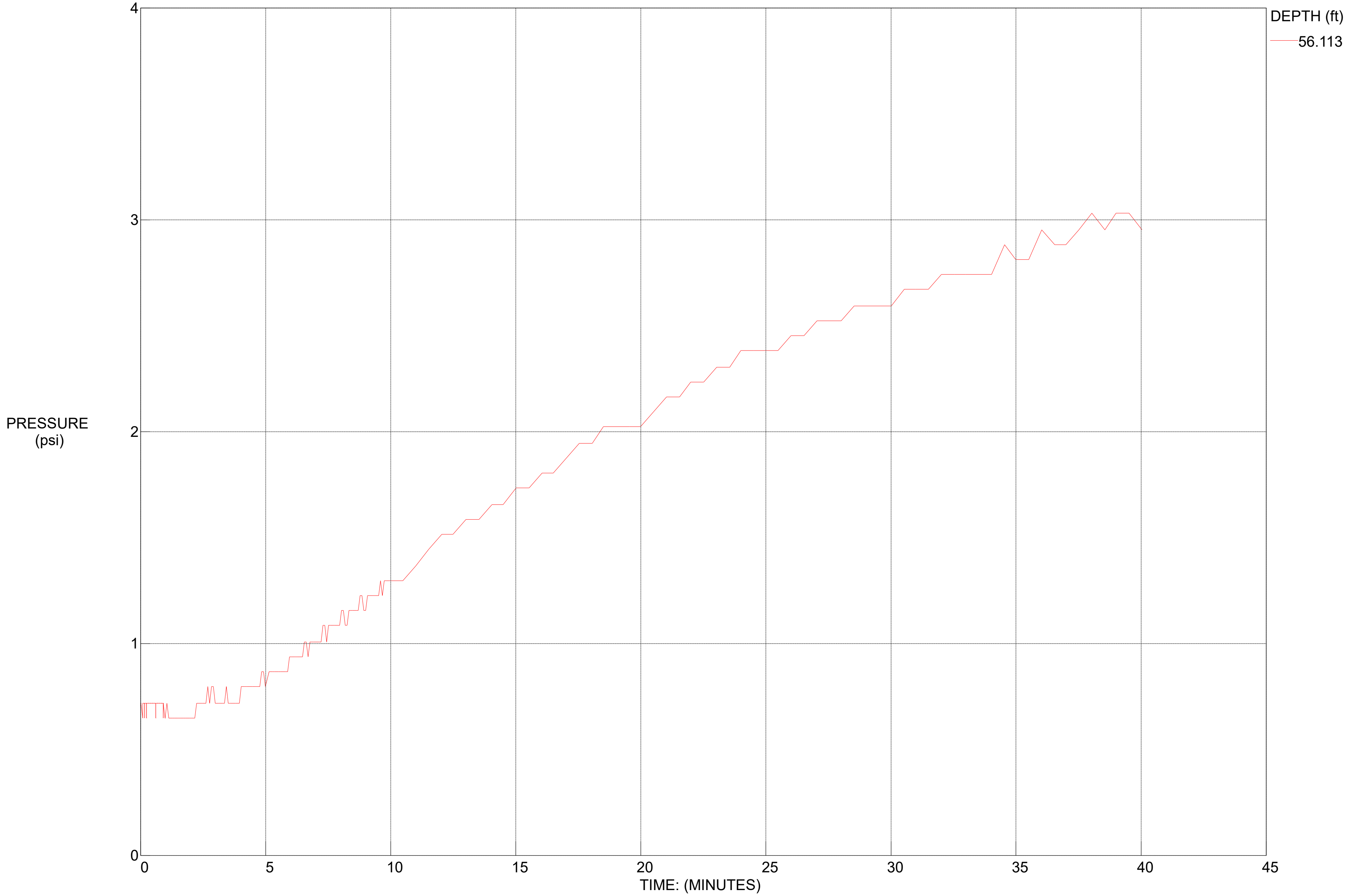
TEST ID: BVS-201



TEST ID: BVS-203



TEST ID: BVS206



Appendix D. Laboratory Testing Results

SUMMARY OF LABORATORY RESULTS

BORING ID	Depth (Ft.)	Soil Classification USCS & AASHTO	Water Content (%)	Plastic Limit	Plasticity Index	% Gravel	% Sand	% Fines	% Silt	% Clay
BVB-101	18.5 - 20		22.2			0.1	64.6	35.3		
BVB-101	23.5 - 25		24.3			0.3	32.3	67.3		
BVB-101	28.5 - 30		20.4					44.5		
BVB-101	33.5 - 35	SANDY SILT(ML) / A-4 (0)	28.6	NP	NP	0.0	30.2	69.8		
BVB-101	38.5 - 40		14.2			2.3	87.7	10.0		
BVB-102	20 - 21.5		15.8			1.7	46.2	52.1		
BVB-102	25 - 25.5	SILTY CLAY(CL-ML) / A-4 (5)	27.9	20	7	0.0	12.1	87.9		
BVB-102	25.5 - 26		17.2			0.0	40.8	59.2	45.6	13.6
BVB-102	30 - 31.5		6.2			7.4	68.5	24.1		
BVB-102	43.5 - 45		17.2			4.9	86.5	8.6		
BVB-103	23.5 - 25		17.6					44.1		
BVB-103	28.5 - 30		21			0.0	27.6	72.4	54.2	18.2
BVB-103	33.5 - 35		12.1			0.9	77.0	22.1		
BVB-103A	44.2 - 45		20.1			16.5	48.6	34.8		
BVB-104	23.5 - 25		16.2			11.3	78.9	9.8		
BVB-104	28.5 - 30		19.9					6.9		
BVB-104	33.5 - 35		30.9			2.6	9.8	87.5		
BVB-104	38.5 - 40		31.3			0.1	19.3	80.6		
BVB-104	43.5 - 45		25.6			0.0	81.3	18.7		

PROJECT: B&V: Grayson Repowering Plant

SITE: Service Contract #405153.78.0101, Task #001
Glendale, CA

Terracon
1355 E Cooley Dr, Ste C
Colton, CA
PH. 909-824-7311 FAX.

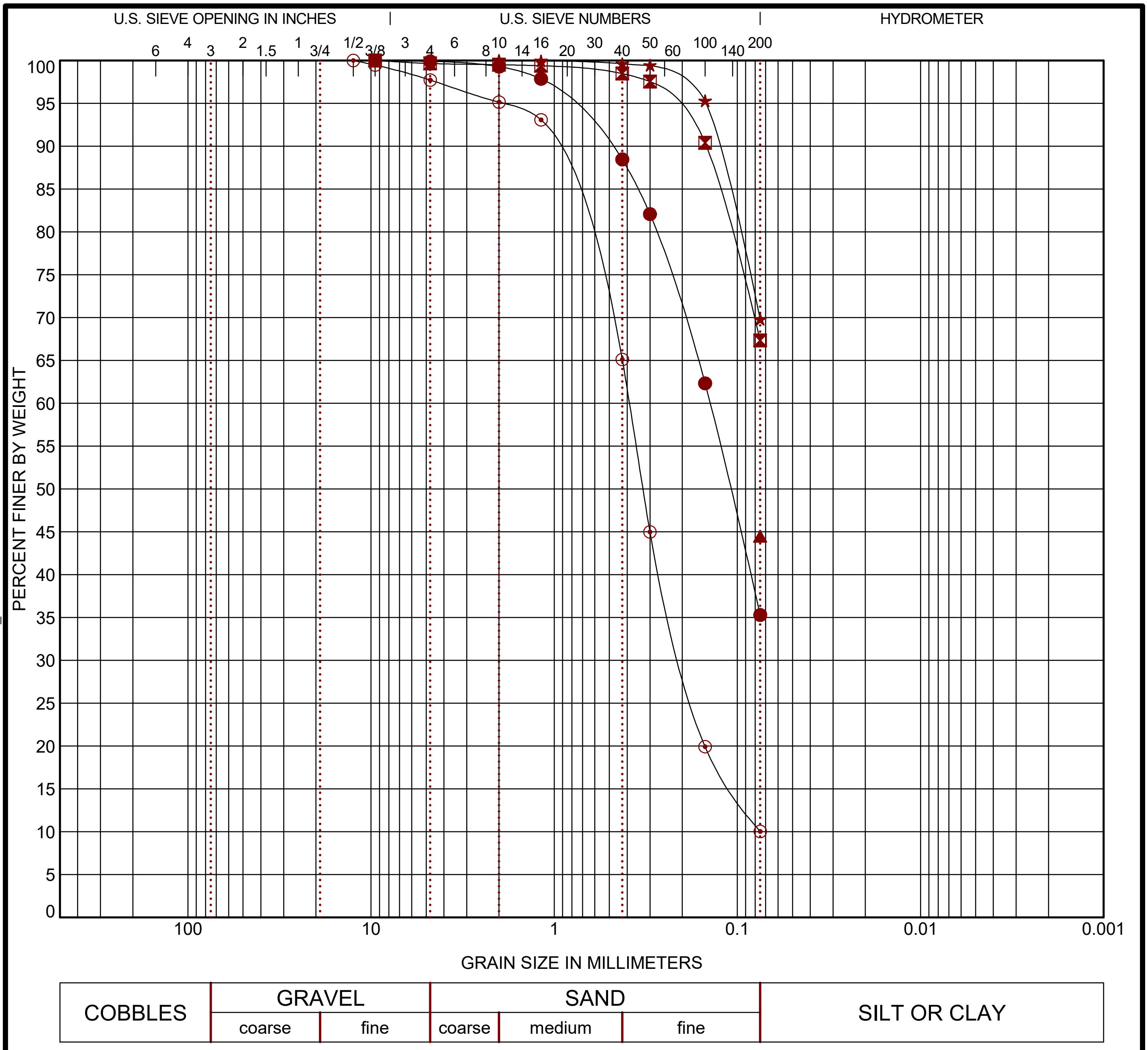
PROJECT NUMBER: CB205080

CLIENT: Black & Veatch Corporation
Overland Park, KS

EXHIBIT: B-1

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



	Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	BVB-101	18.5 - 20		22.2					
☒	BVB-101	23.5 - 25		24.3					
▲	BVB-101	28.5 - 30		20.4					
★	BVB-101	33.5 - 35	SANDY SILT (ML)	28.6	NP	NP	NP		
⊙	BVB-101	38.5 - 40		14.2				1.35	5.20

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	BVB-101	18.5 - 20	9.5	0.141			0.0	0.1	64.6		35.3	
☒	BVB-101	23.5 - 25	9.5				0.0	0.3	32.3		67.3	
▲	BVB-101	28.5 - 30	0.075								44.5	
★	BVB-101	33.5 - 35	2				0.0	0.0	30.2		69.8	
⊙	BVB-101	38.5 - 40	12.5	0.389	0.198		0.0	2.3	87.7		10.0	

PROJECT: B&V: Grayson Repowering Plant

SITE: Service Contract #405153.78.0101,
Task #001
Glendale, CA

1355 E Cooley Dr, Ste C
Colton, CA

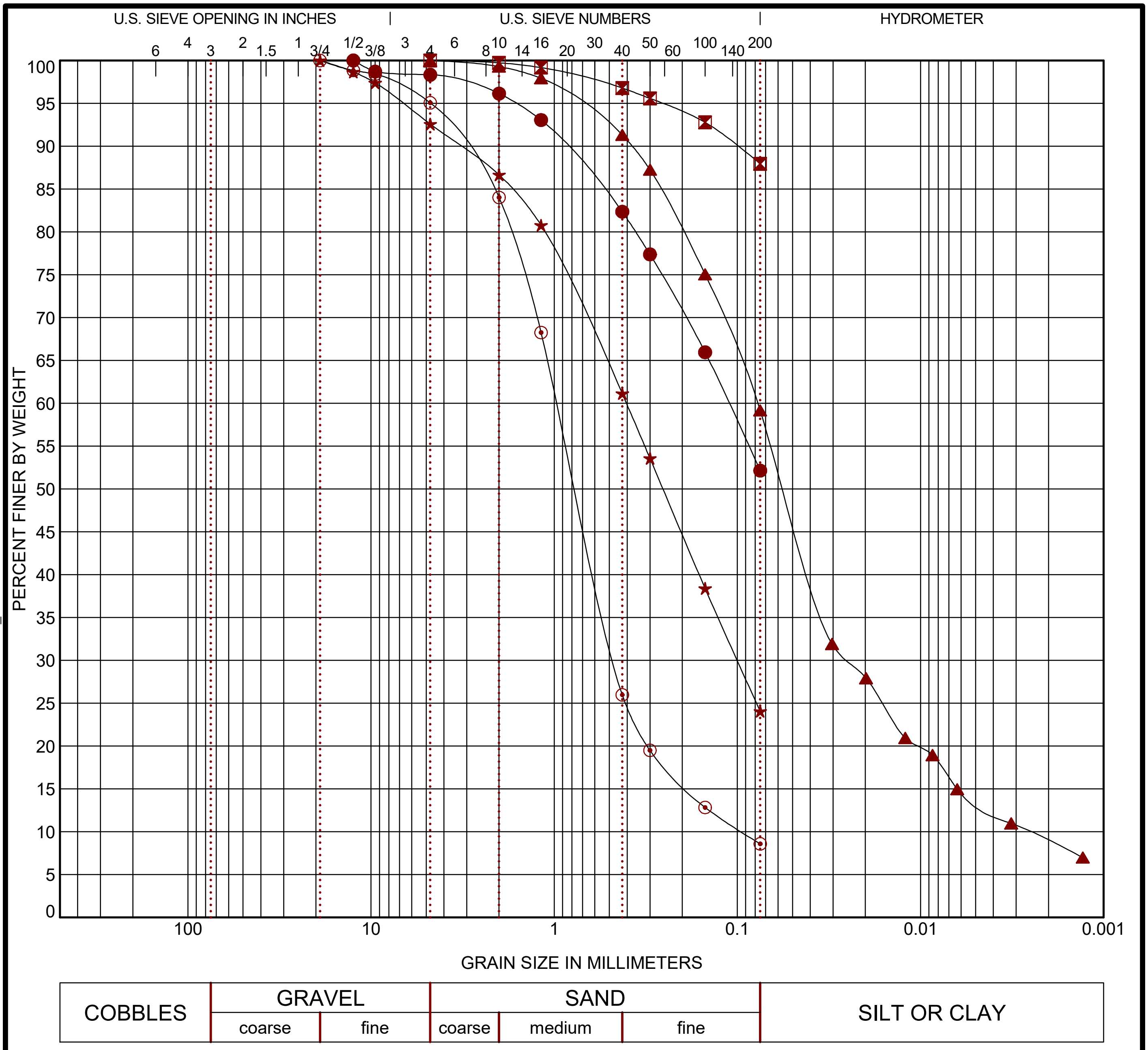
PROJECT NUMBER: CB205080

CLIENT: Black & Veatch Corporation
Overland Park, KS

EXHIBIT: B-1

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



	Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	BVB-102	20 - 21.5		15.8					
☒	BVB-102	25 - 25.5	SILTY CLAY (CL-ML)	27.9	27	20	7		
▲	BVB-102	25.5 - 26		17.2				3.07	30.24
★	BVB-102	30 - 31.5		6.2					
⊙	BVB-102	43.5 - 45		17.2				2.40	10.22

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	BVB-102	20 - 21.5	12.5	0.111			0.0	1.7	46.2		52.1	
☒	BVB-102	25 - 25.5	4.75				0.0	0.0	12.1		87.9	
▲	BVB-102	25.5 - 26	4.75	0.078	0.025	0.003	0.0	0.0	40.8	45.6		13.6
★	BVB-102	30 - 31.5	19	0.403	0.1		0.0	7.4	68.5		24.1	
⊙	BVB-102	43.5 - 45	19	0.967	0.468	0.095	0.0	4.9	86.5		8.6	

PROJECT: B&V: Grayson Repowering Plant

SITE: Service Contract #405153.78.0101,
Task #001
Glendale, CA

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

PROJECT NUMBER: CB205080

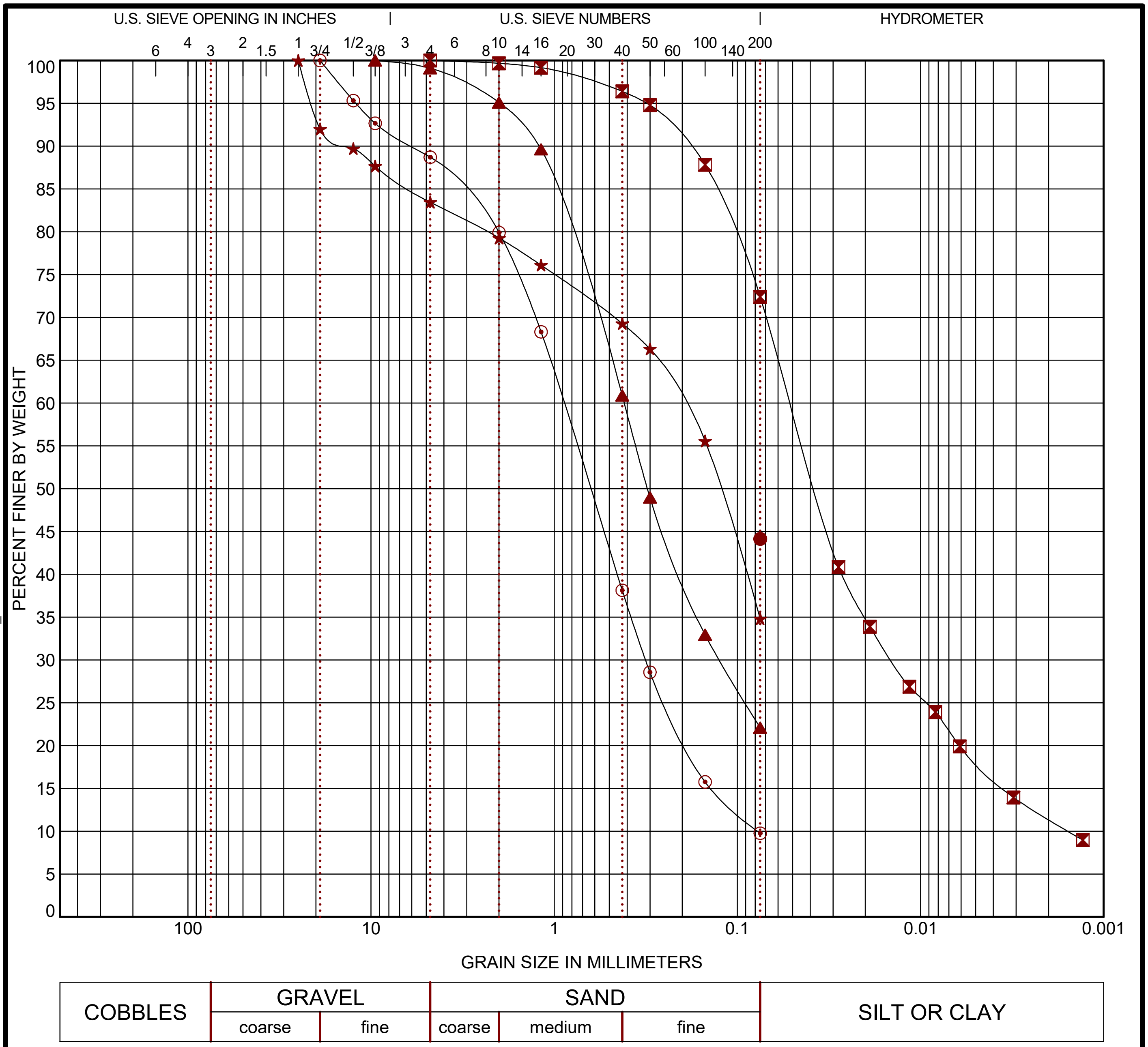
CLIENT: Black & Veatch Corporation
Overland Park, KS

EXHIBIT: B-2

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 CB205080 B&V GRAYSON REPO.GPJ TERRACON_DATATEMPLATE.GDT 10/8/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
● BVB-103	23.5 - 25		17.6					
☒ BVB-103	28.5 - 30		21.0				2.60	32.69
▲ BVB-103	33.5 - 35		12.1					
★ BVB-103A	44.2 - 45		20.1					
⊙ BVB-104	23.5 - 25		16.2				1.45	11.55

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
● BVB-103	23.5 - 25	0.075								44.1	
☒ BVB-103	28.5 - 30	4.75	0.051	0.014	0.002	0.0	0.0	27.6	54.2		18.2
▲ BVB-103	33.5 - 35	9.5	0.414	0.124		0.0	0.9	77.0		22.1	
★ BVB-103A	44.2 - 45	25	0.2			0.0	16.5	48.6		34.8	
⊙ BVB-104	23.5 - 25	19	0.891	0.316	0.077	0.0	11.3	78.9		9.8	

PROJECT: B&V: Grayson Repowering Plant

SITE: Service Contract #405153.78.0101,
Task #001
Glendale, CA

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

PROJECT NUMBER: CB205080

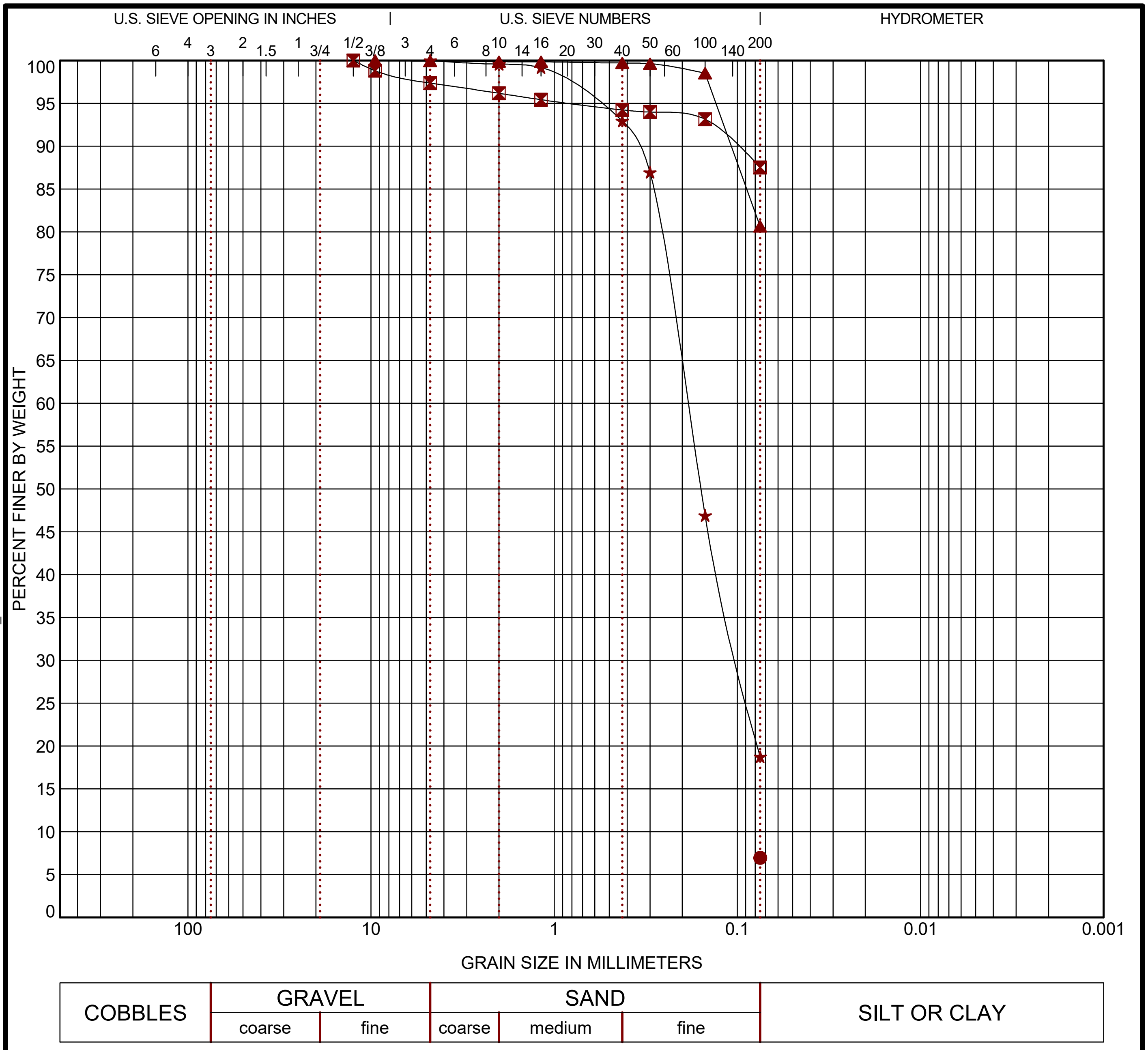
CLIENT: Black & Veatch Corporation
Overland Park, KS

EXHIBIT: B-3

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 CB205080 B&V GRAYSON REPO.GPJ TERRACON_DATATEMPLATE.GDT 10/8/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



	Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	BVB-104	28.5 - 30		19.9					
☒	BVB-104	33.5 - 35		30.9					
▲	BVB-104	38.5 - 40		31.3					
★	BVB-104	43.5 - 45		25.6					

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	BVB-104	28.5 - 30	0.075								6.9	
☒	BVB-104	33.5 - 35	12.5				0.0	2.6	9.8		87.5	
▲	BVB-104	38.5 - 40	9.5				0.0	0.1	19.3		80.6	
★	BVB-104	43.5 - 45	4.75	0.188	0.099		0.0	0.0	81.3		18.7	

PROJECT: B&V: Grayson Repowering Plant

SITE: Service Contract #405153.78.0101,
Task #001
Glendale, CA

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

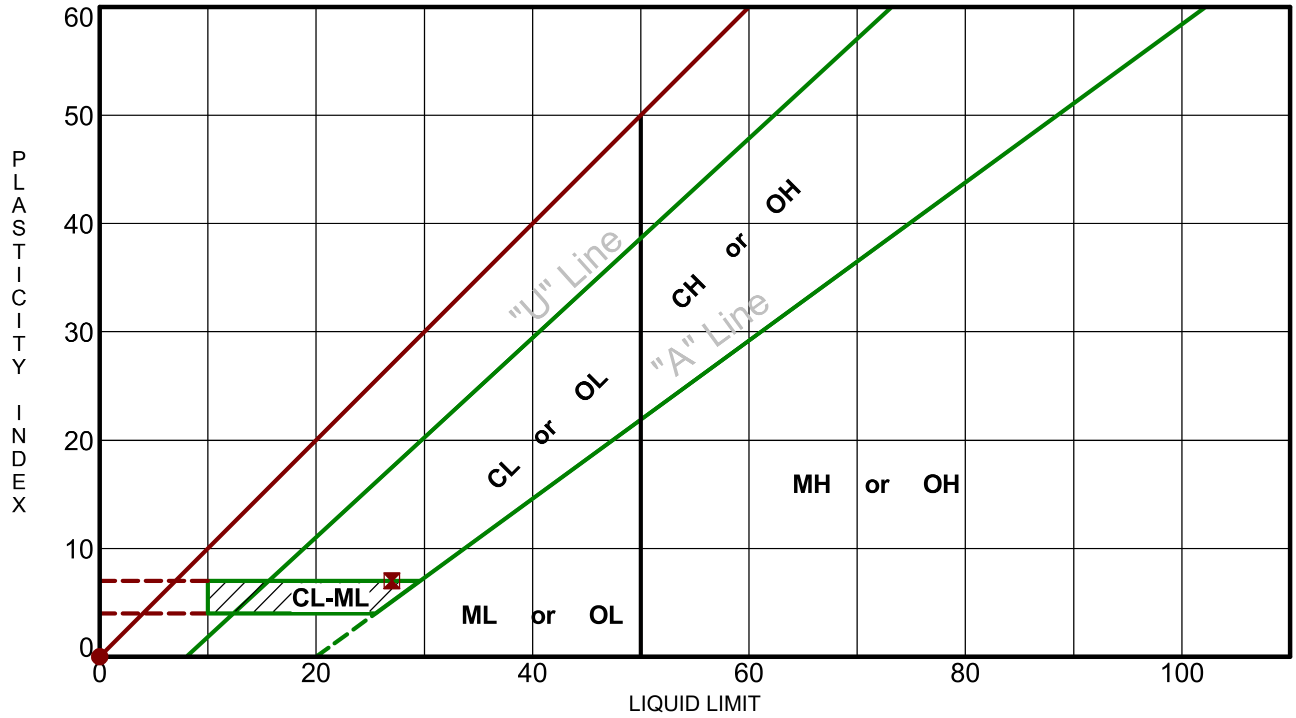
PROJECT NUMBER: CB205080

CLIENT: Black & Veatch Corporation
Overland Park, KS

EXHIBIT: B-4

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
● **BVB-101**	**33.5 - 35**	**NP**	**NP**	**NP**	**69.8**	**ML**	**SANDY SILT**
☒ **BVB-102**	**25 - 25.5**	**27**	**20**	**7**	**87.9**	**CL-ML**	**SILTY CLAY**

PROJECT: B&V: Grayson Repowering Plant

SITE: Service Contract #405153.78.0101,
Task #001
Glendale, CA

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

PROJECT NUMBER: CB205080

CLIENT: Black & Veatch Corporation
Overland Park, KS

EXHIBIT: B-1

Appendix E. USGS Seismic Hazard Deaggregation Results

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

34.15527778

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western long…

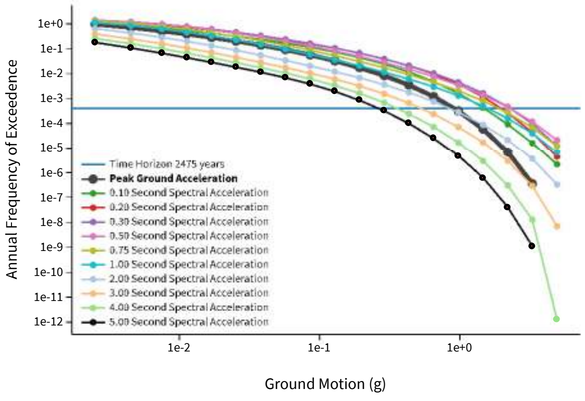
-118.2783333

Site Class

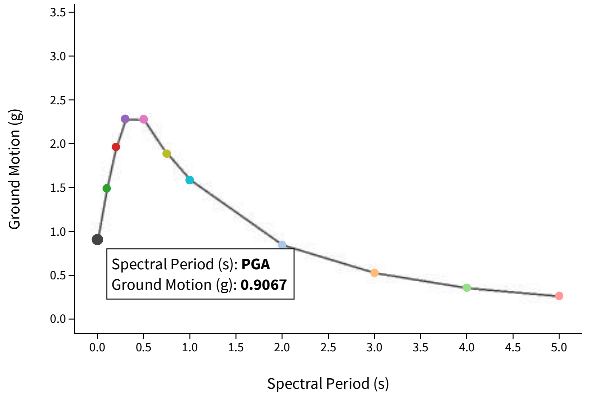
259 m/s (Site class D)

Hazard Curve

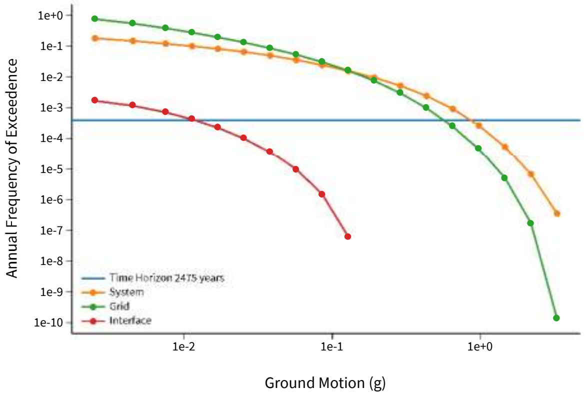
Hazard Curves



Uniform Hazard Response Spectrum



Component Curves for Peak Ground Acceleration

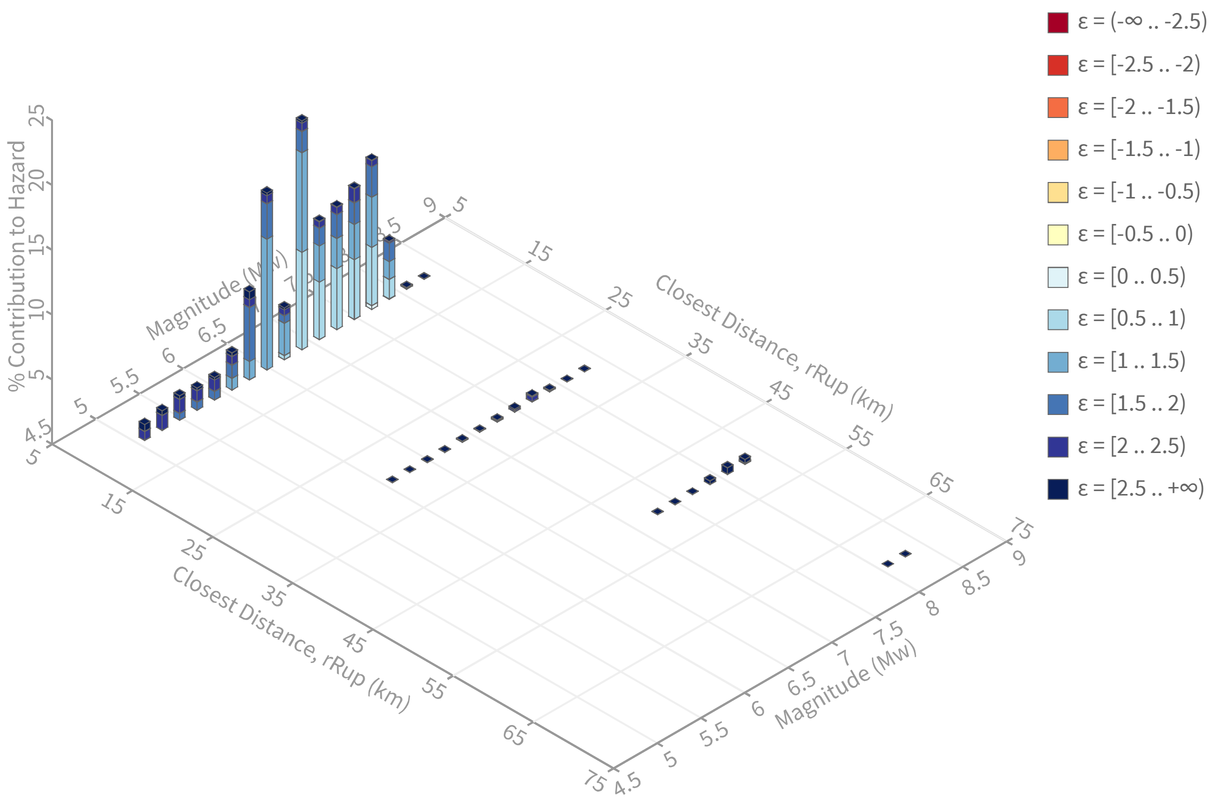


View Raw Data

^ Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.90670515 g

Recovered targets

Return period: 2989.2951 yrs
Exceedance rate: 0.00033452702 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.04 %

Mean (over all sources)

m: 6.95
r: 8.34 km
ε_0: 1.4 σ

Mode (largest m-r bin)

m: 6.9
r: 6.41 km
ε_0: 1.17 σ
Contribution: 17.65 %

Mode (largest m-r-ε_0 bin)

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε₀	lon	lat	az	%
UC33brAvg_FM32	System							44.12
Hollywood [0]		4.18	7.10	1.01	118.273°W	34.121°N	173.07	15.09
Puente Hills (LA) [1]		8.51	7.08	1.00	118.325°W	34.054°N	201.08	4.48
Santa Monica alt 2 [0]		4.25	7.28	0.95	118.288°W	34.117°N	191.85	3.84
Verdugo [1]		4.16	7.42	1.09	118.254°W	34.184°N	35.42	3.31
Elysian Park (Upper) [2]		5.83	6.75	1.20	118.294°W	34.121°N	200.78	3.12
Sierra Madre [5]		11.13	7.70	1.62	118.202°W	34.232°N	39.20	2.21
Hollywood [1]		4.59	6.71	1.24	118.293°W	34.119°N	198.26	1.66
Compton [3]		18.01	7.49	1.57	118.443°W	33.877°N	206.12	1.64
UC33brAvg_FM31	System							42.13
Hollywood [0]		4.18	7.27	0.96	118.273°W	34.121°N	173.07	10.37
Elysian Park (Upper) [2]		5.83	6.67	1.20	118.294°W	34.121°N	200.78	9.47
Verdugo [1]		4.16	7.45	1.09	118.254°W	34.184°N	35.42	3.72
Elysian Park (Upper) [1]		9.83	6.35	1.75	118.239°W	34.081°N	156.23	3.00
Sierra Madre [5]		11.13	7.67	1.62	118.202°W	34.232°N	39.20	2.30
Puente Hills [4]		9.29	7.10	1.20	118.291°W	34.073°N	187.34	2.13
Hollywood [1]		4.59	6.93	1.17	118.293°W	34.119°N	198.26	1.79
Compton [3]		18.01	7.40	1.62	118.443°W	33.877°N	206.12	1.69
Raymond [2]		6.29	6.75	1.51	118.224°W	34.124°N	124.33	1.63
UC33brAvg_FM32 (opt)	Grid							7.10
PointSourceFinite: -118.278, 34.214		7.88	5.77	1.98	118.278°W	34.214°N	0.00	1.29
PointSourceFinite: -118.278, 34.214		7.88	5.77	1.98	118.278°W	34.214°N	0.00	1.29
UC33brAvg_FM31 (opt)	Grid							6.65
PointSourceFinite: -118.278, 34.214		7.88	5.77	1.99	118.278°W	34.214°N	0.00	1.15
PointSourceFinite: -118.278, 34.214		7.88	5.77	1.99	118.278°W	34.214°N	0.00	1.15

Appendix C UPDATED AIR QUALITY TECHNICAL REPORT

C.1 Alternative 7

Foulweather Consulting

Revised
Application to the South Coast AQMD for a Permit to Construct For the Grayson Repowering Project

prepared for:

City of Glendale,
Department of Water & Power

June 2021

prepared by:

Foulweather Consulting
Foulweather Bluff, Hansville, WA

REVISED
APPLICATION TO THE SOUTH COAST AQMD FOR A PERMIT TO CONSTRUCT
FOR THE
GRAYSON REPOWERING PROJECT
GLENDALE, CA

Prepared for:

City of Glendale, Department of Water and Power

Submitted to:

South Coast Air Quality Management District

June 2021

Prepared by:

Foulweather Consulting
Foulweather Bluff, Hansville, WA

REVISED
APPLICATION TO THE SOUTH COAST AQMD FOR A PERMIT TO CONSTRUCT
FOR THE GLENDALE WATER & POWER
GRAYSON REPOWERING PROJECT
GLENDALE, CA

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1. Introduction

The City of Glendale, Department of Water and Power ("City"), owns and operates the Grayson Power Plant, located at 800 Air Way in Glendale. The power plant has been in operation since 1941. The City is proposing to construct and operate the Grayson Repowering Project on the site of the existing power plant.

One of the proposed Grayson Repowering Project alternatives would replace all the existing generation units at the Grayson Power Plant, with the exception of Unit 9, by removing existing above-ground and below-ground equipment and facilities and building new generation and energy storage facilities. This includes demolishing the Grayson Power Plant Boiler Building and Cooling Towers 1 through 5 and replacing the generating units (Units 1, 2, 3, 4, 5, 8A, and 8B/C). The 238 megawatts (MW) of existing generation facilities would be replaced with five Wärtsilä 18V50SG natural gas-fired reciprocating internal combustion engine generators and battery storage, for a total of 94 MW (gross) of replacement generation and up to 75 MW (300 MW-hours) of battery storage capacity. Unit 9, a 48 MW (net, nominal) simple cycle gas turbine, will remain operational.

Two different physical arrangements were studied for the Tesla and Wartsila alternatives. Alternative 6 located the Wärtsilä power island to the southwest corner of the Grayson site and a battery energy storage system (BESS) to the north. Alternative 7 interchanged those two locations. Alternative 6 was the subject of the original application to SCAQMD. However, subsequent conceptual design and geotechnical work resulted in a determination that the Alternative 6 arrangement was infeasible. Hence Alternative 7 became the only viable arrangement for the Wärtsilä engines and BESS. This revision was prepared to add the additional modeling and analysis results for Alternative 7.

The Alternative 7 layout is shown as Figure 1-2 of Air Dispersion Modeling Report and Health Risk Assessment: Alternative 6 and 7 Addendum (Attachment D2). The engines, technical specifications and operating assumptions are identical to those for the equipment configuration originally proposed in the application filed in May of 2020; only the equipment layout will differ. This revised application presents the ambient air quality impact and screening health risk assessments for the revised configuration.

2. Proposed Facility Modifications

The Wärtsilä engine portion of the proposed Grayson Repowering Project Alternative 7, or "proposed project[1]," will consist of five Wärtsilä 18V50SG generating units. Total site capacity will not to exceed 94 MW (gross, nominal) from these gas-fired units, plus 75 MW of battery storage capacity, for a total of 169 MW— below the 238 MW of rated capacity of units to be retired. The five Wärtsilä 18V50SG generating units are the subject of this application.

---

[1] In this document, the term "proposed project" refers to the Wärtsilä engine portion of the proposed Grayson Repowering Project Alternative 7.

The Wärtsilä generators are four-stroke, lean burn spark ignition engine generators, each rated at 18.8 MW (gross, nominal). Each natural gas-fueled generator will be equipped with an emission control system consisting of Selective Catalyst Reduction (SCR) for oxides of nitrogen (NOx) emissions control and oxidation catalysts to control carbon monoxide (CO), volatile organic compound (VOC) and hazardous air pollutant (HAP) emissions; continuous emissions monitoring system (CEMS); and associated support equipment. The 19% aqueous ammonia (NH_3) used in the SCR systems will be stored in a new 15,000-gallon (gross, 13,200 net) storage tank to be constructed as part of the proposed project.

Following completion of the South Coast Air Quality Management District's (SCAQMD) permitting activities, the City intends to shut down the existing units in early 2022 and commence demolition of the units. Construction of the battery storage facility is independent of the Wärtsilä generators, and is expected to start in early 2023, with a projected on-line date in the fall of 2023. Construction of the Wärtsilä generators is also expected to start in early 2023, with a projected on-line date in late 2024.

The SCAQMD application forms for the project are enclosed as Appendix A. The existing Grayson Power Plant is subject to federal Acid Rain and Title V requirements. In addition, the existing facility is a NOx Major Source. The applicability of these regulatory programs to the modified facility are addressed in this application support document.

2.1. Existing Generating Units to be Replaced

Existing generating Units 1, 2, 3, 4, 5, 8A, and 8B/C will be replaced by energy storage and the new Wärtsilä reciprocating engines. The heat input and generation output ratings of the units to be replaced are summarized in Table 1.

Table 1. Generating Units to be Replaced

Unit No./Description	Rated Heat Input, MMBtu/hr[a]	Rated Output, Gross MW[a]
Unit 1, steam turbine	n/a[b]	20
Unit 2, steam turbine	n/a[b]	20
Unit 3, steam boiler	260	20
Unit 4, steam boiler	492	44
Unit 5, steam boiler	527.25	44
Unit 8A, gas turbine generator	350	30
Units 8B/C, gas turbine generators	700	60
Total Rated Output		238

Note:

a. SCAQMD Title V permit No. 800327.

b. Units 1 and 2 are steam turbines that receive steam from the combined cycle units 8A and 8B/C.

2.2. California Energy Commission Jurisdiction

The proposed project will remove 238 MW (gross) of capacity and replace it with 94 MW (gross) of new capacity from the gas-fired generating units and 75 MW (gross) of capacity from the new battery storage facility for a total 169 MW (gross) of new capacity at the site. This will result in an overall reduction in generating capacity at the site. Because the proposed project will result in a reduction in generating capacity at the existing power plant, the proposed project is not subject to review by the California Energy Commission.

2.3. CEQA

The proposed project is an alternative to the original repowering project that consisted of 270 MW (gross) of gas and steam turbine generating units. The Draft Environmental Impact Report (EIR) for the original repowering project was issued in March 2018. At the lead agency's request, additional lower-capacity reduced carbon footprint alternatives were developed. After the evaluation of the updated integrated resource plan and project proposals, the proposed Grayson Repowering Project using Wärtsilä engines in conjunction with a BESS was selected for further consideration as an alternative to the original project configuration. As explained previously, Alternative 7 was subsequently added. The draft EIR for the proposed project alternative will be submitted to the City for review in mid-2021.

3. Existing Site Conditions

3.1. Geography and Topography

Grayson Power Plant is located in at 800 Air Way, Glendale, California 91201, just northeast of the Interstate 5 and Highway 134 interchange in an industrial area of the City. The project power generation equipment will be constructed entirely within the existing Grayson Power Plant, which is bounded to the south by Verdugo Wash and Highway 134, to the west by the Los Angeles River and Interstate 5, to the north by commercial properties, and to the east by commercial and residential properties. The approximate latitude and longitude coordinates of the project are 34° 09′19″ N and 118° 16′42″ W. The Grayson Power Plant site is located within the South Coast Air Basin, which is regulated by the SCAQMD.

3.2. Climate and Meteorology

The overall climate at the project site is dominated by the semi-permanent Pacific High pressure system over the eastern Pacific Ocean. The Pacific High is centered between the 140°W and 150°W meridians and oscillates in a north-south direction seasonally. Its position governs California's weather. In the summer, the high moves to its northernmost position, which results in a strong subsidence inversion and clear skies inland; along the coast, the weather is dominated by coastal stratus and fog caused by the cooler and more homogeneous ocean surface temperature. Almost no precipitation occurs during summer months, because migrating storm systems are blocked by the Pacific High.

In the fall, the Pacific High weakens and shifts southwestward toward Hawaii, allowing storms originating in the Gulf of Alaska to reach California. The average annual rainfall at the project site is approximately 16 inches, of which approximately 85% falls between November and March.[2] Between storms, skies are fair, winds are light, and temperatures are moderate.[3]

Wind and mixing height are two key meteorological parameters that govern the potential for air pollution problems. The predominant winds in California are generally light and easterly in the winter, but strong and westerly in the spring, summer, and fall.

The nearest full-time meteorological monitoring station to the proposed project site is maintained at the Burbank Airport, approximately 2.5 miles northwest of the project site. Wind patterns for the project site are presented in Figure 1, which is a wind rose for the Burbank airport meteorological station.[4] It can be seen that at this site, the majority of winds come from south through southeast. Calm conditions prevail only about 1% of the time.

The average high temperature at the project site is 77 degrees Fahrenheit (°F); the average annual temperature is 64°F. Temperatures of 32°F or below and of 100°F or above rarely occur at this location.

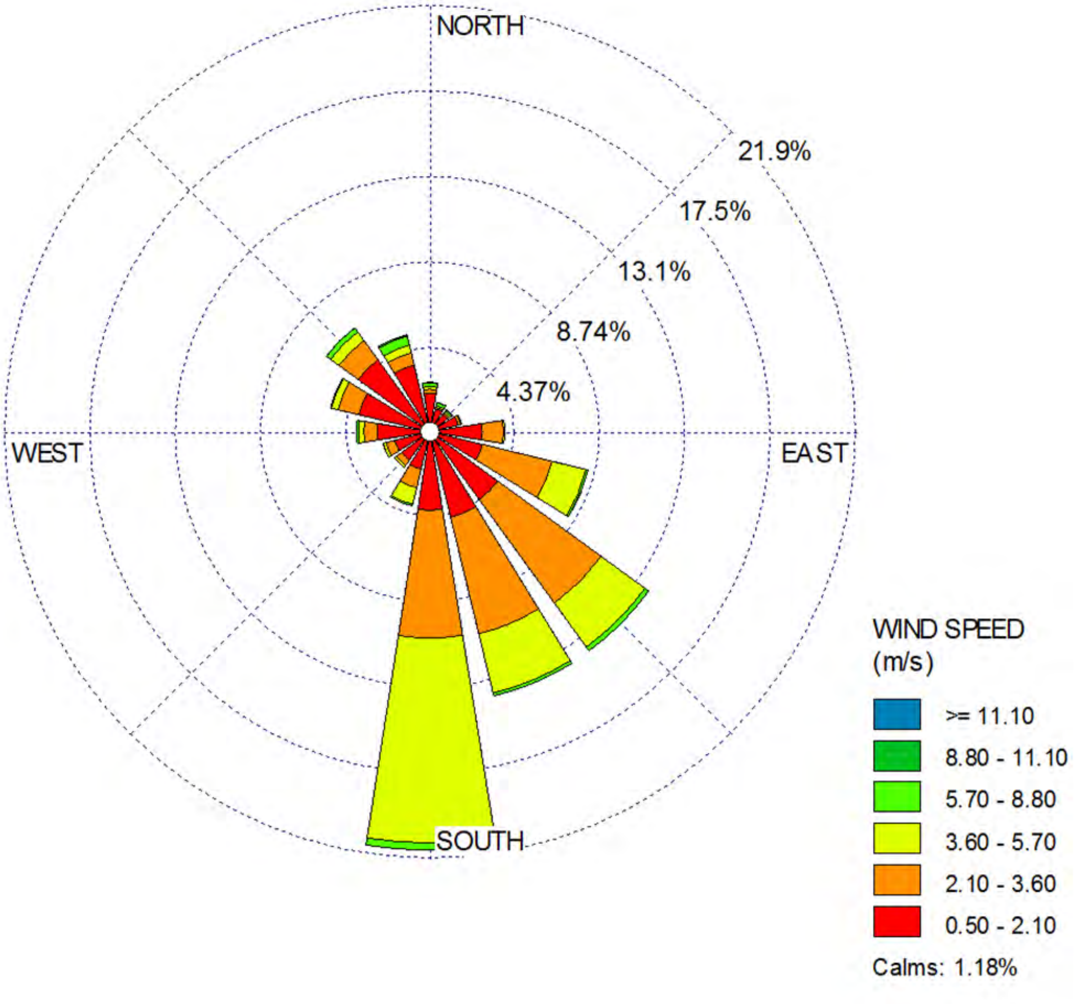
---

[2] Western Regional Climate Change Center (WRCC), Period of Record Monthly Climate Summary for Burbank Valley Pump, CA. Accessed at https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca1194

[3] *Climates of the States- California,* U.S. Department of Commerce, Weather Bureau, 1959.

[4] SCAQMD Meteorological Data for Dispersion Modeling; data for KBUR meteorological station. Available at *http://www.aqmd.gov/home/air-quality/meteorological-data/aermod-table-1*

Figure 1. Burbank Airport Wind Rose (2012-2016)



3.3. Overview of Air Quality Standards

The U.S. Environmental Protection Agency (EPA) has established national ambient air quality standards (NAAQS) for the following seven pollutants, termed criteria pollutants: ozone, nitrogen dioxide (NO_2), CO, sulfur dioxide (SO_2), particulate matter with aerodynamic diameter less than or equal to 10 microns (PM_{10}), particulate matter with aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$), and airborne lead. The federal Clean Air Act (CAA) requires EPA to designate areas (counties) as attainment or non-attainment with respect to each criteria pollutant, depending on whether the areas meet the NAAQS. An area that is designated non-attainment means the area is not meeting the NAAQS and is subject to planning requirements to attain the standard.

In addition to the seven pollutants listed above, the California Air Resources Board (ARB) has established state standards for visibility-reducing particles, sulfates, hydrogen sulfide, and vinyl chloride. Similar to EPA, ARB designates counties in California as attainment or non-attainment with respect to the California ambient air quality standards (CAAQS). The state standards were designed to protect the most sensitive members of the population, such as children, the elderly, and people who suffer from lung or heart diseases.

Both state and federal air quality standards are based on two variables: maximum concentration and an averaging time over which the concentration would be measured. Maximum concentrations are based on levels that may have an adverse effect on human health. The averaging times are based on whether the damage caused by the pollutant would occur during exposures to a high concentration for a short time (for example, 1 hour), or to a relatively lower average concentration over a longer period (8 hours, 24 hours, or 1 month). For some pollutants, there is more than one air quality standard, reflecting both short-term and long-term effects. Table 2 presents the NAAQS and CAAQS.

3.1. Existing Air Quality

The project area's attainment status for the NAAQS and CAAQS are listed in Table 3. The project site is an urban area that is in nonattainment for most state and federal standards. Ambient air concentrations of ozone (O_3), NO_2, CO, PM_{10}, $PM_{2.5}$ and Pb are recorded at Los Angeles – North Main Street station (ARB Monitoring Site 70087 and EPA Site ID 060371103). This site is located approximately 6.9 miles from the project site.[5] Based on a review of meteorological data collected at the Burbank meteorological monitoring station, the Los Angeles ambient monitoring station is upwind of the project site for most meteorological conditions. However, the Los Angeles monitoring station is exposed to similar emissions sources—in particular, both the project site and the Los Angeles monitoring station are located near high volume freeways.

Ambient air quality monitoring data for ozone, PM_{10}, $PM_{2.5}$, CO, NO_2, SO_2 and Pb from the Los Angeles—North Main Street monitoring station for the years 2017 through 2019 are summarized in Table 4. The locations of the monitoring stations relative to the project site is shown in Figure 2.

The ambient air quality data are based on data published by ARB (ADAM Web site) and EPA (AIRS Web site). The maximum ambient background concentrations will be combined with the modeled concentrations and used for comparison to the AAQS.

---

[5] The nearest ambient monitoring station, at Burbank, closed in 2014.

Table 2. Ambient Air Quality Standards

Pollutant	Averaging Time	California	National
Ozone	1-hour 8 hour	0.09 ppm (180 µg/m^3) 0.07 ppm (137 µg/m^3)	— 0.075 ppm (147 µg/m^3)
CO	1-hour 8-hour	20 ppm (23 mg/m^3) 9.0 ppm (10 mg/m^3)	35 ppm (40 mg/m^3) 9 ppm (10 mg/m^3)
NO$_2$	1-hour Annual arithmetic mean	0.18 ppm (339 µg/ m^3) 0.030 (57 µg/m^3)	100 ppb (188 µg/m^3) [a] 53 ppb (100 µg/m^3)
SO$_2$ [b]	1-hour 3-hour (secondary standard) 24-hour	0.25 ppm (655 µg/m^3) — 0.04 ppm (105 µg/m^3)	75 ppb (196 µg/m^3) 0.5 ppm (1,300 µg/m^3) —
Respirable Particulate Matter (PM$_{10}$)	24-hour Annual arithmetic mean	50 µg/m^3 20 µg/m^3	150 µg/m3 —
Fine Particulate Matter (PM$_{2.5}$)	24-hour Annual arithmetic mean	— 12 µg/m^3	35 µg/m^3 [c] 12.0 µgm^3 [d]
Sulfates	24-hour	25 µg/m^3	—
Lead	30-day average Calendar quarter Rolling 3-month average	1.5 µg/m^3 —	— 1.5 µg/m^3 0.15 µg/m^3
Hydrogen sulfide (H2S)	1- hour	0.03 ppm (42 µg/m^3)	—
Vinyl chloride	24-hour	0.010 ppm (26 µg/m^3)	—
Visibility-reducing particles	8-hour (10 a.m. to 6 p.m. PST)	In sufficient amount to produce an extinction coefficient of 0.23 per kilometer due to particles when the relative humidity is less than 70 percent.	—

Note:

a. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb.

b. On June 2, 2010, EPA established a new 1-hour SO2 standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. The EPA also revoked both the 24-hour SO2 standard of 0.14 ppm and the annual primary SO2 standard of 0.030 ppm, effective August 23, 2010. The secondary SO2 standard was not revised at that time; however, the secondary standard is undergoing a separate review by EPA.

c. The 24-hour standard is attained when 98 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard.

d. 3-year average of the weighted annual mean concentrations.

µg/m^3 = microgram(s) per cubic meter
ppm = parts per million
Source: ARB, 2012a

Table 3. State and Federal Air Quality Designations for the Project Area

Pollutant	State Designation	Federal Designation
Ozone	Nonattainment	Nonattainment (Extreme)
CO	Attainment	Attainment/unclassified
NO_2	Attainment	Attainment/unclassified
SO_2	Attainment	Attainment/unclassified
PM_{10}	Nonattainment	Attainment
$PM_{2.5}$	Nonattainment	Nonattainment
Lead	Attainment	Nonattainment[a]
H_2S and Sulfates	Attainment	n/a

Sources: ARB (); SCAQMD (http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/naaqs-caaqs-feb2016.pdf?sfvrsn=14)

H_2S = hydrogen sulfide

n/a = not applicable

Note:

a. Although the project area is designated nonattainment for the federal lead standard, no exceedances of that standard have been recorded since at least 2015.

Figure 2. Locations of Monitoring Stations and Project Site

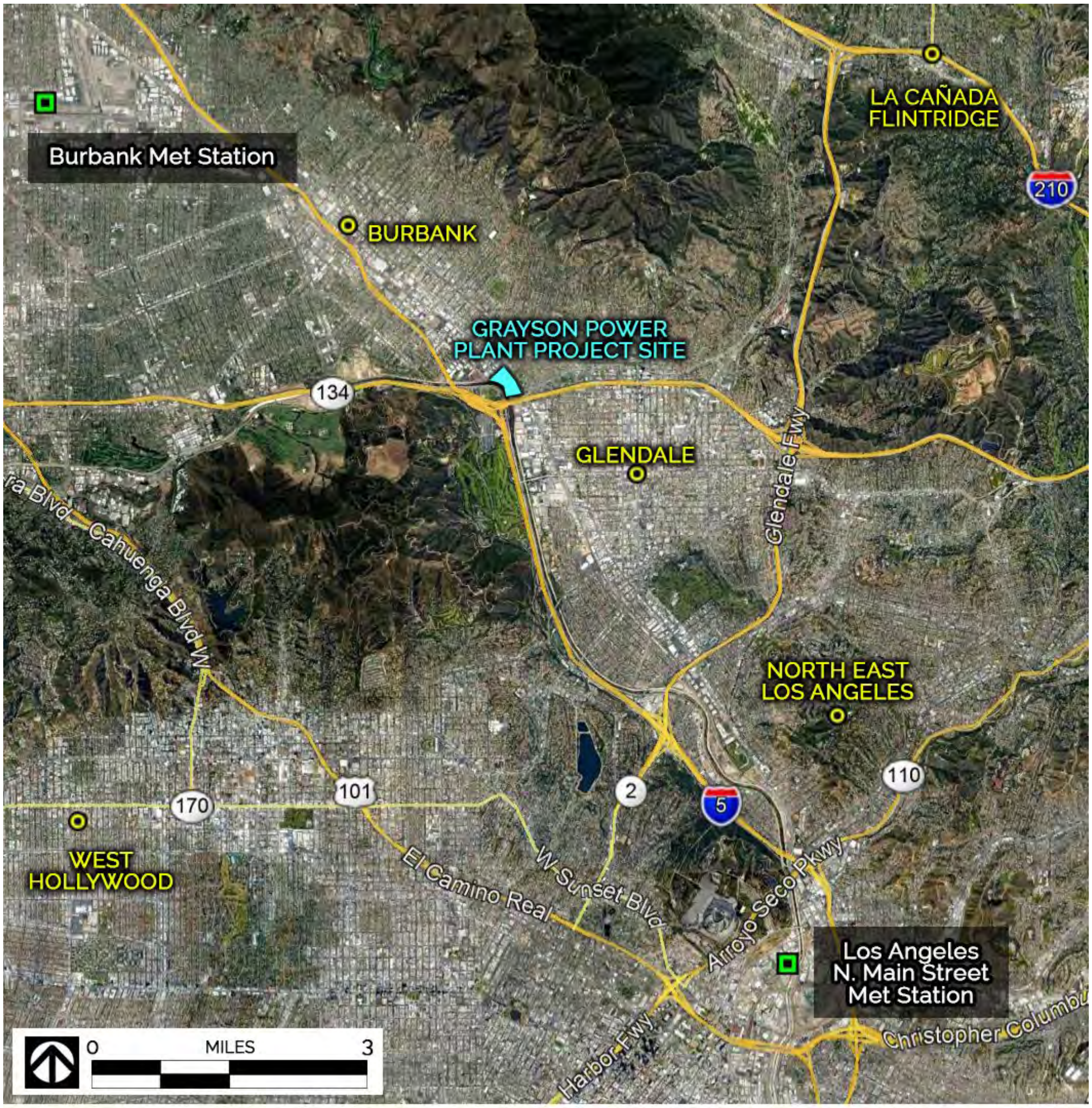


Table 4. Background Concentrations from the Los Angeles-North Main Street Monitoring Station

Pollutant	Averaging Period	Monitored Background Concentration			Maximum Concentration
		2017	2018	2019	
NO$_2$	1 hour[a] – state std	80.6 ppb	70 ppb	69.7 ppb	80.6 ppb
	1 hour[b] – federal std	61.7 ppb	57.2 ppb	55.5 ppb	61.7 ppb
	Annual – state std	20 ppb	18 ppb	18 ppb	20 ppb
	Annual – federal std	21 ppb	19 ppb	18 ppb	21 ppb
SO$_2$	1-hour – state std	5.7 ppb	17.9 ppb	10.0 ppb	17.9 ppb
	1 hour[c] – federal std	2.6 ppb	2.8 ppb	2.3 ppb	2.8 ppb
	24 hours	1.5 ppb	1.3 ppb	1.4 ppb	1.5 ppb
	Annual	0.36 ppb	0.3 ppb	0.33 ppb	0.36 ppb
CO	1 hour	1.9 ppm	1.9 ppm	2.0 ppm	2.0 ppm
	8 hours	1.6 ppm	1.4 ppm	1.6 ppm	1.6 ppm
PM$_{10}$	24 hours – state std	96 µg/m^3	81 µg/m^3	62 µg/m3	96 µg/m^3
	24 hours – federal std	64.6 µg/m^3	68.2 µg/m^3	62.4 µg/m3	68.2 µg/m^3
	Annual[d] - state std	34.4 µg/m^3	34.1 µg/m^3	25.5 µg/m3	34.4 µg/m^3
PM$_{2.5}$	24 hours[f]	27.8 µg/m^3	30.5 µg/m^3	28.3 µg/m3	30.5 µg/m^3
	Annual[d] – state std	16.3 µg/m^3	16.0 µg/m^3	10.8 µg/m3	16.3 µg/m^3
	Annual[e] – federal std	11.9 µg/m^3	12.6 µg/m^3	10.8 µg/m3	12.6 µg/m^3
Pb	Month	0.017 µg/m^3	0.011 µg/m^3	0.012 µg/m3	0.017 µg/m^3
	3-month rolling	0.01 µg/m^3	0.01 µg/m^3	0.01 µg/m3	0.01 µg/m^3

Sources:

SCAQMD Historical Air Quality Data Tables; NO$_2$, PM$_{10}$ and PM$_{2.5}$ from CARB iADAM; SO$_2$, CO and Pb from U.S. EPA Monitor Values Report.

Notes:

a. California 1-hour standard design value.
b. 98th percentile value.
c. 99th percentile value.
d. Three-year maximum annual average.
e. Three-year average.
f. 24-hour standard 98th percentile.

3.2. Greenhouse Gases

ARB has promulgated several regulations to address the potential effects of increasing atmospheric concentrations of carbon dioxide and other greenhouse gases. On September 20, 2006, the California Global Warming Solutions Act of 2006 (Assembly Bill [AB] 32, codified at Section 1, Division 25.5, Section 38500 et seq. of the California Health & Safety Code), became law. This law requires ARB to design and implement emission limits, regulations, and other measures, such that statewide greenhouse gas emissions are reduced in a technologically feasible and cost-effective manner to 1990 levels by 2020 (representing a 25 percent reduction), and further reduced by 2050 (an 80 percent reduction over 1990 levels).

AB 32 does not directly amend other environmental laws, such as the California Environmental Quality Act (CEQA). Instead, it provides for creation of a greenhouse gas emissions program that includes identification of sources, prioritization of sources for regulation based on significance of source contribution to greenhouse gas emissions, and eventual regulation of those sources.

Greenhouse gases include the following pollutants:

- Carbon dioxide (CO_2) is a naturally occurring gas, as well as a by-product of burning fossil fuels and biomass, land-use changes, and other industrial processes. It is the principal anthropogenic greenhouse gas that affects the Earth's radiative balance.
- Methane (CH_4) is a greenhouse gas with a global warming potential (GWP) most recently estimated at 25 times that of CO_2. GWP is a measure of how much a given mass of greenhouse gas is estimated to contribute to global warming and is a relative scale that compares the mass of a greenhouse gas to that same mass of carbon dioxide. CH_4 is produced through anaerobic (without oxygen [O_2]) decomposition of waste in landfills, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion.
- Nitrous oxide (N_2O) is a greenhouse gas with a GWP of 298 times that of CO_2. Major sources of nitrous oxide include soil cultivation practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning.

The project impact assessment includes the impacts from emissions of CO_2, CH_4, and N_2O.

4. Environmental Analysis

The following sections describe the emission sources that have been evaluated, the results of the ambient impact analyses, and the evaluation of project compliance with the applicable air quality regulations, including the District's New Source Review (NSR) requirements. These analyses are designed to confirm that the proposed project's design features lead to less-than–significant impacts even with the following conservative analysis assumptions and procedures: maximum allowable emission rates, project operating schedules that lead to maximum emissions, worst-case meteorological conditions, and the worst-observed existing air quality added to the highest potential ground-level impact from modeling—even when all of these situations could not physically occur at the same time.

4.1. Process Description

As discussed above, the proposed project includes the installation of five new Wärtsilä 18V50SG reciprocating IC engines to replace the existing steam boilers and gas turbines (with the exception of Unit 9). Each new engine generator will be equipped with an inlet air filter and an intercooling system. Table 5 lists the technical specifications for the new engines. Note the specifications are for a single engine.

Table 5. Wärtsilä 18V50SG Nominal Specifications	
Parameter	Specifications
Manufacturer	Wärtsilä
Model	18V50SG
Fuel Type	California Public Utilities Commission (CPUC) quality natural gas
Natural Gas Heating Value	1,031 Btu/scf
Heat Input (HHV)	161.6 MMBtu/hr at 80°F ambient (peak load)
Fuel Consumption	0.157 MMscf/hr[a]
Exhaust Flow	51,604 dscfm at 80°F ambient (peak load)
Exhaust Temperature	697 °F at 80°F ambient (peak load)
Engine Generator Output	18,817 kW (nominal – gross)

Note:

a. Represents the maximum possible fuel consumption of the engine, based on 161.6 MMBTU/hr heat input and 1,031 BTU/scf fuel heat content.

4.2. Air Pollution Control (APC) Systems

Each engine generator will utilize an SCR catalyst with ammonia injection for control of NOx emissions. As a result, the NOx emissions at full load will be limited to 2.4 ppmv, 1-hour average, dry basis at 15% O_2. The oxidation catalyst is expected to achieve CO emissions at full load of 11.2 ppmv, 1-hour average, dry basis, at 15% O_2. VOC emissions at full load will be limited to 9.8 ppmv, dry basis at 15% O_2. SOx and PM_{10} emissions will be mitigated through the use of PUC-quality natural gas.

Detailed descriptions of the air pollution control systems are provided in the next section. Table 6 and Table 7 show the specifications for the SCR and oxidation catalysts to be used for each new engine generators.

Table 6. Selective Catalytic Reduction Specifications	
Catalyst Properties	**Specifications**
Manufacturer	Umicore, Cormetech or equivalent
Catalyst Active Material	Vanadium
Catalyst Dimensions (each module)	0.466 m (L) x 0.466 m (W) x 0.27 m (h) per catalyst element
Number of Modules	147 (3 layers, 49 elements per layer)
Catalyst Volume	304 ft^3
Total Weight	6157 lb
Expected Catalyst Life	~5 years, depending on operating hours
Space Velocity	<11,900 per hour
Ammonia Injection Rate (lb/hr)	Between 1 and 220 lb/hr of 19% aqueous ammonia, depending on load
NOx removal efficiency	Varies by load
NOx at stack outlet	Not to exceed 2.4 ppmvd @ 15% O_2 at full load
Maximum Operating Temperature	896 deg F

Table 7. Oxidation Catalyst Specifications	
Catalyst Properties	**Specifications**
Manufacturer	Umicore, Cormetech or equivalent
Catalyst Active Material	Palladium, platinum or equivalent
Catalyst Dimensions (each module)	0.466 m (L) x 0.466 m (W) x 0.13 m (h) per catalyst element
Number of Modules	98 (2 layers, 49 elements per layer)
Catalyst Volume	150 cu ft
Total Weight	4104 lb
Expected Catalyst Life	~5 years, depending on operating hours
Space Velocity	<24,000 per hour
CO removal efficiency	Varies by load
CO at stack outlet	Not to exceed 11.2 ppmvd @ 15% O_2 at full load
Maximum Operating Temperature	896 deg F

The exhaust from each engine will be discharged from an 80-foot tall, 63-inch diameter exhaust stack. Individual Continuous Emission Monitoring System (CEMS) sampling probes will be located in the horizontal ducting prior to the stack silencer for each engine for continuous measurement and recording of NOx and CO emissions.

4.3. Criteria Pollutant Emissions from the New Generating Units

The highest hourly heat input and emission rates during normal operation occur at peak load. The plant may be operated under a wide variety of conditions over its life. The worst-case hourly emissions assume all five engines will undergo startups during the same hour. Maximum daily emissions are calculated assuming that each engine will undergo three startups/shutdowns per day, with the units operating at full load for the remaining hours of the day. Maximum monthly emissions are calculated assuming 50 startups and 225 full-load operating hours per engine per month. Maximum annual emissions are calculated assuming each engine operates a total of 1120 hours per year with up to 280 startups/shutdowns per year and remaining operations at full load. These assumptions are not intended to be imposed as permit limitations.

4.3.1. Emissions Calculations

Criteria pollutant emission rates were calculated for three operating modes of the project: commissioning activities for the new engines, engine startup, and engine operation. These operating modes are described in Table 8. Detailed emission calculations are in Appendix B. Calculations for emissions during commissioning are included in Appendix C.

Table 8. Operating Modes of the Engine Generators

Mode	Description
Commissioning	The process of fine-tuning each of the engines. Facility follows a systematic approach to optimize performance of the engines and the associated control equipment, in accordance with the procedures developed by the engine manufacturer. Emissions are expected to be greater during commissioning than during normal operation for some pollutants. This mode affects only the initial year of operation.
Start-up	Following the commissioning period, there will be up to three startups per day for each engine. Startup emissions are elevated due to the fact that the control equipment has not reached optimal temperature to begin the chemical reactions needed to convert NOx to elemental nitrogen and water.
Normal Operation	Normal operation occurs after the engines and the control equipment are working optimally, as designed. Emissions may vary due to fluctuations in engine load, but mass emissions at part load are not higher than mass emissions at full load.

4.3.2. Commissioning Period

Engine commissioning consists of no-load, partial-load and full-load testing performed immediately after construction for the purpose of optimizing engine operations, followed by installation of the emission control systems and optimizing and testing of the SCR systems. Several parameters—such as engine load, engine tuning, and degree of SCR control—may be varied simultaneously during testing at the discretion of the applicant and in accordance with the commissioning program laid out by the engine and control equipment manufacturers.

Emissions during the commissioning year may be higher than those during a non-commissioning year for some pollutants due to the fact that the engines may not be optimally tuned and the SCR systems may be only partially operational or not operational at all. However, monthly emissions during the commissioning period will not exceed the proposed monthly limits in effect during normal project operation.

The CEMS will be installed and calibrated on each engine prior to the first start of each engine, and NOx and CO emissions will be continuously monitored during the commissioning phase. Prior to installation and tuning of the emission control systems, VOC emissions calculations will be based on emission factors and fuel consumption to represent the best estimate of uncontrolled emissions from the engines. After the SCR and oxidation catalysts are installed, VOC emission factors reflecting normal operations, including startups, will be used to track emissions of these pollutants. $PM_{10}/PM_{2.5}$ and SO_2 emissions are assumed not to be controlled by the SCR systems or oxidation catalysts, so the emission factors used for those pollutants will be the same during uncontrolled engine operation as they are during normal operation.

A typical commissioning schedule is presented in Appendix C. The schedule may vary from engine to engine, depending upon the performance of each individual engine.

4.3.3. Start-Up Emissions

The applicant expects that there will be an average of 50 startups per month and 280 startups per year for the engines during normal plant operations. During a startup, there are up to 30 minutes with elevated emissions (emissions higher than during normal operation) as the emission control devices reach full effectiveness. Shutdowns occur quickly enough that they are not expected to result in emissions above normal levels.

The startup emission calculations are shown in Appendix B. The applicant expects that there could be as many as three startups per day. During start-up operations, the engine is assumed to operate at elevated NOx and CO emission rates due to the phased-in effectiveness of the SCR systems and oxidation catalysts.

4.3.4. Normal Operations

The emissions during normal operations are assumed to be fully controlled to Best Available Control Technology (BACT) levels and exclude emissions due to commissioning and startup periods. Hourly, monthly, and annual averages are calculated and shown in Appendix B.

4.3.5. Emissions During a Commissioning Year

Table 9, Table 10 and Table 11 show the total emissions during a commissioning year for the new engines, which includes commissioning, startup, and normal operation. Details of the mass emission rates calculation for each phase of commissioning are provided in Appendix C.

Table 9. Maximum Mass Emission Rates, lb/hr (Commissioning Year)

	NOx	CO	VOC	SOx	PM_{10}	NH_3
Each Individual Engine						
Normal Operating Hour	1.33	3.76	1.89	0.14	1.32	1.02
Startup Hour[a]	11.8	14.0	5.7	0.14	2.5	1.02
Commissioning Hour	67.0	79.4	16.8	0.14	2.50	1.02
Maximum Hour[b]	67.0	79.4	16.8	0.14	2.50	1.02
Total, Five Engines						
Normal Operating Hour	6.65	18.80	9.45	0.68	6.60	5.1
Startup Hour[a]	58.8	69.9	28.3	0.68	12.3	5.1
Commissioning[c]	239.1	396.8	84.1	0.70	12.50	5.10
Maximum[b]	239.1	396.8	84.1	0.70	12.50	5.10

Note:

a. Pound per hour emission rates for startup hour include 30 minutes of startup and 30 minutes of normal, full-load operation.

b. Maximum hour is the higher of (Normal Operations plus Startup) OR Commissioning.

c. Maximum hourly emissions during commissioning for five engines assumes one engine performing safety stops check and four engines performing initial SCR system tuning prior to catalyst loading. See Table C-1, Appendix C.

Table 10. Maximum Mass Emission Rates, lb/month (Commissioning Year)

	NOx	CO	VOC	SOx	PM_{10}	NH_3
Each Individual Engine						
Normal Operations	298.1	841.5	423.0	32.1	297.0	229.5
Startup	308.0	214.5	224.3	3.6	90.0	25.5
Commissioning	1,325.2	1,701.9	652.4	21.8	288.0	255.0
Maximum[a]	1,325.2	1,701.9	652.4	35.6	387.0	255.0
Total, Five Engines						
Normal Operations	1,490.6	4,207.5	2,115.0	160.4	1,485.0	1,147.5
Startup	1,540.0	1,072.5	1,121.3	17.8	450.0	127.5
Commissioning	3,036.3	5,304.4	3,242.1	169.3	1,935.0	1,275.0
Maximum [a]	3,036.3	5,304.4	3,242.1	178.2	1,935.0	1,275.0

Note:

a. Maximum is the higher of (Normal Operations plus Startup) OR Commissioning.

Table 11. Maximum Mass Emission Rates, tons/yr (Commissioning Year)						
	NOx	CO	VOC	SOx	PM_{10}	NH_3
Each Individual Engine						
Normal Operations	0.74	2.09	1.05	0.08	0.74	0.57
Startup	0.90	0.68	0.63	0.01	0.25	0.07
Commissioning	0.66	0.85	0.33	0.01	0.14	0.05
Maximum	2.30	3.63	2.01	0.10	1.14	0.69
Total, Five Engines						
Normal Operations	3.7	10.5	5.3	0.40	3.7	2.9
Startup	4.5	3.4	3.2	0.05	1.3	0.4
Commissioning	3.3	4.3	1.6	0.05	0.7	0.2
Maximum	11.5	18.1	10.0	0.50	5.7	3.4

Note:

a. Maximum is the sum of Normal Operations, Startup and Commissioning.

4.3.6. Emissions During a Non-Commissioning Year

Table 12, Table 13 and Table 14 show the emissions during a non-commissioning year for the five engines, which include startup and normal operation. Hourly, monthly and annual averages are calculated and shown in Appendix B.

Table 12. Maximum Mass Emission Rates, lb/hr (Non-Commissioning Year)						
	NOx	CO	VOC	SOx	PM10	NH3
Each Individual Engine						
Normal Operating Hour	1.33	3.74	1.88	0.14	1.32	1.02
Startup Hour[a]	11.8	14.0	5.7	0.14	2.5	1.02
Maximum Hour	11.8	14.0	5.7	0.14	2.5	1.02
Total, Five Engines						
Normal Operating Hour	6.65	18.8	9.45	0.71	6.60	5.1
Startup Hour[a]	58.8	69.9	28.3	0.71	12.3	5.1
Maximum Hour	58.8	69.9	28.3	0.71	12.3	5.1

Note:

a. Pounds per hour emission rates for startup hour include 30 minutes of startup and 30 minutes of full-load operation.

Table 13. Maximum Mass Emission Rates, lb/month (Non-Commissioning Year)

	NOx	CO	VOC	SOx	PM_{10}	NH_3
Each Individual Engine						
Normal Operations	299.3	846.4	424.2	32.08	297.0	229.7
Startup	308.0	214.5	224.3	3.56	90.0	25.5
Total	607.3	1,060.9	648.4	35.6	387.0	255.3
Total, Five Engines						
Normal Operations	1,496.3	4,231.9	2,120.9	160.4	1,485.0	1,148.7
Startup	1,540.0	1,072.5	1,121.3	17.8	450.0	127.6
Total	3,036.3	5,304.4	3,242.1	178.2	1,935.0	1,276.3

Table 14. Maximum Mass Emission Rates, tons/yr (Non-Commissioning Year)

	NOx	CO	VOC	SOx	PM_{10}	NH_3
Each Individual Engine						
Normal Operations	0.74	2.1	1.05	0.08	0.74	0.6
Startup	0.90	0.7	0.63	0.01	0.25	0.1
Total	1.64	2.8	1.68	0.09	0.99	0.6
Total, Five Engines						
	NOx	CO	VOC	SOx	PM_{10}	NH_3
Normal Operations	3.7	10.5	5.3	0.40	3.7	2.9
Startup	4.5	3.4	3.2	0.05	1.3	0.4
Total	8.2	13.9	8.4	0.45	5.0	3.2

4.4. Non-Criteria Pollutant Emissions from the New Generating Units

Noncriteria pollutant emissions were estimated for the new engines. These emissions are summarized in Table 15. The detailed noncriteria pollutant emissions calculations and the associated screening-level health risk assessment are included in Appendix D1 and Appendix D2. Also shown below in Table 15 is a summary of the maximum potential to emit for noncriteria pollutants for existing gas turbine Unit 9, which will remain operational following the proposed project. This information is provided for regulatory applicability purposes and is discussed further below.

Table 15. Non-Criteria Pollutant Emissions for the New Equipment	
Compound	**Emissions (tons/yr, each engine)**
Ammonia (not a HAP)	3.2
Propylene (not a HAP)	0.53
Acetaldehyde	$5.2x10^{-2}$
Acrolein	$5.8x10^{-3}$
Benzene	$2.2x10^{-2}$
1,3-Butadiene	$3.6x10^{-2}$
Ethylbenzene	$7.0x10^{-3}$
Formaldehyde	0.26
Naphthalene	$2.5x10^{-3}$
PAHs (other)	$3.5x10^{-4}$
Toluene	$2.4x10^{-2}$
Xylene	$6.4x10^{-2}$
Total, All HAPs	**Emissions (tons/yr, 5 engines)**
Total HAPs	2.4
See detailed calculations in Appendix D1, Appendix Table A-4.	

Table 16. Non-Criteria Pollutant Emissions for Existing Grayson Unit 9	
Compound	**Emissions (tons/yr)**
Ammonia (not a HAP)	14.25
Acetaldehyde	$1.88x10^{-3}$
Acrolein	$3.01x10^{-2}$
Benzene	$5.60x10^{-4}$
1,3-Butadiene	$2.02x10^{-5}$
Ethylbenzene	$1.50x10^{-5}$
Formaldehyde	$3.34x10^{-2}$
Naphthalene	$6.15x10^{-4}$
PAHs (other)	$4.23x10^{-5}$
Propylene Oxide	$1.37x10^{-3}$
Toluene	$6.15x10^{-3}$
Xylene	$3.01x10^{-3}$
Total HAPs (Existing Unit 9)	$7.86x10^{-2}$
Source: Air Toxics "Hot Spots" Program (AB2588) Health Risk Assessment Report for the Grayson Power Plant, October 2019. Appendix B, Emission Rate by Substance and Source.	

4.4.1. Greenhouse Gas Emission Estimates

Combustion of natural gas in the reciprocating engine generators would result in emissions of CO_2, CH_4, and N_2O. GHG emissions for normal facility operations were calculated based on the maximum fuel use predicted for the project and emission factors contained in the EPA GHG Reporting Regulation.[6] Emissions of CO_2, N_2O, and CH_4 resulting from operation of the generators are presented in Table 17.

Table 17. Greenhouse Gas Emissions from the New Generators

	CO_2, metric tons/year	CH_4, metric tons/year	N_2O, metric tons/year	CO_2eq, metric tons/yr[a]	CO_2, pounds per MWh
Each Engine	10,802	0.20	0.02		
Total, 5 Engines	54,008	1.02	0.10	54,063	1005.4

Note:
a. Includes CH_4 and N_2O.

Detailed GHG emission calculations for the new engines are included in Appendix B.

4.5. Criteria Pollutant Emissions from the Generating Units to be Replaced

Emissions decreases from the existing generating units at Grayson are calculated based on actual emissions, in accordance with the requirements of Rule 1306(c), Emissions Calculations. Rule 1306(c) requires that the actual emissions used to calculate emissions decreases to be adjusted as follows:

- Emissions must be adjusted to reflect the calculation of current BACT; and
- Emissions must be based on reported emissions that have occurred during the two-year period immediately preceding the date of permit application. However, another appropriate period may be used if it is determined to be representative of the source's cyclical operation, consistent with federal requirements.

This permit application is being submitted in early 2020, so the two-year period immediately preceding the date of permit application would otherwise be 2018/19. However, the generating units at the Grayson Power Plant underwent significant changes in operation in the years 2018 and 2019, so the emissions during these two years are not representative of the source's cyclical operation. The two-year period proposed for the Rule 1306(c) baseline period is 2016/2017. The justification for the selection of 2016/17 is presented in the following sections.

4.5.1. 2018/19 Operations are Not Representative of Normal Plant Operation

The following significant changes in operation of the Grayson Power Plant in the years 2018 and 2019 make emissions during these years unrepresentative of normal plant operation.

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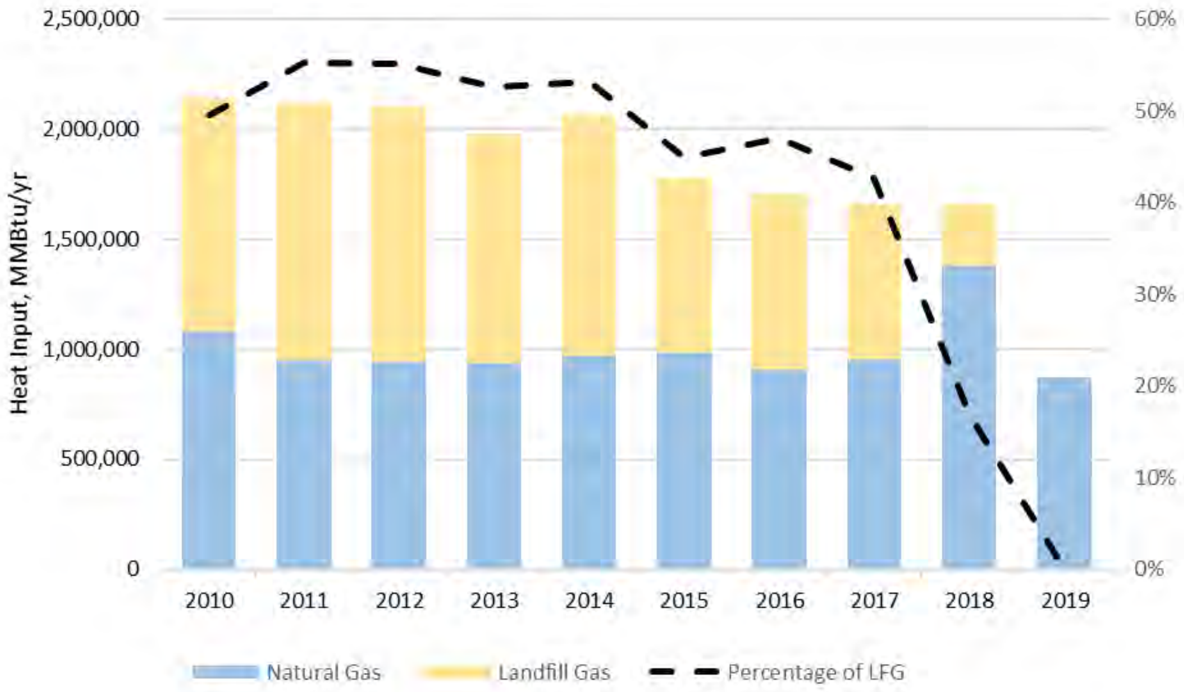
[6] 40 CFR 98 (as revised on 12/09/2016).

- **April 2018 – Present:** Historically, landfill gas has accounted for approximately 60% of fuel consumption at the facility on a MMBtu basis. However, in response to public concerns regarding a preliminary SCAQMD Rule 1402 emission inventory and health risk assessment, Glendale City Council instructed GWP to discontinue combusting landfill gas in the Grayson boilers to reduce noncriteria pollutant emissions and modeled health risks from the plant. Because landfill gas also has higher criteria pollutant emissions than natural gas, the change from landfill gas to natural gas also resulted in lower criteria pollutant emissions from the boilers than would have occurred under normal operating conditions. In addition, only a portion of the discontinued landfill gas combustion was replaced with additional natural gas combustion in the years 2018 and 2019, reducing plant generation below typical levels and further reducing criteria pollutant emissions.
- **November 2018 - April 2019** Storage restrictions at the Southern California Gas Company Aliso Canyon facility resulted in significant natural gas price increases that led to an unprecedented seasonal facility shutdown of the entire Grayson Power Plant. During the period beginning October 24, 2018 and lasting through April of 2019, all generating units at the facility were shut down, except for a brief period during November to conduct SCAQMD emission tests. Prior to the 2018-2019 period, equipment was shut down annually for only one month (January) to complete maintenance and repair operations.
- **2017 – 2019** Three significant equipment failures resulted in downtime that further restricted the ability of GWP to operate the Grayson Power Plant at typical levels. First, beginning in 2017 and continuing through today, Boiler #3 has been inoperable due to a major waterwall and header leak. Second, facility operating capacity was further impacted in 2019 due to uncommon failures of Boiler #4 components, including a voltage regulator that has not failed in 20 years, and a controller that has not previously failed. Obtaining and installing replacement parts has been delayed due to the unique nature of Boiler #4. As a result of these failures, Boiler #4 was available for use for only 903 hours in 2019. Although Boiler #4 is expected to be operational in the near future, only one boiler (Boiler #5) was consistently available for operation in 2019. Finally, Unit 8A was also down for a prolonged period of time (from August 2017 to June 2019) due to equipment failure.

Figure 3 summarizes annual power plant boiler fuel use between 2010 and 2019. The summary shows that the boiler heat input from landfill gas was over 50% through 2014, declining slightly in 2015 and 2016 and then dropping precipitously starting in 2018. Annual boiler heat input is also lower between 2015 and 2019 than during the previous 5 years. The use of 2016/17 as the baseline period for this analysis is more conservative than the previous baseline period of 2015/16, and is also far more representative of long-term boiler operations and impacts than the most recent two year period.

Figure 3. Grayson Power Plant Boiler Fuel Use by Fuel, 2010-2019



4.5.2. <u>BACT Adjustment for Reported Emissions</u>

For the boilers, reported emissions from the 2016 and 2017 AERs were adjusted using NOx BACT emission rates of 5 ppmvd @ 3% O_2 during natural gas firing and 9 ppmvd @ 3% O_2 during landfill gas firing. These emission limits reflect current NOx limits for well-controlled boilers.[7] No BACT adjustments were made for VOC, SO_2 or $PM_{10}/PM_{2.5}$ emissions.

For the gas turbines, reported emissions from the AERs were adjusted using BACT emission rates of 2.5 ppmvd @ 15% O_2 for NOx and 2 ppm for VOC. These limits reflect current BACT limits for new gas turbine generating units.[8] No BACT adjustments are required or have been made for SO_2 or $PM_{10}/PM_{2.5}$ emissions.

4.5.3. <u>Additional Adjustments to Determine Baseline Emissions</u>

In accordance with the procedures set forth in Rule 1306(c), the BACT-adjusted emissions for each unit in pounds per year were divided by the number of operating days for that unit to calculate BACT-adjusted emissions in pounds per day. Finally, the Rule 1306(c) usage factors from Rule 1309(c)(3) were applied to the annual BACT-adjusted emissions for each unit, as follows:

- when operated 180 days or more,

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[7] SCAQMD BACT determination for A/N 427061, AES Huntington Beach, posted 8/2/06.
[8] SCAQMD BACT determination for A/N 581392, Walnut Creek Energy, LLC, posted 2/1/19.

- 0.5 when operated 30 to 179 days,
- and 0.0 when operated less than 30 days.

The resulting adjusted annual emissions were averaged to determine a 2-year average adjusted emissions baseline. The results of these calculations are summarized in Table 18; detailed calculations are provided in Appendix E.

Table 18. Adjusted Baseline Emissions for the Generating Units to be Replaced

Generating Unit Description	2-Year Average Adjusted Emissions, lb/day				
	NOx	CO	VOC	SOx	PM10
Boiler Unit 3	6.13	31.54	6.04	1.76	11.04
Boiler Unit 4	12.25	106.09	11.34	2.34	34.10
Boiler Unit 5	22.08	124.29	21.59	6.06	63.30
Turbine Unit 8A	0.00	0.00	0.00	0.00	0.00
Turbine Unit 8BC	0.00	0.00	0.00	0.00	0.00
Total	40.46	261.92	38.97	10.16	108.43

4.6. Air Quality Impact Analysis

This section presents a summary of the air quality impact analysis that was performed to evaluate the potential impacts of the proposed project alternative (referred to in Appendix D2 as Alternative 7) on ambient air quality in the region. The analysis evaluated impacts from the proposed project during normal project operation (which includes startups).

The air quality impact analysis was conducted in accordance with the modeling protocol that was submitted to the District in September 2019. The supplemental air quality impact report demonstrating that the proposed project in the currently proposed configuration will not cause or contribute to an exceedance of any ambient air quality standard is provided in Appendix D2. A summary of the modeling results for the proposed layout (referred to in Appendix D2 as Alternative 7) is provided below in Table 19.

Table 19. Results of the Ambient Air Quality Impact Analysis, Revised Project Configuration

Pollutant	Averaging Period	Concentration (µg/m³)			SAAQS/ NAAQS (µg/m³)
		Project [a]	Background Sources [b]	Total	
SO_2	1-hr - state std [c]	0.48	46.9	47.4	655
	1-hr - federal std [c]	0.48	7.34	7.81	196
	3-hr - federal std [c]	0.44	46.9	47.3	1200
	24-hr - state std [c]	0.12	3.93	4.05	105
	Annual - federal std	0.006	0.94	0.95	80
PM_{10}	24-hr - federal std [c]	1.24	68.2	69.4	150
	24-hr – state std [c]	1.24	96.0	97.2	50
	Annual – state std	0.07	34.4	34.5	20
$PM_{2.5}$	24-hr - federal std [d]	1.20	30.5	31.7	35
	Annual – state std	0.07	16.3	16.4	12
	Annual – state std [d]	0.07	12.6	12.7	12.0
NO_2 (ARM)	1-hr - federal std [e,f]	32.8	116.0	148.8	188
NO_2 as NO_X	1-hr - state std [c]	39.5	151.5	191.1	339
	Annual - state std	0.12	37.6	37.7	57
	Annual – federal std	0.12	37.6	37.7	100
CO	1-hr - state std [c]	47.0	2,288	2,335	23,000
	8-hr - state std [c]	32.7	1,830	1,863	10,000

Notes:

a. The modeling was conducted using EPA's AERMOD dispersion model (version 19191).

b. See Table 4 for the background concentrations. The 1-hour SO_2 state background is conservatively used for the 3-hour background.

c. Modeled concentrations shown are the maximum highest first-high (H1H) concentrations.

d. The listed 24-hour modeled concentration is the overall highest 24-hr concentration, averaged over 5 years. The listed annual modeled concentration is the overall highest annual concentration, averaged over 5 years. Both listed modeled concentrations include secondary $PM_{2.5}$, based on EPA’s worst-case MERPs for the climate zone.

e. Per EPA's March 1, 2011 memorandum, the listed modeled concentration is the highest 98th percentile maximum daily 1-hr concentration averaged over 5 years.

f. The 1-hour federal NO2 modeling was based on ARM2 to model the NOx to NO_2 conversion.

4.7. Consistency with Laws, Ordinances, Regulations, and Standards

This section considers consistency separately for federal, state, and local requirements.

4.7.1. Consistency with Federal Requirements

PSD Program

EPA has promulgated PSD regulations for areas that are in compliance with national ambient air quality standards (40 CFR 52.21). The PSD program allows new sources of air pollution to be constructed, or existing sources to be modified, while preserving the existing ambient air quality levels, protecting public health and welfare, and protecting Class I areas (e.g., specific national parks and wilderness areas). There are five principal areas of the PSD program: (1) Applicability; (2) Best Available Control Technology; (3) Pre-Construction Monitoring; (4) Increments Analysis; and (5) Air Quality Impact Analysis. Although issuance of a PSD permit would be the responsibility of the SCAQMD, the protection of Class I areas is still the responsibility of the Federal Land Managers (FLMs).

Applicability. The federal PSD requirements apply on a pollutant-specific basis to any project that is a new major stationary source or a major modification to an existing stationary source. (These terms are defined in federal regulations.) (40 CFR 52.21). Since the Grayson Power Plant is an existing major source, the determination of PSD applicability to the proposed project is based on evaluating the emissions changes associated with the proposed project in addition to all other emissions changes at the facility over a five-year lookback period. In Table 20, the net emission changes at the Grayson Power Plant, based on the emissions from the new equipment and from the existing units, are compared to the regulatory significance thresholds. As shown in this table, the net emission changes associated with the proposed project are below these significance thresholds for all pollutants, and thus the proposed project is not subject to PSD review.

Table 20. Net Emission Change and PSD Applicability

Pollutant	Baseline Emissions from Existing Grayson PP (tpy)	Emissions from New Equipment (tpy)	Facility Net Increase (tpy)	PSD Significance Levels (tpy)	Are Increases Significant?
NOx	28.3	8.2	-20.1	40	No
SOx	2.0	0.45	-1.55	40	No
VOC	8.7	8.4	-0.3	40	No
CO	55.3	13.9	-41.3	100	No
PM_{10}	13.4	5.0	-8.5	15	No
$PM_{2.5}$	13.4	5.0	-8.5	10	No

New Source Performance Standards

40 CFR Part 60 Subpart JJJJ, Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (NSPS Subpart JJJJ) applies to owners and operators of stationary spark ignition internal combustion engines (SI) ICE that commence construction after June 12, 2006. The NSPS Subpart JJJJ requirements are dependent on the following factors:

- The maximum engine power,
- When the SI ICE was manufactured, and
- The purpose of the stationary SI ICE.

Per 40 CFR §60.4233(e), the applicable NSPS Subpart JJJJ NO_X, CO, and VOC emission standards are those for non-emergency SI ICE with a maximum engine power greater than or equal to 500 bhp fired on natural gas and manufactured on or after July 1, 2010. The proposed permit limits are well below the applicable NSPS standards, as shown in Table 21.

Table 21. Compliance with SI NSPS Limits

Pollutant	Proposed Permit Limits[a]	Subpart JJJJ Limits
NO_X	2.4 ppmvd at 15% O_2	1.0 g/hp-hr OR 82 ppmvd at 15% O_2
CO	11.2 ppmvd at 15% O_2	2.0 g/hp-hr OR 270 ppmvd at 15% O_2
VOC (excluding formaldehyde)	9.8 ppmvd at 15% O_2	0.7 g/hp-hr OR 60 ppmvd at 15% O_2

Note:
a. Exhaust concentrations vary by load; highest (full load) limits shown. See Appendix B, Table B-1.

National Emission Standards for Hazardous Air Pollutants

40 CFR Part 63 Subpart ZZZZ, National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE NESHAP) applies to all stationary RICE. The specific applicable requirements are dependent on the following factors:

- The engine output and engine type (CI or SI),
- The engine installation date,
- Whether the source is a major or area source of HAPs, and
- The purpose of the stationary RICE.

The RICE NESHAP classifies the proposed Wärtsilä 18V50SG units as “new stationary engines >500 hp located at area source of HAP, spark ignition 4-stroke lean burn” as they:

- Have a site rating of more than 500 brake horsepower (bhp),
- Will be constructed after June 12, 2006,

- Are four-stroke, lean burn spark ignition engines, and
- Will be located at an area source of HAP emissions (40 CFR §63.6590(a)(2)(iii)).

The NESHAP requires new, spark ignition 4-stroke lean burn stationary engines >500 hp located at area sources of HAP to comply with the requirements of NSPS Subpart JJJJ. There are no separate requirements for these engines under the NESHAP.

Compliance Assurance Monitoring (CAM)

The CAM regulation (40 CFR 64) applies to emission units at major stationary sources required to obtain a Title V permit, which use control equipment to achieve a specified emission limit. The rule is intended to provide "reasonable assurance" that the control systems are operating properly to maintain compliance with the emission limits. Based on the emission calculations shown in Appendix B, and for purposes of the CAM requirements, following repowering, the facility will not be a major source. Therefore, CAM requirements do not apply to the proposed project.

Acid Rain Requirements

The federal Acid Rain program (40 CFR Part 72) applies to electric generating units rated at greater than 25 MW. Because each of the Wärtsilä generating units is rated at 18.8 MW, these units are not subject to Acid Rain program requirements. The applicant will submit the required new unit exemption forms as part of the Title V permit modification application.

4.7.2. Consistency with State Requirements

State law set up local air pollution control districts and air quality management districts with the principal responsibility for regulating emissions from stationary sources. The project is under the local jurisdiction of the SCAQMD; therefore, compliance with District regulations will assure compliance with state air quality requirements.

4.7.3. Consistency with Local Requirements: SCAQMD

The SCAQMD has been delegated responsibility for implementing local, state, and federal air quality regulations in the South Coast Air Basin. The proposed project is subject to District regulations that apply to new stationary sources, to the prohibitory regulations that specify emission standards for individual equipment categories, and to the requirements for evaluation of impacts from non-criteria pollutants. The following sections evaluate facility compliance with applicable District requirements.

New Source Review Requirements

Under the regulations that govern new sources of emissions, the proposed project is required to secure a Permit to Construct from the SCAQMD, as well as demonstrate continued compliance with regulatory limits when the new equipment becomes operational. The preconstruction review includes demonstrating that subject new equipment will use BACT, will provide any necessary emission offsets, and will perform an ambient air quality impact analysis. The requirements of each of these elements of the SCAQMD's new source review program are discussed below.

Best Available Control Technology. BACT must be applied to a new or modified emissions unit resulting in an emission increase of any nonattainment air contaminant or ammonia. The new engines are subject to BACT for NOx, VOC, SOx, PM_{10}, $PM_{2.5}$, and ammonia.

BACT for the applicable pollutants was determined by reviewing the South Coast Air Quality Management District BACT Guideline Manual, as well as a number of BACT guideline documents, including the BAAQMD and SJVAPCD BACT Guidance, and the EPA's RACT/BACT/LAER Clearinghouse. The detailed BACT analysis is included in Appendix F. As discussed in this analysis, the new engines will comply with BACT using the following measures.

- BACT for NOx emissions will be the use of low-NOx emitting equipment and add-on controls. The proposed project will use combustion technology and SCR to reduce NOx emissions to 2.4 ppmvd NOx, corrected to 15 percent O_2 (ppmc).
- BACT for CO emissions will be achieved by using good combustion practices and an oxidation catalyst to achieve CO emissions of 11.2 ppmc.
- BACT for VOC emissions will be achieved by use of good combustion practices and an oxidation catalyst to achieve VOC emissions of 9.8 ppmc.
- BACT for PM_{10}, $PM_{2.5}$ and SOx is best combustion practices and the use of natural gas. The proposed engines will burn exclusively PUC-regulated natural gas with a maximum sulfur content of 5 parts per million by volume (0.32 grains per 100 scf (gr/100 scf).

Emission Offsets, Under Rule 1303 (b)(2)(a), emission offsets must be provided for increases in emissions of nonattainment pollutants that occur at the facility unless the project is exempt from offset requirements pursuant to Rule 1304 or qualifies for access to the Priority Reserve under the conditions set forth in Rule 1309.1.

Rule 1304(a)(2)- Electric Utility Steam Boiler Replacement provides an exemption from offset requirements if

> "The source is replacement of electric utility steam boiler(s) with combined cycle gas turbine(s), intercooled, chemically-recuperated gas turbines, other advanced gas turbine(s); solar, geothermal, or wind energy *or other equipment, to the extent that such equipment will allow compliance with Rule 1135* or Regulation XX rules. The new equipment must have a maximum electrical power rating (in megawatts) that does not allow basinwide electricity generating capacity on a per-utility basis to increase." (emphasis added)

The proposed project configuration qualifies for this exemption as "other equipment, to the extent that such equipment will allow compliance with Rule 1135." The proposed project is intended by the City to better enable the integration of renewable energy resources within the City's service territory and will facilitate the City's continuing compliance with Rule 1135. As shown in Table 22 below, the maximum electrical power rating and the maximum potential megawatt-hours (MWh) of generation for the new equipment is less than the power rating and the actual MWh during the baseline period of the existing boilers that will be shut down as part of the proposed project.

Table 22. Comparison of Ratings and Output for Repowered Steam Boilers

Parameter	Proposed Project[a]	Grayson Steam Boilers[b]
Gross Electrical Power Rating, MW	94.1	108
Generation, MWh per year	118,547	125,694[c]

Note:

a. Proposed project consists of the 5 Wärtsilä 18V50SG reciprocating engine generators.
b. Existing Units 3, 4 and 5.
c. Two-year average, 2016/17.

The District most recently interpreted the Rule 1304(a)(2) Electric Utility Steam Boiler Replacement exemption in its August 2014 Final Determination of Compliance for the El Segundo Power Facility Modification Project, which includes the following language:

> "The SCAQMD defines APPROVED ALTERNATIVE OR ADVANCED COMBUSTION RESOURCE as an alternative resource or advanced combustion resource which is approved by the Executive Officer. SCAQMD defines an alternative resource or an advanced combustion resource as one which (A) Displaces boiler capacity existing in the District on or after July 19, 1991; and (B) Emits NOx at no more than 0.10 pound per net megawatt-hours (MWH) on a daily average basis if the resource is located within the District, or no more than 0.05 pound per net MWH on a daily average basis if the resource is located outside the District; for cogeneration facilities, the daily NOx emission per MWH shall be calculated after deducting 0.013 pound of NOx for each million BTU of useful thermal energy produced which is not used for electric power generation; and (C) Commences operation on or after July 19, 1991; and (D) Is proven to the satisfaction of the Executive Officer that the net megawatt-hours obtained or conserved are real, quantifiable, and enforceable."

The proposed project would also satisfy these requirements, if they were applicable to an exemption determination under 1304(a)(2). This is because the repowering project:

> (A) would displace boiler capacity at the Grayson Power Plant that was existing on and after July 19, 1991;
> (B) would emit NOx at no more than 0.10 lbs/MW-hr;
> (C) would commence operation on or after July 19, 1991; and
> (D) can be shown to the satisfaction of the Executive Officer that the net megawatt-hours obtained or conserved are real, quantifiable, and enforceable, due to the permanent shutdown of the Grayson units that will be replaced by the reciprocating engines.

If the proposed project were to qualify for this exemption, the applicant would be required to pay a mitigation fee calculated in accordance with SCAQMD Rule 1304.1. The Rule 1304(a)(2) exemption would apply to emissions of all pollutants that would otherwise be subject to offset requirements.

If the District determines that the proposed project does not qualify for the Rule 1304(a)(2) exemption, a portion of the offsets that may be required for the proposed project would be provided through ERCs obtained from the shutdown of the Grayson Power Plant boilers and gas turbines 8A and 8B/C.[9] An estimate of the ERCs that may be generated by the shutdown of these units and the ERCs required, calculated in accordance with Rule 1306 and the Rule 1303(b)(2)(A) offset ratios, is provided in Appendix E and summarized in Table 23 below.

Table 23. Offsets Required for the Project

	NOx	CO	VOC	PM_{10}	SOx
New Engines: Total Emissions Per Unit					
ton per year (tpy)	1.64	2.77	1.68	0.99	0.09
lb/month	606.1	1056.0	647.3	387.0	35.6
lb/day (lb/month/30)	20.2	35.2	21.6	12.9	1.2
Facility Total Emissions (5 Engines)					
tpy	8.2	13.9	8.4	5.0	0.4
lb/day	101.2	176.0	107.9	64.5	5.9
SCAQMD Offset Requirements					
Offset threshold, tpy	4.0	n/a	4.0	4.0	4.0
Amount requiring offsets, tpy	8.2	-	8.4	5.0	-
Offset ratio[a]	1.2	n/a	1.2	1.2	1.0
Offsets Needed (lb/day)	121.2	n/a	129.5	77.4	n/a
Potential ERCs from shutdown of Grayson Power Plant Units (lb/day)	40.5	n/a	39.0	108.4	n/a
Remaining ERCs required (lb/day)	80.8	-	90.5	0.0	-

Note:

a. Offset ratio is 1.2 to 1.0 for ERCs and 1.0 to 1.0 for allocations from the Priority Reserve. Therefore, the offset requirements will be lower if the offsets are obtained from the Priority Reserve.

If the required ERCs cannot be obtained from the Priority Reserve pursuant to Rule 1309.1, they will be purchased on the open market.

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[9] Because these existing Grayson units are scheduled to be shut down and may be demolished in advance of the expected issuance of the Permit to Construct for the new Wärtsilä units, the ERC application will be prepared and submitted separately. The potential ERCs discussed here are an estimate and are subject to final approval by the SCAQMD.

Rule 1309.1(a)(1) – Priority Reserve: Innovative Technology allows sources demonstrating that they are using innovative technology to draw emission reduction credits from the Priority Reserve. The rule defines "Innovative Technology" as follows:

> "…innovative equipment or a process which:
>
> > (A) the applicant demonstrates will result in a significantly lower emission rate from the affected source than would have occurred with the use of BACT; and
> >
> > (B) can be expected to serve as a model for emission reduction technology."

The advanced combustion technology proposed for use at the proposed Grayson Repowering Project clearly satisfies these criteria. The combustion technology used by Wärtsilä in the natural gas-fueled 18V50SG engines enables lower concentrations to be achieved on a consistent basis, including periods when there are rapid load swings. It is this combination of an ability to change loads quickly (ramp rate of 1% load per second), maintain a high level of efficiency (13% variation in heat rate between 40% load and rated load), and maintain compliance with low emission limits, that makes the technology innovative. Three key elements of the engine-control process that are necessary to enable this combination are air-fuel ratio control, load control, and cylinder balancing.

- <u>Air/fuel ratio control:</u> Wärtsilä's advanced engine control technology includes a charge air receiver and exhaust gas waste-gate valves that are used to control the amount and pressure of air sent into each cylinder by controlling the turbocharger output. The target receiver pressure is read from a reference table based on engine speed and engine load. This target receiver pressure is then adjusted for temperature and humidity. The waste-gate valves are modulated such that the receiver pressure matches the target. By adjusting the receiver pressure along with the fuel gas pressure, the air/fuel ratio in each cylinder remains optimized at all times, including during rapid load changes.

- <u>Load control:</u> The duration of fuel gas injection is dynamically controlled by the internal speed controller. The quantity of fuel gas injected to each cylinder on each combustion stroke is controlled by cylinder-specific gas injection valves, which are actuated by individual cylinder control modules. The amount of gas injected during each combustion stroke is a function of the gas supply pressure and the time the main gas solenoid valve is open (duration). Gas valve parameters are controlled individually for each cylinder and each combustion stroke. The injection duration is adjusted as needed (again on a cylinder-specific basis) to address cylinder balancing (discussed below) and knock control (pre-ignition). The time in the cycle when fuel injection begins is based on engine speed and engine load.

- <u>Cylinder balancing:</u> An equal duration for fuel gas injection for all cylinders will not result in exactly the same gas quantity being injected in all cylinders. This is due to the geometry of the engine and to some variations in the gas valve performance from cylinder-to-cylinder. Cylinder balancing control compensates

> for this slight disparity. The cylinder balancing control system uses the cylinder pressure as an input and operates when the engine load is above a pre-defined level. In this control mode the gas valve duration is modified based on the deviation between the individual cylinder pressure and the average cylinder pressure across all cylinders.

Taken together, and in combination with Wärtsilä's advanced catalyst control systems, this technology is able to achieve significantly lower emission rates than have previously been demonstrated for reciprocating internal combustion engines and serves as a model for emission reduction technology.

Permitted NOx emissions limits for other, comparable large natural gas-fired engine generators are shown in detail in Table F-1 of Appendix F (BACT) and summarized in Table 24 below. The data in these tables shows that the limits for most of the comparable engines permitted within the past few years are significantly higher than those proposed for this project. The only projects with comparable limits are Tucson Electric Power's Irvington Generating Station and Denton Energy Center in Texas. Both of these projects utilize the same Wärtsilä 18V50SG engine technology as is being proposed for the Glendale project.

Table 24. NOx Emission Limits for Comparable Engine Generator Projects

Project Name/Year Permit Issued	Engine Rating	Permit Limit		
		lb/hr	g/bhp-hr	g/kWh
Proposed Project (~2021)	18.8 MW	1.33	0.023[a]	0.032[b]
Irvington Generating Station (2018)	18.8 MW	--	--	0.032
Denton Energy Center (2018)	18.8 MW	1.33	--	--
Michigan State University (2019)	16,500 HP (12.3 MW)	--	0.3	--
Rubart Station (2016)	10 MW	2.13	--	0.097
Lacy Randall Generation Facility (2014)	9.34 MW	1.45		0.12
Red Gate Power Plant (2013)	18 MW	--	0.084	--

Notes:
a. Based on engine shaft power of 25,828 bhp at full load.
b. Based on engine gross rated output of 18,817 kW at full load.

As shown in Table 24, NOx limits for other large engine generators permitted over the past few years are higher than the limits for the Wärtsilä 18V50SG engines equipped with advanced combustion technology. Even a Wärtsilä 18V50SG engine permitted in 2013 with less advanced technology has a higher permitted NOx limit than the emissions performance achieved by the newest engine design.

Other NSR Requirements. Additional Regulation XIII requirements are listed below.

RULE 1303(b)(1) Modeling

Under the SCAQMD new source review regulations, every applicant for a new or modified facility must demonstrate that the proposed emission increases will not interfere with the attainment or maintenance of an applicable ambient air quality standard unless the project is exempt under Rule 1304. The modeling analyses presented in Appendix D show that the proposed project will not interfere with the attainment or maintenance of the applicable air quality standards or cause additional violations of any standards.

RULE 1303(b)(4)-Facility Compliance

The new equipment will comply with all applicable Rules and Regulations of the SCAQMD.

RULE 1303(b)(5)-Major Polluting Facility

The requirements of this rule apply to major polluting facilities. The emissions from the proposed project are below the Major Polluting Facility thresholds, and therefore these requirements are not applicable.

School and Sensitive Receptor Locations

The Grayson Power Plant is located in an industrial area of the City of Glendale at 800 Air Way, Glendale. There is no K-12 school within 1,000 feet of the proposed repowering project. The closest K-12 school will be the Scholars Armenian School and Art Center, a private school, which is located approximately 0.6 miles northeast from the emission sources. Mark Keppel Elementary School and Eleanor J. Toll Middle School are located approximately 0.8 miles to the northeast.[10] Three childcare facilities are located within a mile of the project. Sensitive receptors within a mile of the project are listed in Table 25. The nearest residential receptor is located approximately 694 feet (211 meters) from the emission sources and the nearest worker/commercial receptor is located approximately 572 feet (174 meters) from the emission sources. Both receptors are located in the northeast direction of the emission sources.[11] The health risk assessment presented in Appendix D2 for the currently proposed project configuration (Alternative 7) shows that the maximum health risks due to the proposed project are well below levels of significance, and that these maximum health risks do not extend to the locations of these sensitive receptors.

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[10] Montrose Air Quality Services, Air Toxics “Hot Spots” Program (AB2588) Health Risk Assessment Report, Grayson Power Plant. April 2019.

[11] Stantec, Final EIR, Grayson Repowering Project. March 1, 2018.

Table 25. Schools and Childcare Facilities in Project Area		
Name	**Address**	**Distance (Miles)**
Disney Children's Center	625 Paula Ave., Glendale	0.49
Scholars Armenian School and Art Center	1021 Grandview Ave., Glendale	0.59
Little Angels' Daycare Center	316 Lincoln Ave., Glendale	0.66
Mark Keppel Elementary School	730 Glenwood Road, Glendale	0.75
Eleanor J. Toll Middle School	700 Glenwood Road, Glendale	0.77
Herbert Hoover High School	651 Glenwood Road, Glendale	0.80
Milky Way Child Care & Preschool	1325 Idlewood Road, Glendale	0.84
Gohar Daycare	1336 Highland Ave., Glendale	0.87
Grandview Children's Center	1130 Ruberta Ave., Glendale	1.03

4.7.4. Prohibitory Rule Evaluation

RULE 212-Standards for Approving Permits

Rule 212 requires that a person shall not build, erect, install, alter, or replace any equipment, the use of which may cause the issuance of air contaminants or the use of which may eliminate, reduce, or control the issuance of air contaminants without first obtaining written authorization for such construction from the Executive Officer.

Rule 212(c) requires written notification if at least one criterion is met:

- There is an emission increase for ANY criteria pollutant in excess of the daily maximums specified in Rule 212(g); or
- The project results in an increase in emissions of toxic air contaminants, and the project is within 1,000 feet of a school; or
- The project results in an increase in emissions of toxic air contaminants, the project results in a Maximum Individual Cancer Risk (MICR) greater than one in a million, and the facility poses a Maximum Individual Cancer Risk (MICR) of more ten in a million (10E-6) during a lifetime (70 years).

The total facility-wide residential MICR is less than 10E-6, and the facility is located more than 1,000 feet from a school; however, since the emissions of criteria pollutants for the facility exceed the thresholds in Rule 212(g), a public notice is required in accordance with the requirements of Rule 212. A public notice will be issued followed by a 30-day public comment period prior to issuance of a permit.

RULE 401-Visible Emissions

This rule limits visible emissions to an opacity of less than 20% (No.1 on the Ringelmann Chart, as published by the U.S. Bureau of Mines). With the use of natural gas and SCR and oxidation catalyst systems, it is unlikely that there will be visible emissions following the early stages of the commissioning period. However, in the unlikely event that visible emissions do occur, anything greater than 20% opacity is not expected to last for greater than three minutes. During normal operation, no visible emissions are expected.

RULE 402-Nuisance

This rule requires that a person not discharge from any source whatsoever such quantities of air contaminants or other material that cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public; or that cause, or have a natural tendency to cause, injury or damage to business or property. The new engines will be operated with natural gas, oxidation catalysts, and SCR systems to comply with BACT and are not expected to create a public nuisance based on experience with similar engines. Therefore, compliance with Rule 402 is expected.

RULE 403-Fugitive Dust

The purpose of this rule is to reduce the amount of particulate matter entrained in the ambient air as a result of man-made fugitive dust sources by requiring actions to prevent, reduce, or mitigate fugitive dust emissions. The provisions of this rule apply to any activity or man-made condition capable of generating fugitive dust. This rule prohibits emissions of fugitive dust beyond the property line of the emission source. The applicant will be taking steps to prevent and/or reduce or mitigate fugitive dust emissions from the project site. Such measures include covering loose material on haul vehicles, watering, and using chemical stabilizers when necessary. The installation and operation of the engines are expected to comply with this rule.

RULE 407-Liquid and Gaseous Air Contaminants

This rule limits CO emissions to 2,000 ppmvd and SO_2 emissions to 500 ppmvd, averaged over 15 minutes. Per 407(b)(1), this rule does not apply to stationary internal combustion engines so is not applicable to the proposed project.

RULE 409-Combustion Contaminants

This rule restricts the discharge of contaminants from the combustion of fuel to 0.23 grams per cubic meter (0.1 grain per cubic foot) of gas, calculated to 12% CO_2, averaged over 15 minutes. This rule does not apply to stationary internal combustion engines so is not applicable to the proposed project.

RULE 431.1-Sulfur Content of Gaseous Fuels

The facility will use pipeline quality natural gas that will comply with the 16 ppmv sulfur limit, calculated as H_2S, specified in this rule. Natural gas will have a sulfur content of less than 5 ppmv sulfur. Accordingly, compliance is expected.

RULE 474-Fuel Burning Equipment-Oxides of Nitrogen

This rule limits NOx emissions from non-mobile fuel burning equipment based on the heat input to the equipment. This rule does not apply to fuel burning equipment rated at less than 555 MMbtu/hr, and so is not applicable to these engines.

RULE 475-Electric Power Generating Equipment

This rule applies to power-generating equipment rated greater than 10 MW installed after May 7, 1976. Requirements specify that the equipment must comply with a PM_{10} mass emission limit of 11 lbs/hr or a PM_{10} concentration limit of 0.01 grains/dscf. Compliance is demonstrated if either the mass emission limit or the concentration limit is met. The PM_{10} mass emissions from the engines will not exceed 1.32 lbs/hr. The estimated grain loading is less than 0.01 grain/dscf. Therefore, compliance is expected. Compliance will be verified through performance tests.

Regulation IX- Standards of Performance for New Stationary Sources

This regulation incorporates Title 40 CFR, Part 60 of the Code of Federal Regulations (CFR), and is applicable to all new, modified, or reconstructed sources of air pollution. Subpart JJJJ of this regulation applies to the new reciprocating IC engines. This subpart establishes emission limits and monitoring and test method requirements. Compliance with this subpart is discussed in Section 4.7.1.

RULE 1110.2- Emissions from Gaseous- and Liquid-Fueled Engines

This rule limits NOx, VOCs and CO from stationary and portable engines. The engine generators proposed for this project must comply with the limits in 1110.2(L), shown below in Table 26:

Table 26. Rule 1110.2 Emission Standards for New Electrical Generation Devices

Pollutant	Emission Standard (lbs/MW-hr)[1]
NOx	0.070
CO	0.20
VOC (as methane)	0.10

Note:
[1] The averaging time of the emission standards is 15 minutes for NOx and CO and the sampling time required by the test method for VOC.

Compliance with these limits is demonstrated in Appendix Table B-2.

Rule 1325 Federal NSR for $PM_{2.5}$

The purpose of this rule is to address emissions of $PM_{2.5}$ and its precursors, NOx and SOx. Applicability of the rule is determined on a pollutant-by-pollutant basis.

This rule applies to any new major polluting facility, major modifications to a major polluting facility, and any modification to an existing facility that would constitute a major polluting facility in and of itself; located in areas federally designated pursuant to Title 40 of the Code of Federal Regulations (40 CFR) 81.305 as nonattainment for $PM_{2.5}$. (Rule 1325(a)).

As shown in Table 27, the proposed project is not a major modification for any pollutant. Therefore, the rule is not applicable to the proposed project.

Table 27. Applicability of Rule 1325 to Proposed Project

	$PM_{2.5}$	NOx	SOx
Proposed Project Potential to Emit, tpy	5.0	8.2	0.45
Major Source Threshold, tpy	100	100	100
Is Project a Major Source by Itself?	No	No	No
Major Modification Threshold, TPY	n/a	40	n/a
Is Project a Major Modification?	n/a	No	n/a

Rule 1401 – New Source Review of Toxic Air Contaminants

This rule specifies limits for maximum individual cancer risk (MICR), acute hazard index (HIA), chronic hazard index (HIC), and cancer burden (CB) from new permit units, relocations, or modifications to existing permits that emit toxic air contaminants. Rule 1401 requirements and the results of the health risk assessment for the project are summarized in Table 28. The project will include toxics best available control technology (T-BACT) in the form of oxidation catalysts on each engine, so only the "with T-BACT" cancer risk limit of Rule 1401 is applicable. The health risk assessment demonstrates that the potential health impacts of the project will be well below the limits of the rule.

Table 28. Rule 1401 Requirements and Project Impacts

Parameter	Rule 1401 Requirement	Project Impact
MICR, with T-BACT	≤10 in one million	1.7 in one million
Acute Hazard Index	≤1.0	0.05
Chronic Hazard Index	≤1.0	0.024
Cancer Burden	≤0.5	0.001

Calculation of noncriteria pollutant emissions from the proposed project and the health risk assessment are part of the ambient air quality report in Appendix D1.

4.8. Regulation XXX – Title V

The Grayson Power Plant is an existing Title V facility because the facility total emissions exceed the Title V major source thresholds and because it is subject to the federal acid rain provisions. The proposed project will require a modification to the Title V permit for the Grayson Power Plant. The required Title V modification application will be filed separately from this application for permit to construct. Although the new generating units will not be subject to acid rain requirements, the facility will remain a Title V source because VOC and NOx emissions will exceed SCAB major source thresholds after modification and because Unit 9 will continue to be an acid rain unit.

This Title V modification will be processed and the required public notice will be sent along with the Rule 212(g) Public Notice, which is also required for this project. EPA will be afforded the opportunity to review and comment on the proposed project within a 45-day review period.

Appendix A

SCAQMD Application Forms

AQMD

South Coast Air Quality Management District

Form 400-A

Application Form for Permit or Plan Approval

List only one piece of equipment or process per form.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

1. Facility Name (Business Name of Operator to Appear on the Permit): Glendale City, Glendale Water and Power

2. Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

3. Owner's Business Name (If different from Business Name of Operator): [same]

Section B - Equipment Location Address

4. Equipment Location Is: ● Fixed Location ○ Various Location
(For equipment operated at various locations, provide address of initial site.)

Street Address: 800 Air Way
City: Glendale, CA , CA Zip: 91201
Contact Name: Mark Young Title: Deputy General Manager
Phone #: 8185483293 Ext. Fax #:
E-Mail: MYoung@Glendaleca.gov

Section C - Permit Mailing Address

5. Permit and Correspondence Information:
☐ Check here if same as equipment location address

Address: 141 N. Glendale Ave
City: Glendale, CA , State: CA Zip: 91206
Contact Name: Mark Young Title: Deputy General Manager
Phone #: 8185483293 Ext. Fax #:
E-Mail: MYoung@Glendaleca.gov

Section D - Application Type

6. The Facility Is: ○ Not In RECLAIM or Title V ○ In RECLAIM ● In Title V ○ In RECLAIM & Title V Programs

7. Reason for Submitting Application (Select only ONE):

7a. New Equipment or Process Application:
- ● New Construction (Permit to Construct)
- ○ Equipment On-Site But Not Constructed or Operational
- ○ Equipment Operating Without A Permit *
- ○ Compliance Plan
- ○ Registration/Certification
- ○ Streamlined Standard Permit

7b. Facility Permits:
- ○ Title V Application or Amendment (Refer to Title V Matrix)
- ○ RECLAIM Facility Permit Amendment

7c. Equipment or Process with an Existing/Previous Application or Permit:
- ○ Administrative Change
- ○ Alteration/Modification
- ○ Alteration/Modification without Prior Approval *
- ○ Change of Condition
- ○ Change of Condition without Prior Approval *
- ○ Change of Location
- ○ Change of Location without Prior Approval *
- ○ Equipment Operating with an Expired/Inactive Permit *

Existing or Previous Permit/Application
If you checked any of the items in 7c., you MUST provide an existing Permit or Application Number:

* A Higher Permit Processing Fee and additional Annual Operating Fees (up to 3 full years) may apply (Rule 301(c)(1)(D)(i)).

8a. Estimated Start Date of Construction (mm/dd/yyyy): 06/01/2021

8b. Estimated End Date of Construction (mm/dd/yyyy): 12/01/2024

8c. Estimated Start Date of Operation (mm/dd/yyyy): 12/01/2024

9. Description of Equipment or Reason for Compliance Plan (list applicable rule):
Install/operate Wartsila 18V50SG reciprocating IC engines to replace existing generating equipment [Unit 12]

10. For identical equipment, how many additional applications are being submitted with this application? (Form 400-A required for each equipment / process) 4

11. Are you a Small Business as per AQMD's Rule 102 definition? (10 employees or less and total gross receipts are $500,000 or less OR a not-for-profit training center) ● No ○ Yes

12. Has a Notice of Violation (NOV) or a Notice to Comply (NC) been issued for this equipment? ● No ○ Yes
If Yes, provide NOV/NC#:

Section E - Facility Business Information

13. What type of business is being conducted at this equipment location? Electricity generation

14. What is your business primary NAICS Code? (North American Industrial Classification System) 221112

15. Are there other facilities in the SCAQMD jurisdiction operated by the same operator? ○ No ● Yes

16. Are there any schools (K-12) within 1000 feet of the facility property line? ● No ○ Yes

Section F - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application are true and correct.

17. Signature of Responsible Official:

18. Title of Responsible Official: General Manager

19. I wish to review the permit prior to issuance. (This may cause a delay in the application process.) ○ No ● Yes

20. Print Name: Steve Zurn

21. Date: 5.20.20

22. Do you claim confidentiality of data? (If Yes, see instructions.) ● No ○ Yes

23. Check List: ☒ Authorized Signature/Date ☒ Form 400-CEQA ☒ Supplemental Form(s) (ie., Form 400-E-xx) ☒ Fees Enclosed

AQMD USE ONLY	APPLICATION TRACKING #	CHECK #	AMOUNT RECEIVED	PAYMENT TRACKING #	VALIDATION
			$		

DATE	APP REJ	DATE	APP REJ	CLASS I III	BASIC CONTROL	EQUIPMENT CATEGORY CODE	TEAM	ENGINEER	REASON/ACTION TAKEN

South Coast Air Quality Management District

Form 400-CEQA
California Environmental Quality Act (CEQA) Applicability

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

The SCAQMD is required by state law, the California Environmental Quality Act (CEQA), to review discretionary permit project applications for potential air quality and other environmental impacts. This form is a screening tool to assist the SCAQMD in clarifying whether or not the project[1] has the potential to generate significant adverse environmental impacts that might require preparation of a CEQA document [CEQA Guidelines §15060(a)].[2] Refer to the attached instructions for guidance in completing this form.[3] For each Form 400-A application, also complete and submit one Form 400-CEQA. If submitting multiple Form 400-A applications for the same project at the same time, only one 400-CEQA form is necessary for the entire project. If you need assistance completing this form, contact Permit Services at (909) 396-3385 or (909) 396-2668.

Section A - Facility Information

1. Facility Name (Business Name of Operator To Appear On The Permit): Glendale City, Glendale Water & Power

2. Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

3. Project Description: Grayson Repower Project: replace existing boilers, gas turbine generators (except Unit 9), cooling towers and auxiliary equipment with 5 new reciprocating IC engines, emission control systems, CEMS and other auxiliary equipment. [Unit 12]

Section B - Review For Exemption From Further CEQA Action

Check "Yes" or "No" as applicable

	Yes	No	**Is this application for:**
1.	●	○	**A CEQA and/or NEPA document previously or currently prepared that specifically evaluates this project?** If yes, attach a copy of the signed Notice of Determination to this form.
2.	○	●	**A request for a change of permittee only (without equipment modifications)?**
3.	○	●	**A functionally identical permit unit replacement with no increase in rating or emissions?**
4.	○	●	**A change of daily VOC permit limit to a monthly VOC permit limit?**
5.	○	●	**Equipment damaged as a result of a disaster during state of emergency?**
6.	○	●	**A Title V** (i.e., Regulation XXX) **permit renewal (without equipment modifications)?**
7.	○	●	**A Title V administrative permit revision?**
8.	○	●	**The conversion of an existing permit into an initial Title V permit?**

If "**Yes**" is checked for any question in Section B, your application does not require additional evaluation for CEQA applicability. Skip to Section D - Signatures on page 2 and sign and date this form.

Section C - Review of Impacts Which May Trigger CEQA

Complete Parts I-VI by checking "Yes" or "No" as applicable. To avoid delays in processing your application(s), explain all "Yes" responses on a separate sheet and attach it to this form.

	Yes	No	**Part I - General**
1.	○	○	**Has this project generated any known public controversy regarding potential adverse impacts that may be generated by the project?** Controversy may be construed as concerns raised by local groups at public meetings; adverse media attention such as negative articles in newspapers or other periodical publications, local news programs, environmental justice issues, etc.
2.	○	○	**Is this project part of a larger project?** If yes, attach a separate sheet to briefly describe the larger project.
			Part II - Air Quality
3.	○	○	**Will there be any demolition, excavating, and/or grading construction activities that encompass an area exceeding 20,000 square feet?**
4.	○	○	**Does this project include the open outdoor storage of dry bulk solid materials that could generate dust?** If Yes, include a plot plan with the application package.

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[1] A "project" means the whole of an action which has a potential for resulting in physical change to the environment, including construction activities, clearing or grading of land, improvements to existing structures, and activities or equipment involving the issuance of a permit. For example, a project might include installation of a new, or modification of an existing internal combustion engine, dry-cleaning facility, boiler, gas turbine, spray coating booth, solvent cleaning tank, etc.

[2] To download the CEQA guidelines, visit http://ceres.ca.gov/env_law/state.html.

[3] To download this form and the instructions, visit http://www.aqmd.gov/ceqa or http://www.aqmd.gov/permit

Section C - Review of Impacts Which May Trigger CEQA (cont.)

	Yes	No	Part II - Air Quality (cont.)
5.	○	○	**Would this project result in noticeable off-site odors from activities that may not be subject to SCAQMD permit requirements?** For example, compost materials or other types of greenwaste (i.e., lawn clippings, tree trimmings, etc.) have the potential to generate odor complaints subject to Rule 402 – Nuisance.
6.	○	○	**Does this project cause an increase of emissions from marine vessels, trains and/or airplanes?**
7.	○	○	**Will the proposed project increase the QUANTITY of hazardous materials stored aboveground onsite or transported by mobile vehicle to or from the site by greater than or equal to the amounts associated with each compound on the attached Table 1?**[4]
			Part III – Water Resources
8.	○	○	**Will the project increase demand for water at the facility by more than 5,000,000 gallons per day?** The following examples identify some, but not all, types of projects that may result in a "yes" answer to this question: 1) projects that generate steam; 2) projects that use water as part of the air pollution control equipment; 3) projects that require water as part of the production process; 4) projects that require new or expansion of existing sewage treatment facilities; 5) projects where water demand exceeds the capacity of the local water purveyor to supply sufficient water for the project; and 6) projects that require new or expansion of existing water supply facilities.
9.	○	○	**Will the project require construction of new water conveyance infrastructure?** Examples of such projects are when water demands exceed the capacity of the local water purveyor to supply sufficient water for the project, or require new or modified sewage treatment facilities such that the project requires new water lines, sewage lines, sewage hook-ups, etc.
			Part IV – Transportation/Circulation
10.			**Will the project result in** (Check all that apply):
	○	○	**a. the need for more than 350 new employees?**
	○	○	**b. an increase in heavy-duty transport truck traffic to and/or from the facility by more than 350 truck round-trips per day?**
	○	○	**c. increase customer traffic by more than 700 visits per day?**
			Part V – Noise
11.	○	○	**Will the project include equipment that will generate noise GREATER THAN 90 decibels (dB) at the property line?**
			Part VI – Public Services
12.			**Will the project create a permanent need for new or additional public services in any of the following areas** (Check all that apply):
	○	○	**a. Solid waste disposal?** Check "No" if the projected potential amount of wastes generated by the project is less than five tons per day.
	○	○	**b. Hazardous waste disposal?** Check "No" if the projected potential amount of hazardous wastes generated by the project is less than 42 cubic yards per day (or equivalent in pounds).

REMINDER: *For each "Yes" response in Section C, attach all pertinent information including but not limited to estimated quantities, volumes, weights, etc.*

Section D - Signatures

I HEREBY CERTIFY THAT ALL INFORMATION CONTAINED HEREIN AND INFORMATION SUBMITTED WITH THIS APPLICATION IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE. I UNDERSTAND THAT THIS FORM IS A SCREENING TOOL AND THAT THE SCAQMD RESERVES THE RIGHT TO CONSIDER OTHER PERTINENT INFORMATION IN DETERMINING CEQA APPLICABILITY.

1. Signature of Responsible Official of Firm:		**2. Title of Responsible Official of Firm:** General Manager
3. Print Name of Responsible Official of Firm: Steve Zurn		**4. Date Signed:** 5·20·20
5. Phone # of Responsible Official of Firm: (818) 548-2107	**6. Fax # of Responsible Official of Firm:**	**7. Email of Responsible Official of Firm:** SZurn@Glendaleca.gov
8. Signature of Preparer, (If prepared by person other than responsible official of firm): Nancy L. Matthews		**9. Title of Preparer:** Partner, Foulweather Consulting
10. Print Name of Preparer: Nancy Matthews		**11. Date Signed:** 4/29/20
12. Phone # of Preparer: 9167985665	**13. Fax # of Preparer:**	**14. Email of Preparer:** Nancy@foulweatherconsulting.com

THIS CONCLUDES FORM 400-CEQA. INCLUDE THIS FORM AND ANY ATTACHMENTS WITH FORM 400-A.

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[4] Table 1 – Regulated Substances List and Threshold Quantities for Accidental Release Prevention can be found in the Instructions for Form 400-CEQA.

South Coast Air Quality Management District

Form 400-PS Revised June 2021

Plot Plan And Stack Information Form

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Form 400A and Form 400-CEQA.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944
Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator To Appears On The Permit): Glendale City, Glendale Water & Power

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 800 Air Way, Glendale, CA 91201

● **Fixed Location** ○ **Various Locations**

Section B - Location Data [Unit 12]

Plot Plan

Please attach a site map for the project with distances and scales. Identify and locate the proposed equipment on the map. A copy of the appropriate Thomas Brothers page, a web-based map, or a sketch that shows the major streets and location of the equipment is acceptable.

Location of Schools Nearby

Is the facility located within a 1/4 mile radius (1,320 feet) of the outer boundary of a school? ○ Yes ● No

If yes, please provide name(s) of school(s) below:

School Name: ____________________ **School Name:** ____________________

School Address: ____________________ **School Address:** ____________________

Distance from stack or equipment vent to the outer boundary of the school: __________ feet **Distance from stack or equipment vent to the outer boundary of the school:** __________ feet

CA Health & Safety Code 42301.9: "School" means any public or private school used for the purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes.

Population Density

● Urban ○ Rural (<50% of land within 3 km radius accounted for by urban land use categories, i.e., multi-family dwelling or industrial.)

Zoning Classification

○ **Mixed Use Residential Commercial Zone (M-U)** ○ **Service and Professional Zone (C-S)** ○ **Medium Commercial (C-3)**

● **Heavy Commercial (C-4)** ○ **Commercial Manufacturing (C-M)**

Section C - Emission Release Parameters - Stacks, Vents

Stack Data

Stack Height: 9.67 feet (above ground level) **What is the height of the closest building nearest the stack?** 43 feet

Stack Inside Diameter: __________ inches **Stack Flow:** __________ acfm **Stack Temperature:** __________ ℉

Rain Cap Present: ○ Yes ● No **Stack Orientation:** ● Vertical ○ Horizontal

If the stack height is less than 2.5 times the closest building height (H), please provide information on any building within 5xH distance from the stack (attach additional sheet if necessary):

Building #/Name: Engine Hall **Building #/Name:** __________

Building Height: 43 feet (above ground level) **Building Height:** __________ feet (above ground level)

Building Width: 107 feet **Building Width:** __________ feet

Building Length: 160 feet **Building Length:** __________ feet

Receptor Distance From Equipment Stack or Roof Vents/Openings

Distance to nearest residence or sensitive receptor*: 3064 feet

Distance to nearest business: 650 feet

Building Information

Are the emissions released from vents and/or openings from a building? ○ Yes ● No

If yes, please provide:

Building #/Name: __________ **Building Width:** __________ feet

Building Height: __________ feet (above ground level) **Building Length:** __________ feet

---

*AQMD Rule 1470 defines SENSITIVE RECEPTOR as meaning any residence including private homes, condominiums, apartments, and living quarters, schools as defined under paragraph (b)(57), preschools, daycare centers and health facilities such as hospitals or retirement and nursing homes. A sensitive receptor includes long term care hospitals, hospices, prisons, and dormitories or similar live-in housing.

South Coast Air Quality Management District

Form 400-PS

Plot Plan And Stack Information Form

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Form 400A and Form 400-CEQA.

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submittfgfed with this application is true and correct.

Signature of Preparer: Nancy Matthews	**Title of Preparer:** Partner, Foulweather Consultin	**Preparer's Phone #:** 916-798-5665 **Preparer's Email:** Nancy@foulweatherconsulting.com

Contact Person: Mark Young **Contact's Email:** MYoung@glendaleca.gov	**Contact's Phone#:** (818) 548-3293 **Contact's Fax#:**	**Date Signed:**

THIS IS A PUBLIC DOCUMENT

Pursuant to the California Public Records Act, your permit application and any supplemental documentation are public records and may be disclosed to a third party. If you wish to claim certain limited information as exempt from disclosure because it qualifies as a trade secret, as defined in the District's Guidelines for Implementing the California Public Records Act, you must make such claim at the time of submittal to the District.

Check here if you claim that this form or its attachments contain confidential trade secret information. ☐

Figure 1-2. Alternative 7 Layout

South Coast Air Quality Management District

Form 400-E-5
Selective Catalytic Reduction (SCR) System, Oxidation Catalyst, and Ammonia Catalyst

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator That Appears On Permit): Glendale City, Glendale Water & Power

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 800 Air Way, Glendale, CA 91201

● Fixed Location ○ Various Locations

Section B - Equipment Description [Unit 12]

Selective Catalytic Reduction (SCR)

SCR Catalyst	**Manufacturer:** Umicore, Cormetech or equiv. **Catalyst Active Material:** vanadium **Model Number:** ___ **Type:** ___ **Size of Each Layer or Module:** L: 1 ft. 6.3 in. W: 1 ft. 6.3 in. H: 0 ft. 10.6 in. **No. of Layers or Modules:** 147 **Total Volume:** 304 cu. ft. **Total Weight:** 6157 lbs.
Reducing Agent	○ Urea ○ Anhydrous Ammonia ● Aqueous Ammonia 19 % **Injection Rate:** 220 lb/hr
Reducing Agent Storage*	**Diameter:** 9 ft. ___ in. **Height:** 15 ft. ___ in. **Capacity:** 13209 gal net Pressure Setting: 19.7 psia * A separate permit may be needed for the storage equipment.
Space Velocity	**Gas Flow Rate/Catalyst Volume:** 11900 per hour
Area Velocity	**Gas Flow Rate/Wetted Catalyst Surface Area:** ___ ft/hr
Manufacturer's Guarantee	**NOx:** 2.4 ppm **%O$_2$:** 15 **NOx:** 0.023 gm/bhp-hr **Ammonia Slip:** 5 ppm @ 15 %O$_2$
Catalyst Life	5 years (expected)
Cost	**Capital Cost:** ___ **Installation Cost:** ___ **Catalyst Replacement Cost:** ___

Oxidation Catalyst

Oxidation Catalyst	**Manufacturer:** Umicore, Cormetech or equiv **Catalyst Active Material:** Palladium, platinum or equiv **Model Number:** ___ **Type:** ___ **Size of Each Layer or Module:** L: 1 ft. 6.3 in. W: 1 ft. 6.3 in. H: 0 ft. 5.1 in. **No. of Layers or Modules:** 98 **Total Volume:** 150 cu. ft. **Total Weight:** 4104 lbs.
Space Velocity	**Gas Flow Rate/Catalyst Volume:** 24000 per hour
Manufacturer's Guarantee	**VOC:** 9.8 ppm **VOC:** 0.033 gm/bhp-hr **%O$_2$:** 15 **CO:** 11.2 ppm **CO:** 0.066 gm/bhp-hr **%O$_2$:** 15
Catalyst Life	5 years (expected)
Cost	**Capital Cost:** ___ **Installation Cost:** ___ **Catalyst Replacement Cost:** ___

South Coast Air Quality Management District

Form 400-E-5
Selective Catalytic Reduction (SCR) System, Oxidation Catalyst, and Ammonia Catalyst

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Section B - Equipment Description (cont.)

Ammonia Catalyst

Ammonia Catalyst	Manufacturer: ____ Catalyst Active Material: ____ Model Number: ____ Type: ____ Size of Each Layer or Module: L: ____ ft. ____ in. W: ____ ft. ____ in. H: ____ ft. ____ in. No. of Layers or Modules: ____ Total Volume: ____ cu. ft. Total Weight: ____ lbs.
Space Velocity	Gas Flow Rate/Catalyst Volume: ____ per hour
Manufacturer's Guarantee	NH_3: ____ ppm %O_2: ____
Catalyst Life	____ years (expected)
Cost	Capital Cost: ____ Installation Cost: ____ Catalyst Replacement Cost: ____

Section C - Operation Information

Operating Temperature	Minimum Inlet Temperature: ____ °F (from cold start) Maximum Temperature: 896 °F Warm-up Time: — hr. 30 min. (maximum)
Operating Schedule	Normal: up to 10 hours/day up to 5 days/week up to 50 weeks/yr Maximum: 24 hours/day 7 days/week 52 weeks/yr

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application is true and correct.

Preparer Info	Signature: Nancy L. Matthews Date: 4/29/20 Title: Partner Company Name: Foulweather Consulting	Name: Nancy Matthews Phone #: 9167985665 Fax #: Email: Nancy@foulweatherconsulting.com
Contact Info	Name: Mark Young Title: Deputy General Manager Company Name: Glendale Water & Power	Phone #: 8185483293 Fax #: Email: MYoung@Glendaleca.gov

THIS IS A PUBLIC DOCUMENT

Pursuant to the California Public Records Act, your permit application and any supplemental documentation are public records and may be disclosed to a third party. If you wish to claim certain limited information as exempt from disclosure because it qualifies as a trade secret, as defined in the District's Guidelines for Implementing the California Public Records Act, you must make such claim at the time of submittal to the District.

Check here if you claim that this form or its attachments contain confidential trade secret information. ☐

South Coast Air Quality Management District

Form 400-E-13b
Non-Emergency Internal Combustion Engine

This form must be accompanied by a completed Application for a Permit to Construct/Operate – Forms 400-A, Form 400-CEQA, and Form 400-PS.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator That Appears On Permit): Glendale City, Glendale Water & Power

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 800 Air Way, Glendale, CA 91201

● Fixed Location ○ Various Locations

Section B - Equipment Description [Unit 12]

Internal Combustion Engine	Is the ICE an EPA Certified or Qualifying Non-Road Engine? ● No ○ Yes If yes, provide EPA Certificate No., and attach copy: ______ Manufacturer: Wartsila Model: 18V50SG Serial No.: tbd Date of Manufacture: tbd (mm/dd/yyyy) Date of Installation: 06/01/2024 (mm/dd/yyyy) Note: For an ICE manufactured after 7/18/94, please provide manufacturer's specification and guarantee. Manufacturer Maximum Rating: 25,828 BHP@ 514 RPM
ICE Function (Check all that apply)	☒ Electrical Generator ☐ Fire Pump ☐ Compressor ☐ Co-Generation ☐ Flood Control ☐ Pump Driver ☐ Other (specify): ______
Type	● Stationary ○ Portable How Is This Type of Equipment Used? (Check All That Apply) ☒ Within Facility ☐ Off-Site ☐ Rental ☐ Non-Rental
Fuel	☒ Natural Gas ☐ LPG ☐ Refinery Gas* ☐ Digester Gas* ☐ Landfill Gas* ☐ Diesel Oil No. 2 ☐ Other*: ______ *If Digester Gas, Landfill Gas, Refinery Gas, and/or Other are checked, attach fuel analysis indicating higher heating value and sulfur content.
Stand-By Fuel	☐ Natural Gas ☐ LPG ☐ Refinery Gas* ☐ Digester Gas* ☐ Landfill Gas* ☐ Diesel Oil No. 2 ☐ Other*: ______ *If Digester Gas, Landfill Gas, Refinery Gas, and/or Other are checked, attach fuel analysis indicating higher heating value and sulfur content.
Cycle Type	○ Two Cycle ● Four Cycle
Combustion Type	● Lean Burn ○ Rich Burn
No. of Cylinders	○ Four ○ Six ○ Eight ○ Ten ○ Twelve ○ Sixteen ● Other: 18
Aspiration Type	○ Turbocharged ● Turbocharged/Aftercooled ○ Naturally Aspirated ☐ Timing Retarded ≥ 4° (relative to standard timing)
Air Pollution Control (If Applicable)	○ Selective Catalytic Reduction (SCR) * ○ No Controls ○ Selective Non-Catalytic Reduction (SNCR) * ○ Air Fuel Ratio Controller ○ Non-selective Catalytic Reduction (NSCR) ● Other (specify): oxidation catalyst and SCR * Separate application is required. Manufacturer: Umicore, Cormetech or equiv. Model: tbd If already permitted, indicate Permit No.: ______ Device No.: ______

South Coast Air Quality Management District

Form 400-E-13b
Non-Emergency Internal Combustion Engine

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Section C - Operation Information

Fuel Consumption

Maximum Rated Load: ______ gal./hr. OR 156,720 cu.ft./hr

Average Load: ______ gal./hr. OR 156,720 cu.ft./hr.

Emissions Data

Pollutants	Maximum Emissions Before Control		Maximum Emissions After Control	
	gm/Bhp-hr	PPM (15% O_2)	gm/Bhp-hr	PPM (15% O_2)
ROG			0.033	9.8
NOx			0.023	2.4
CO			0.066	11.2
PM	0.023	5.0 mg/Nm3	0.023	5.0 mg/Nm3
SOx	0.002	0.029	0.002	0.029

Emissions Reference (attach):

- ☒ Manufacturer's Guarantee
- ☐ Catalytic Manufacturer's Guarantee
- ☐ Source Test Data
- ☐ EPA Emission Factors
- ☐ Other (specify): ______

Operating Schedule

Normal: up to 10 hours/day up to 5 days/week up to 50 weeks/yr

Maximum: 24 hours/day 7 days/week 52 weeks/yr

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application is true and correct.

Preparer Info

Signature: Nancy L. Matthews

Date: 4/29/20

Title: Partner

Company Name: Foulweather Consulting

Name: Nancy Matthews

Phone #: 9167985665

Fax #:

Email: Nancy@Foulweatherconsulting.com

Contact Info

Name: Mark Young

Title: Deputy General Manager

Company Name: Glendale Water & Power

Phone #: 8185483293

Fax #:

Email: MYoung@Glendaleca.gov

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Check here if you claim that this form or its attachments contain confidential trade secret information. ☐

AQMD

South Coast Air Quality Management District

Form 400-A

Application Form for Permit or Plan Approval

List only one piece of equipment or process per form.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

1. Facility Name (Business Name of Operator to Appear on the Permit): Glendale City, Glendale Water and Power

2. Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

3. Owner's Business Name (If different from Business Name of Operator): [same]

Section B - Equipment Location Address

4. Equipment Location Is: ● Fixed Location ○ Various Location
(For equipment operated at various locations, provide address of initial site.)

800 Air Way
Street Address

Glendale, CA , CA 91201
City Zip

Mark Young — Contact Name
Deputy General Manager — Title

8185483293 — Phone # Ext. Fax #

E-Mail: MYoung@Glendaleca.gov

Section C - Permit Mailing Address

5. Permit and Correspondence Information:
☐ Check here if same as equipment location address

141 N. Glendale Ave
Address

Glendale, CA , CA 91206
City State Zip

Mark Young — Contact Name
Deputy General Manager — Title

8185483293 — Phone # Ext. Fax #

E-Mail: MYoung@Glendaleca.gov

Section D - Application Type

6. The Facility Is: ○ Not In RECLAIM or Title V ○ In RECLAIM ● In Title V ○ In RECLAIM & Title V Programs

7. Reason for Submitting Application (Select only ONE):

7a. New Equipment or Process Application:
- ● New Construction (Permit to Construct)
- ○ Equipment On-Site But Not Constructed or Operational
- ○ Equipment Operating Without A Permit *
- ○ Compliance Plan
- ○ Registration/Certification
- ○ Streamlined Standard Permit

7b. Facility Permits:
- ○ Title V Application or Amendment (Refer to Title V Matrix)
- ○ RECLAIM Facility Permit Amendment

7c. Equipment or Process with an Existing/Previous Application or Permit:
- ○ Administrative Change
- ○ Alteration/Modification
- ○ Alteration/Modification without Prior Approval *
- ○ Change of Condition
- ○ Change of Condition without Prior Approval *
- ○ Change of Location
- ○ Change of Location without Prior Approval *
- ○ Equipment Operating with an Expired/Inactive Permit *

Existing or Previous Permit/Application
If you checked any of the items in 7c., you MUST provide an existing Permit or Application Number: ______

* A Higher Permit Processing Fee and additional Annual Operating Fees (up to 3 full years) may apply (Rule 301(c)(1)(D)(i)).

8a. Estimated Start Date of Construction (mm/dd/yyyy): 06/01/2021

8b. Estimated End Date of Construction (mm/dd/yyyy): 12/01/2024

8c. Estimated Start Date of Operation (mm/dd/yyyy): 12/01/2024

9. Description of Equipment or Reason for Compliance Plan (list applicable rule): Install/operate Wartsila 18V50SG reciprocating IC engines to replace existing generating equipment [Unit 13]

10. For identical equipment, how many additional applications are being submitted with this application? (Form 400-A required for each equipment / process): 4

11. Are you a Small Business as per AQMD's Rule 102 definition? (10 employees or less and total gross receipts are $500,000 or less OR a not-for-profit training center) ● No ○ Yes

12. Has a Notice of Violation (NOV) or a Notice to Comply (NC) been issued for this equipment? ● No ○ Yes
If Yes, provide NOV/NC#: ______

Section E - Facility Business Information

13. What type of business is being conducted at this equipment location? Electricity generation

14. What is your business primary NAICS Code? (North American Industrial Classification System): 221112

15. Are there other facilities in the SCAQMD jurisdiction operated by the same operator? ○ No ● Yes

16. Are there any schools (K-12) within 1000 feet of the facility property line? ● No ○ Yes

Section F - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application are true and correct.

17. Signature of Responsible Official:

18. Title of Responsible Official: General Manager

19. I wish to review the permit prior to issuance. (This may cause a delay in the application process.) ○ No ● Yes

20. Print Name: Steve Zurn

21. Date: 5·20·20

22. Do you claim confidentiality of data? (If Yes, see instructions.) ● No ○ Yes

23. Check List: ☒ Authorized Signature/Date ☒ Form 400-CEQA ☒ Supplemental Form(s) (ie., Form 400-E-xx) ☒ Fees Enclosed

AQMD USE ONLY	APPLICATION TRACKING #	CHECK #	AMOUNT RECEIVED	PAYMENT TRACKING #	VALIDATION
			$		

DATE	APP REJ	DATE	APP REJ	CLASS I III	BASIC CONTROL	EQUIPMENT CATEGORY CODE	TEAM	ENGINEER	REASON/ACTION TAKEN

South Coast Air Quality Management District

Form 400-CEQA
California Environmental Quality Act (CEQA) Applicability

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

The SCAQMD is required by state law, the California Environmental Quality Act (CEQA), to review discretionary permit project applications for potential air quality and other environmental impacts. This form is a screening tool to assist the SCAQMD in clarifying whether or not the project[1] has the potential to generate significant adverse environmental impacts that might require preparation of a CEQA document [CEQA Guidelines §15060(a)].[2] Refer to the attached instructions for guidance in completing this form.[3] For each Form 400-A application, also complete and submit one Form 400-CEQA. If submitting multiple Form 400-A applications for the same project at the same time, only one 400-CEQA form is necessary for the entire project. If you need assistance completing this form, contact Permit Services at (909) 396-3385 or (909) 396-2668.

Section A - Facility Information

1. Facility Name (Business Name of Operator To Appear On The Permit): Glendale City, Glendale Water & Power

2. Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

3. Project Description: Grayson Repower Project: replace existing boilers, gas turbine generators (except Unit 9), cooling towers and auxiliary equipment with 5 new reciprocating IC engines, emission control systems, CEMS and other auxiliary equipment. [Unit 13]

Section B - Review For Exemption From Further CEQA Action

Check "Yes" or "No" as applicable

	Yes	No	Is this application for:
1.	●	○	**A CEQA and/or NEPA document previously or currently prepared that specifically evaluates this project?** If yes, attach a copy of the signed Notice of Determination to this form.
2.	○	●	**A request for a change of permittee only (without equipment modifications)?**
3.	○	●	**A functionally identical permit unit replacement with no increase in rating or emissions?**
4.	○	●	**A change of daily VOC permit limit to a monthly VOC permit limit?**
5.	○	●	**Equipment damaged as a result of a disaster during state of emergency?**
6.	○	●	**A Title V** (i.e., Regulation XXX) **permit renewal (without equipment modifications)?**
7.	○	●	**A Title V administrative permit revision?**
8.	○	●	**The conversion of an existing permit into an initial Title V permit?**

If "**Yes**" is checked for any question in Section B, your application does not require additional evaluation for CEQA applicability. Skip to Section D - Signatures on page 2 and sign and date this form.

Section C - Review of Impacts Which May Trigger CEQA

Complete Parts I-VI by checking "Yes" or "No" as applicable. To avoid delays in processing your application(s), explain all "Yes" responses on a separate sheet and attach it to this form.

	Yes	No	Part I - General
1.	○	○	**Has this project generated any known public controversy regarding potential adverse impacts that may be generated by the project?** Controversy may be construed as concerns raised by local groups at public meetings; adverse media attention such as negative articles in newspapers or other periodical publications, local news programs, environmental justice issues, etc.
2.	○	○	**Is this project part of a larger project?** If yes, attach a separate sheet to briefly describe the larger project.
			Part II - Air Quality
3.	○	○	**Will there be any demolition, excavating, and/or grading construction activities that encompass an area exceeding 20,000 square feet?**
4.	○	○	**Does this project include the open outdoor storage of dry bulk solid materials that could generate dust?** If Yes, include a plot plan with the application package.

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[1] A "project" means the whole of an action which has a potential for resulting in physical change to the environment, including construction activities, clearing or grading of land, improvements to existing structures, and activities or equipment involving the issuance of a permit. For example, a project might include installation of a new, or modification of an existing internal combustion engine, dry-cleaning facility, boiler, gas turbine, spray coating booth, solvent cleaning tank, etc.

[2] To download the CEQA guidelines, visit http://ceres.ca.gov/env_law/state.html.

[3] To download this form and the instructions, visit http://www.aqmd.gov/ceqa or http://www.aqmd.gov/permit

Section C - Review of Impacts Which May Trigger CEQA (cont.)

	Yes	No	Part II - Air Quality (cont.)
5.	○	○	**Would this project result in noticeable off-site odors from activities that may not be subject to SCAQMD permit requirements?** For example, compost materials or other types of greenwaste (i.e., lawn clippings, tree trimmings, etc.) have the potential to generate odor complaints subject to Rule 402 – Nuisance.
6.	○	○	**Does this project cause an increase of emissions from marine vessels, trains and/or airplanes?**
7.	○	○	**Will the proposed project increase the QUANTITY of hazardous materials stored aboveground onsite or transported by mobile vehicle to or from the site by greater than or equal to the amounts associated with each compound on the attached Table 1?**[4]
			Part III – Water Resources
8.	○	○	**Will the project increase demand for water at the facility by more than 5,000,000 gallons per day?** The following examples identify some, but not all, types of projects that may result in a "yes" answer to this question: 1) projects that generate steam; 2) projects that use water as part of the air pollution control equipment; 3) projects that require water as part of the production process; 4) projects that require new or expansion of existing sewage treatment facilities; 5) projects where water demand exceeds the capacity of the local water purveyor to supply sufficient water for the project; and 6) projects that require new or expansion of existing water supply facilities.
9.	○	○	**Will the project require construction of new water conveyance infrastructure?** Examples of such projects are when water demands exceed the capacity of the local water purveyor to supply sufficient water for the project, or require new or modified sewage treatment facilities such that the project requires new water lines, sewage lines, sewage hook-ups, etc.
			Part IV – Transportation/Circulation
10.			**Will the project result in** (Check all that apply):
	○	○	**a. the need for more than 350 new employees?**
	○	○	**b. an increase in heavy-duty transport truck traffic to and/or from the facility by more than 350 truck round-trips per day?**
	○	○	**c. increase customer traffic by more than 700 visits per day?**
			Part V – Noise
11.	○	○	**Will the project include equipment that will generate noise GREATER THAN 90 decibels (dB) at the property line?**
			Part VI – Public Services
12.			**Will the project create a permanent need for new or additional public services in any of the following areas** (Check all that apply):
	○	○	**a. Solid waste disposal?** Check "No" if the projected potential amount of wastes generated by the project is less than five tons per day.
	○	○	**b. Hazardous waste disposal?** Check "No" if the projected potential amount of hazardous wastes generated by the project is less than 42 cubic yards per day (or equivalent in pounds).

****REMINDER:** *For each "Yes" response in Section C, attach all pertinent information including but not limited to estimated quantities, volumes, weights, etc.*******

Section D - Signatures

I HEREBY CERTIFY THAT ALL INFORMATION CONTAINED HEREIN AND INFORMATION SUBMITTED WITH THIS APPLICATION IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE. I UNDERSTAND THAT THIS FORM IS A SCREENING TOOL AND THAT THE SCAQMD RESERVES THE RIGHT TO CONSIDER OTHER PERTINENT INFORMATION IN DETERMINING CEQA APPLICABILITY.

1. Signature of Responsible Official of Firm:		**2. Title of Responsible Official of Firm:** General Manager
3. Print Name of Responsible Official of Firm: Steve Zurn		**4. Date Signed:** 5·20·20
5. Phone # of Responsible Official of Firm: (818) 548-2107	**6. Fax # of Responsible Official of Firm:**	**7. Email of Responsible Official of Firm:** SZurn@Glendaleca.gov
8. Signature of Preparer, (If prepared by person other than responsible official of firm): Nancy L. Matthews		**9. Title of Preparer:** Partner, Foulweather Consulting
10. Print Name of Preparer: Nancy Matthews		**11. Date Signed:** 4/29/20
12. Phone # of Preparer: 9167985665	**13. Fax # of Preparer:**	**14. Email of Preparer:** Nancy@foulweatherconsulting.com

THIS CONCLUDES FORM 400-CEQA. INCLUDE THIS FORM AND ANY ATTACHMENTS WITH FORM 400-A.

---

[4] Table 1 – Regulated Substances List and Threshold Quantities for Accidental Release Prevention can be found in the Instructions for Form 400-CEQA.

South Coast Air Quality Management District

Form 400-PS Revised June 2021

Plot Plan And Stack Information Form

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Form 400A and Form 400-CEQA.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944
Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator To Appears On The Permit): Glendale City, Glendale Water & Power

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 800 Air Way, Glendale, CA 91201

● Fixed Location ○ Various Locations

Section B - Location Data [Unit 13]

Plot Plan

Please attach a site map for the project with distances and scales. Identify and locate the proposed equipment on the map. A copy of the appropriate Thomas Brothers page, a web-based map, or a sketch that shows the major streets and location of the equipment is acceptable.

Location of Schools Nearby

Is the facility located within a 1/4 mile radius (1,320 feet) of the outer boundary of a school? ○ Yes ● No

If yes, please provide name(s) of school(s) below:

School Name: ____________ **School Name:** ____________

School Address: ____________ **School Address:** ____________

Distance from stack or equipment vent to the outer boundary of the school: ________ feet **Distance from stack or equipment vent to the outer boundary of the school:** ________ feet

CA Health & Safety Code 42301.9: "School" means any public or private school used for the purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes.

Population Density

● Urban ○ Rural (<50% of land within 3 km radius accounted for by urban land use categories, i.e., multi-family dwelling or industrial.)

Zoning Classification

○ **Mixed Use Residential Commercial Zone (M-U)** ○ **Service and Professional Zone (C-S)** ○ **Medium Commercial (C-3)**

● **Heavy Commercial (C-4)** ○ **Commercial Manufacturing (C-M)**

Section C - Emission Release Parameters - Stacks, Vents

Stack Data

Stack Height: 9.67 feet (above ground level) **What is the height of the closest building nearest the stack?** 43 feet

Stack Inside Diameter: ________ inches **Stack Flow:** ________ acfm **Stack Temperature:** ________ °F

Rain Cap Present: ○ Yes ● No **Stack Orientation:** ● Vertical ○ Horizontal

If the stack height is less than 2.5 times the closest building height (H), please provide information on any building within 5xH distance from the stack (attach additional sheet if necessary):

Building #/Name: Engine Hall **Building #/Name:** ________

Building Height: 43 feet (above ground level) **Building Height:** ________ feet (above ground level)

Building Width: 107 feet **Building Width:** ________ feet

Building Length: 160 feet **Building Length:** ________ feet

Receptor Distance From Equipment Stack or Roof Vents/Openings

Distance to nearest residence or sensitive receptor*: 3064 feet

Distance to nearest business: 650 feet

Building Information

Are the emissions released from vents and/or openings from a building? ○ Yes ● No

If yes, please provide:

Building #/Name: ________ **Building Width:** ________ feet

Building Height: ________ feet (above ground level) **Building Length:** ________ feet

---

*AQMD Rule 1470 defines SENSITIVE RECEPTOR as meaning any residence including private homes, condominiums, apartments, and living quarters, schools as defined under paragraph (b)(57), preschools, daycare centers and health facilities such as hospitals or retirement and nursing homes. A sensitive receptor includes long term care hospitals, hospices, prisons, and dormitories or similar live-in housing.

South Coast Air Quality Management District

Form 400-PS

Plot Plan And Stack Information Form

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Form 400A and Form 400-CEQA.

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submittfgfed with this application is true and correct.

Signature of Preparer: Nancy Matthews

Title of Preparer: Partner, Foulweather Consultin

Preparer's Phone #: 916-798-5665

Preparer's Email: Nancy@foulweatherconsulting.com

Contact Person: Mark Young

Contact's Email: MYoung@glendaleca.gov

Contact's Phone#: (818) 548-3293

Contact's Fax#:

Date Signed:

THIS IS A PUBLIC DOCUMENT

Pursuant to the California Public Records Act, your permit application and any supplemental documentation are public records and may be disclosed to a third party. If you wish to claim certain limited information as exempt from disclosure because it qualifies as a trade secret, as defined in the District's Guidelines for Implementing the California Public Records Act, you must make such claim at the time of submittal to the District.

Check here if you claim that this form or its attachments contain confidential trade secret information. ☐

Figure 1-2. Alternative 7 Layout

South Coast Air Quality Management District

Form 400-E-5
Selective Catalytic Reduction (SCR) System, Oxidation Catalyst, and Ammonia Catalyst

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator That Appears On Permit): Glendale City, Glendale Water & Power

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 800 Air Way, Glendale, CA 91201

● Fixed Location ○ Various Locations

Section B - Equipment Description [Unit 13]

Selective Catalytic Reduction (SCR)

SCR Catalyst	**Manufacturer:** Umicore, Cormetech or equiv. **Catalyst Active Material:** vanadium **Model Number:** ______ **Type:** ______ **Size of Each Layer or Module:** L: 1 ft. 6.3 in. W: 1 ft. 6.3 in. H: 0 ft. 10.6 in. **No. of Layers or Modules:** 147 **Total Volume:** 304 cu. ft. **Total Weight:** 6157 lbs.
Reducing Agent	○ Urea ○ Anhydrous Ammonia ● Aqueous Ammonia 19 % **Injection Rate:** 220 lb/hr
Reducing Agent Storage*	**Diameter:** 9 ft. ______ in. **Height:** 15 ft. ______ in. **Capacity:** 13209 gal net **Pressure Setting:** 19.7 psia *** A separate permit may be needed for the storage equipment.**
Space Velocity	**Gas Flow Rate/Catalyst Volume:** 11900 per hour
Area Velocity	**Gas Flow Rate/Wetted Catalyst Surface Area:** ______ ft/hr
Manufacturer's Guarantee	**NOx:** 2.4 ppm **%O$_2$:** 15 **NOx:** 0.023 gm/bhp-hr **Ammonia Slip:** 5 ppm @ 15 %O$_2$
Catalyst Life	5 years (expected)
Cost	**Capital Cost:** ______ **Installation Cost:** ______ **Catalyst Replacement Cost:** ______

Oxidation Catalyst

Oxidation Catalyst	**Manufacturer:** Umicore, Cormetech or equiv **Catalyst Active Material:** Palladium, platinum or equiv **Model Number:** ______ **Type:** ______ **Size of Each Layer or Module:** L: 1 ft. 6.3 in. W: 1 ft. 6.3 in. H: 0 ft. 5.1 in. **No. of Layers or Modules:** 98 **Total Volume:** 150 cu. ft. **Total Weight:** 4104 lbs.
Space Velocity	**Gas Flow Rate/Catalyst Volume:** 24000 per hour
Manufacturer's Guarantee	**VOC:** 9.8 ppm **VOC:** 0.033 gm/bhp-hr **%O$_2$:** 15 **CO:** 11.2 ppm **CO:** 0.066 gm/bhp-hr **%O$_2$:** 15
Catalyst Life	5 years (expected)
Cost	**Capital Cost:** ______ **Installation Cost:** ______ **Catalyst Replacement Cost:** ______

South Coast Air Quality Management District

Form 400-E-5
Selective Catalytic Reduction (SCR) System, Oxidation Catalyst, and Ammonia Catalyst

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Section B - Equipment Description (cont.)

Ammonia Catalyst

Ammonia Catalyst	**Manufacturer:** **Catalyst Active Material:** **Model Number:** **Type:** **Size of Each Layer or Module:** **L:** ft. in. **W:** ft. in. **H:** ft. in. **No. of Layers or Modules:** **Total Volume:** cu. ft. **Total Weight:** lbs.
Space Velocity	**Gas Flow Rate/Catalyst Volume:** per hour
Manufacturer's Guarantee	**NH_3:** ppm **$\%O_2$:**
Catalyst Life	years (expected)
Cost	**Capital Cost:** **Installation Cost:** **Catalyst Replacement Cost:**

Section C - Operation Information

Operating Temperature	**Minimum Inlet Temperature:** °F (from cold start) **Maximum Temperature:** 896 °F **Warm-up Time:** — hr. 30 min. (maximum)
Operating Schedule	**Normal:** up to 10 hours/day up to 5 days/week up to 50 weeks/yr **Maximum:** 24 hours/day 7 days/week 52 weeks/yr

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application is true and correct.

Preparer Info	**Signature:** Nancy L. Matthews **Date:** 4/29/20 **Title:** Partner **Company Name:** Foulweather Consulting	**Name:** Nancy Matthews **Phone #:** 9167985665 **Fax #:** **Email:** Nancy@foulweatherconsulting.com
Contact Info	**Name:** Mark Young **Title:** Deputy General Manager **Company Name:** Glendale Water & Power	**Phone #:** 8185483293 **Fax #:** **Email:** MYoung@Glendaleca.gov

THIS IS A PUBLIC DOCUMENT

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Check here if you claim that this form or its attachments contain confidential trade secret information. ☐

South Coast Air Quality Management District

Form 400-E-13b
Non-Emergency Internal Combustion Engine

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator That Appears On Permit): Glendale City, Glendale Water & Power

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 800 Air Way, Glendale, CA 91201

● Fixed Location ○ Various Locations

Section B - Equipment Description [Unit 13]

Internal Combustion Engine	Is the ICE an EPA Certified or Qualifying Non-Road Engine? ● No ○ Yes If yes, provide EPA Certificate No., and attach copy: Manufacturer: Wartsila Model: 18V50SG Serial No.: tbd Date of Manufacture: tbd (mm/dd/yyyy) Date of Installation: 06/01/2024 (mm/dd/yyyy) Note: For an ICE manufactured after 7/18/94, please provide manufacturer's specification and guarantee. Manufacturer Maximum Rating: 25,828 BHP@ 514 RPM
ICE Function (Check all that apply)	☒ Electrical Generator ☐ Fire Pump ☐ Compressor ☐ Co-Generation ☐ Flood Control ☐ Pump Driver ☐ Other (specify):
Type	● Stationary ○ Portable How Is This Type of Equipment Used? (Check All That Apply) ☒ Within Facility ☐ Off-Site ☐ Rental ☐ Non-Rental
Fuel	☒ Natural Gas ☐ LPG ☐ Refinery Gas* ☐ Digester Gas* ☐ Landfill Gas* ☐ Diesel Oil No. 2 ☐ Other* : *If Digester Gas, Landfill Gas, Refinery Gas, and/or Other are checked, attach fuel analysis indicating higher heating value and sulfur content.
Stand-By Fuel	☐ Natural Gas ☐ LPG ☐ Refinery Gas* ☐ Digester Gas* ☐ Landfill Gas* ☐ Diesel Oil No. 2 ☐ Other* : *If Digester Gas, Landfill Gas, Refinery Gas, and/or Other are checked, attach fuel analysis indicating higher heating value and sulfur content.
Cycle Type	○ Two Cycle ● Four Cycle
Combustion Type	● Lean Burn ○ Rich Burn
No. of Cylinders	○ Four ○ Six ○ Eight ○ Ten ○ Twelve ○ Sixteen ● Other: 18
Aspiration Type	○ Turbocharged ● Turbocharged/Aftercooled ○ Naturally Aspirated ☐ Timing Retarded ≥ 4° (relative to standard timing)
Air Pollution Control (If Applicable)	○ Selective Catalytic Reduction (SCR) * ○ No Controls ○ Selective Non-Catalytic Reduction (SNCR) * ○ Air Fuel Ratio Controller ○ Non-selective Catalytic Reduction (NSCR) ● Other (specify): oxidation catalyst and SCR * Separate application is required. Manufacturer: Umicore, Cormetech or equiv. Model: tbd If already permitted, indicate Permit No.: Device No.:

South Coast Air Quality Management District

Form 400-E-13b
Non-Emergency Internal Combustion Engine

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Section C - Operation Information

Fuel Consumption

Maximum Rated Load: ______ gal./hr. OR 156,720 cu.ft./hr

Average Load: ______ gal./hr. OR 156,720 cu.ft./hr.

Emissions Data

Pollutants	Maximum Emissions Before Control		Maximum Emissions After Control	
	gm/Bhp-hr	PPM (15% O_2)	gm/Bhp-hr	PPM (15% O_2)
ROG			0.033	9.8
NOx			0.023	2.4
CO			0.066	11.2
PM	0.023	5.0 mg/Nm3	0.023	5.0 mg/Nm3
SOx	0.002	0.029	0.002	0.029

Emissions Reference (attach):

☒ Manufacturer's Guarantee
☐ Catalytic Manufacturer's Guarantee
☐ Source Test Data
☐ EPA Emission Factors
☐ Other (specify): ______

Operating Schedule

Normal: up to 10 hours/day up to 5 days/week up to 50 weeks/yr

Maximum: 24 hours/day 7 days/week 52 weeks/yr

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application is true and correct.

Preparer Info

Signature: Nancy L. Matthews
Date: 4/29/20
Name: Nancy Matthews
Title: Partner
Company Name: Foulweather Consulting
Phone #: 9167985665
Fax #:
Email: Nancy@Foulweatherconsulting.com

Contact Info

Name: Mark Young
Title: Deputy General Manager
Company Name: Glendale Water & Power
Phone #: 8185483293
Fax #:
Email: MYoung@Glendaleca.gov

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Check here if you claim that this form or its attachments contain confidential trade secret information. ☐

AQMD

South Coast Air Quality Management District

Form 400-A

Application Form for Permit or Plan Approval

List only one piece of equipment or process per form.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

1. Facility Name (Business Name of Operator to Appear on the Permit): Glendale City, Glendale Water and Power

2. Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

3. Owner's Business Name (If different from Business Name of Operator): [same]

Section B - Equipment Location Address

4. Equipment Location Is: ● Fixed Location ○ Various Location
(For equipment operated at various locations, provide address of initial site.)

Street Address: 800 Air Way
City: Glendale, CA , CA Zip: 91201
Contact Name: Mark Young Title: Deputy General Manager
Phone #: 8185483293 Ext. Fax #:
E-Mail: MYoung@Glendaleca.gov

Section C - Permit Mailing Address

5. Permit and Correspondence Information:
☐ Check here if same as equipment location address

Address: 141 N. Glendale Ave
City: Glendale, CA , State: CA Zip: 91206
Contact Name: Mark Young Title: Deputy General Manager
Phone #: 8185483293 Ext. Fax #:
E-Mail: MYoung@Glendaleca.gov

Section D - Application Type

6. The Facility Is: ○ Not In RECLAIM or Title V ○ In RECLAIM ● In Title V ○ In RECLAIM & Title V Programs

7. Reason for Submitting Application (Select only ONE):

7a. New Equipment or Process Application:

- ● New Construction (Permit to Construct)
- ○ Equipment On-Site But Not Constructed or Operational
- ○ Equipment Operating Without A Permit *
- ○ Compliance Plan
- ○ Registration/Certification
- ○ Streamlined Standard Permit

7b. Facility Permits:

- ○ Title V Application or Amendment (Refer to Title V Matrix)
- ○ RECLAIM Facility Permit Amendment

7c. Equipment or Process with an Existing/Previous Application or Permit:

- ○ Administrative Change
- ○ Alteration/Modification
- ○ Alteration/Modification without Prior Approval *
- ○ Change of Condition
- ○ Change of Condition without Prior Approval *
- ○ Change of Location
- ○ Change of Location without Prior Approval *
- ○ Equipment Operating with an Expired/Inactive Permit *

Existing or Previous Permit/Application
If you checked any of the items in 7c., you MUST provide an existing Permit or Application Number: ______

* A Higher Permit Processing Fee and additional Annual Operating Fees (up to 3 full years) may apply (Rule 301(c)(1)(D)(i)).

8a. Estimated Start Date of Construction (mm/dd/yyyy): 06/01/2021

8b. Estimated End Date of Construction (mm/dd/yyyy): 12/01/2024

8c. Estimated Start Date of Operation (mm/dd/yyyy): 12/01/2024

9. Description of Equipment or Reason for Compliance Plan (list applicable rule): Install/operate Wartsila 18V50SG reciprocating IC engines to replace existing generating equipment [Unit 14]

10. For identical equipment, how many additional applications are being submitted with this application? (Form 400-A required for each equipment / process) 4

11. Are you a Small Business as per AQMD's Rule 102 definition? (10 employees or less and total gross receipts are $500,000 or less OR a not-for-profit training center) ● No ○ Yes

12. Has a Notice of Violation (NOV) or a Notice to Comply (NC) been issued for this equipment? ● No ○ Yes
If Yes, provide NOV/NC#: ______

Section E - Facility Business Information

13. What type of business is being conducted at this equipment location? Electricity generation

14. What is your business primary NAICS Code? (North American Industrial Classification System) 221112

15. Are there other facilities in the SCAQMD jurisdiction operated by the same operator? ○ No ● Yes

16. Are there any schools (K-12) within 1000 feet of the facility property line? ● No ○ Yes

Section F - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application are true and correct.

17. Signature of Responsible Official:

18. Title of Responsible Official: General Manager

19. I wish to review the permit prior to issuance. (This may cause a delay in the application process.) ○ No ● Yes

20. Print Name: Steve Zurn

21. Date: 5·20·20

22. Do you claim confidentiality of data? (If Yes, see instructions.) ● No ○ Yes

23. Check List: ☒ Authorized Signature/Date ☒ Form 400-CEQA ☒ Supplemental Form(s) (ie., Form 400-E-xx) ☒ Fees Enclosed

AQMD USE ONLY	APPLICATION TRACKING #	CHECK #	AMOUNT RECEIVED	PAYMENT TRACKING #	VALIDATION
			$		

DATE	APP REJ	DATE	APP REJ	CLASS I III	BASIC CONTROL	EQUIPMENT CATEGORY CODE	TEAM	ENGINEER	REASON/ACTION TAKEN

South Coast Air Quality Management District

Form 400-CEQA

California Environmental Quality Act (CEQA) Applicability

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

The SCAQMD is required by state law, the California Environmental Quality Act (CEQA), to review discretionary permit project applications for potential air quality and other environmental impacts. This form is a screening tool to assist the SCAQMD in clarifying whether or not the project[1] has the potential to generate significant adverse environmental impacts that might require preparation of a CEQA document [CEQA Guidelines §15060(a)].[2] Refer to the attached instructions for guidance in completing this form.[3] For each Form 400-A application, also complete and submit one Form 400-CEQA. If submitting multiple Form 400-A applications for the same project at the same time, only one 400-CEQA form is necessary for the entire project. If you need assistance completing this form, contact Permit Services at (909) 396-3385 or (909) 396-2668.

Section A - Facility Information

1. Facility Name (Business Name of Operator To Appear On The Permit): Glendale City, Glendale Water & Power

2. Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

3. Project Description:
Grayson Repower Project: replace existing boilers, gas turbine generators (except Unit 9), cooling towers and auxiliary equipment with 5 new reciprocating IC engines, emission control systems, CEMS and other auxiliary equipment. [Unit 14]

Section B - Review For Exemption From Further CEQA Action

Check "Yes" or "No" as applicable

	Yes	No	Is this application for:
1.	●	○	**A CEQA and/or NEPA document previously or currently prepared that specifically evaluates this project?** If yes, attach a copy of the signed Notice of Determination to this form.
2.	○	●	**A request for a change of permittee only (without equipment modifications)?**
3.	○	●	**A functionally identical permit unit replacement with no increase in rating or emissions?**
4.	○	●	**A change of daily VOC permit limit to a monthly VOC permit limit?**
5.	○	●	**Equipment damaged as a result of a disaster during state of emergency?**
6.	○	●	**A Title V** (i.e., Regulation XXX) **permit renewal (without equipment modifications)?**
7.	○	●	**A Title V administrative permit revision?**
8.	○	●	**The conversion of an existing permit into an initial Title V permit?**

If "**Yes**" is checked for any question in Section B, your application does not require additional evaluation for CEQA applicability. Skip to Section D - Signatures on page 2 and sign and date this form.

Section C - Review of Impacts Which May Trigger CEQA

Complete Parts I-VI by checking "Yes" or "No" as applicable. To avoid delays in processing your application(s), explain all "Yes" responses on a separate sheet and attach it to this form.

	Yes	No	Part I - General
1.	○	○	**Has this project generated any known public controversy regarding potential adverse impacts that may be generated by the project?** Controversy may be construed as concerns raised by local groups at public meetings; adverse media attention such as negative articles in newspapers or other periodical publications, local news programs, environmental justice issues, etc.
2.	○	○	**Is this project part of a larger project?** If yes, attach a separate sheet to briefly describe the larger project.
			Part II - Air Quality
3.	○	○	**Will there be any demolition, excavating, and/or grading construction activities that encompass an area exceeding 20,000 square feet?**
4.	○	○	**Does this project include the open outdoor storage of dry bulk solid materials that could generate dust?** If Yes, include a plot plan with the application package.

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[1] A "project" means the whole of an action which has a potential for resulting in physical change to the environment, including construction activities, clearing or grading of land, improvements to existing structures, and activities or equipment involving the issuance of a permit. For example, a project might include installation of a new, or modification of an existing internal combustion engine, dry-cleaning facility, boiler, gas turbine, spray coating booth, solvent cleaning tank, etc.

[2] To download the CEQA guidelines, visit http://ceres.ca.gov/env_law/state.html.

[3] To download this form and the instructions, visit http://www.aqmd.gov/ceqa or http://www.aqmd.gov/permit

Section C - Review of Impacts Which May Trigger CEQA (cont.)			
	Yes	**No**	**Part II - Air Quality (cont.)**
5.	○	○	**Would this project result in noticeable off-site odors from activities that may not be subject to SCAQMD permit requirements?** For example, compost materials or other types of greenwaste (i.e., lawn clippings, tree trimmings, etc.) have the potential to generate odor complaints subject to Rule 402 – Nuisance.
6.	○	○	**Does this project cause an increase of emissions from marine vessels, trains and/or airplanes?**
7.	○	○	**Will the proposed project increase the QUANTITY of hazardous materials stored aboveground onsite or transported by mobile vehicle to or from the site by greater than or equal to the amounts associated with each compound on the attached Table 1?**[4]
			Part III – Water Resources
8.	○	○	**Will the project increase demand for water at the facility by more than 5,000,000 gallons per day?** The following examples identify some, but not all, types of projects that may result in a "yes" answer to this question: 1) projects that generate steam; 2) projects that use water as part of the air pollution control equipment; 3) projects that require water as part of the production process; 4) projects that require new or expansion of existing sewage treatment facilities; 5) projects where water demand exceeds the capacity of the local water purveyor to supply sufficient water for the project; and 6) projects that require new or expansion of existing water supply facilities.
9.	○	○	**Will the project require construction of new water conveyance infrastructure?** Examples of such projects are when water demands exceed the capacity of the local water purveyor to supply sufficient water for the project, or require new or modified sewage treatment facilities such that the project requires new water lines, sewage lines, sewage hook-ups, etc.
			Part IV – Transportation/Circulation
10.			**Will the project result in** (Check all that apply):
	○	○	**a. the need for more than 350 new employees?**
	○	○	**b. an increase in heavy-duty transport truck traffic to and/or from the facility by more than 350 truck round-trips per day?**
	○	○	**c. increase customer traffic by more than 700 visits per day?**
			Part V – Noise
11.	○	○	**Will the project include equipment that will generate noise GREATER THAN 90 decibels (dB) at the property line?**
			Part VI – Public Services
12.			**Will the project create a permanent need for new or additional public services in any of the following areas** (Check all that apply):
	○	○	**a. Solid waste disposal?** Check "No" if the projected potential amount of wastes generated by the project is less than five tons per day.
	○	○	**b. Hazardous waste disposal?** Check "No" if the projected potential amount of hazardous wastes generated by the project is less than 42 cubic yards per day (or equivalent in pounds).

REMINDER: *For each "Yes" response in Section C, attach all pertinent information including but not limited to estimated quantities, volumes, weights, etc.*

Section D - Signatures

I HEREBY CERTIFY THAT ALL INFORMATION CONTAINED HEREIN AND INFORMATION SUBMITTED WITH THIS APPLICATION IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE. I UNDERSTAND THAT THIS FORM IS A SCREENING TOOL AND THAT THE SCAQMD RESERVES THE RIGHT TO CONSIDER OTHER PERTINENT INFORMATION IN DETERMINING CEQA APPLICABILITY.

1. Signature of Responsible Official of Firm:

2. Title of Responsible Official of Firm: General Manager

3. Print Name of Responsible Official of Firm: Steve Zurn

4. Date Signed: 5·20·20

5. Phone # of Responsible Official of Firm: (818) 548-2107

6. Fax # of Responsible Official of Firm:

7. Email of Responsible Official of Firm: SZurn@Glendaleca.gov

8. Signature of Preparer, (If prepared by person other than responsible official of firm): Nancy L. Matthews

9. Title of Preparer: Partner, Foulweather Consulting

10. Print Name of Preparer: Nancy Matthews

11. Date Signed: 4/29/20

12. Phone # of Preparer: 9167985665

13. Fax # of Preparer:

14. Email of Preparer: Nancy@foulweatherconsulting.com

THIS CONCLUDES FORM 400-CEQA. INCLUDE THIS FORM AND ANY ATTACHMENTS WITH FORM 400-A.

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[4] Table 1 – Regulated Substances List and Threshold Quantities for Accidental Release Prevention can be found in the Instructions for Form 400-CEQA.

South Coast Air Quality Management District

Form 400-PS Revised June 2021

Plot Plan And Stack Information Form

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Form 400A and Form 400-CEQA.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944
Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator To Appears On The Permit): Glendale City, Glendale Water & Power

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 800 Air Way, Glendale, CA 91201

● **Fixed Location** ○ **Various Locations**

Section B - Location Data [Unit 14]

Plot Plan

Please attach a site map for the project with distances and scales. Identify and locate the proposed equipment on the map. A copy of the appropriate Thomas Brothers page, a web-based map, or a sketch that shows the major streets and location of the equipment is acceptable.

Location of Schools Nearby

Is the facility located within a 1/4 mile radius (1,320 feet) of the outer boundary of a school? ○ Yes ● No

If yes, please provide name(s) of school(s) below:

School Name: ______ **School Name:** ______

School Address: ______ **School Address:** ______

Distance from stack or equipment vent to the outer boundary of the school: ______ feet **Distance from stack or equipment vent to the outer boundary of the school:** ______ feet

CA Health & Safety Code 42301.9: "School" means any public or private school used for the purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes.

Population Density

● Urban ○ Rural (<50% of land within 3 km radius accounted for by urban land use categories, i.e., multi-family dwelling or industrial.)

Zoning Classification

○ **Mixed Use Residential Commercial Zone (M-U)** ○ **Service and Professional Zone (C-S)** ○ **Medium Commercial (C-3)**

● **Heavy Commercial (C-4)** ○ **Commercial Manufacturing (C-M)**

Section C - Emission Release Parameters - Stacks, Vents

Stack Data

Stack Height: 9.67 feet (above ground level) **What is the height of the closest building nearest the stack?** 43 feet

Stack Inside Diameter: ______ inches **Stack Flow:** ______ acfm **Stack Temperature:** ______ ℉

Rain Cap Present: ○ Yes ● No **Stack Orientation:** ● Vertical ○ Horizontal

If the stack height is less than 2.5 times the closest building height (H), please provide information on any building within 5xH distance from the stack (attach additional sheet if necessary):

Building #/Name:	Engine Hall	**Building #/Name:**	
Building Height:	43 feet (above ground level)	**Building Height:**	feet (above ground level)
Building Width:	107 feet	**Building Width:**	feet
Building Length:	160 feet	**Building Length:**	feet

Receptor Distance From Equipment Stack or Roof Vents/Openings

Distance to nearest residence or sensitive receptor*: 3064 feet

Distance to nearest business: 650 feet

Building Information

Are the emissions released from vents and/or openings from a building? ○ Yes ● No

If yes, please provide:

Building #/Name: ______ **Building Width:** ______ feet

Building Height: ______ feet (above ground level) **Building Length:** ______ feet

---

*AQMD Rule 1470 defines SENSITIVE RECEPTOR as meaning any residence including private homes, condominiums, apartments, and living quarters, schools as defined under paragraph (b)(57), preschools, daycare centers and health facilities such as hospitals or retirement and nursing homes. A sensitive receptor includes long term care hospitals, hospices, prisons, and dormitories or similar live-in housing.

South Coast Air Quality Management District

Form 400-PS

Plot Plan And Stack Information Form

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Form 400A and Form 400-CEQA.

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submittfgfed with this application is true and correct.

Signature of Preparer: Nancy Matthews

Title of Preparer: Partner, Foulweather Consultin

Preparer's Phone #: 916-798-5665

Preparer's Email: Nancy@foulweatherconsulting.com

Contact Person: Mark Young

Contact's Email: MYoung@glendaleca.gov

Contact's Phone#: (818) 548-3293

Contact's Fax#:

Date Signed:

THIS IS A PUBLIC DOCUMENT

Pursuant to the California Public Records Act, your permit application and any supplemental documentation are public records and may be disclosed to a third party. If you wish to claim certain limited information as exempt from disclosure because it qualifies as a trade secret, as defined in the District's Guidelines for Implementing the California Public Records Act, you must make such claim <u>at the time of submittal</u> to the District.

Check here if you claim that this form or its attachments contain confidential trade secret information. ☐

Figure 1-2. Alternative 7 Layout

South Coast Air Quality Management District

Form 400-E-5
Selective Catalytic Reduction (SCR) System, Oxidation Catalyst, and Ammonia Catalyst

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator That Appears On Permit): Glendale City, Glendale Water & Power

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 800 Air Way, Glendale, CA 91201

● Fixed Location ○ Various Locations

Section B - Equipment Description [Unit 14]

Selective Catalytic Reduction (SCR)

SCR Catalyst	Manufacturer: Umicore, Cormetech or equiv. Catalyst Active Material: vanadium Model Number: ______ Type: ______ Size of Each Layer or Module: L: 1 ft. 6.3 in. W: 1 ft. 6.3 in. H: 0 ft. 10.6 in. No. of Layers or Modules: 147 Total Volume: 304 cu. ft. Total Weight: 6157 lbs.
Reducing Agent	○ Urea ○ Anhydrous Ammonia ● Aqueous Ammonia 19 % Injection Rate: 220 lb/hr
Reducing Agent Storage*	Diameter: 9 ft. ______ in. Height: 15 ft. ______ in. Capacity: 13209 gal net Pressure Setting: 19.7 psia * A separate permit may be needed for the storage equipment.
Space Velocity	Gas Flow Rate/Catalyst Volume: 11900 per hour
Area Velocity	Gas Flow Rate/Wetted Catalyst Surface Area: ______ ft/hr
Manufacturer's Guarantee	NOx: 2.4 ppm $\%O_2$: 15 NOx: 0.023 gm/bhp-hr Ammonia Slip: 5 ppm @ 15 $\%O_2$
Catalyst Life	5 years (expected)
Cost	Capital Cost: ______ Installation Cost: ______ Catalyst Replacement Cost: ______

Oxidation Catalyst

Oxidation Catalyst	Manufacturer: Umicore, Cormetech or equiv Catalyst Active Material: Palladium, platinum or equiv Model Number: ______ Type: ______ Size of Each Layer or Module: L: 1 ft. 6.3 in. W: 1 ft. 6.3 in. H: 0 ft. 5.1 in. No. of Layers or Modules: 98 Total Volume: 150 cu. ft. Total Weight: 4104 lbs.
Space Velocity	Gas Flow Rate/Catalyst Volume: 24000 per hour
Manufacturer's Guarantee	VOC: 9.8 ppm VOC: 0.033 gm/bhp-hr $\%O_2$: 15 CO: 11.2 ppm CO: 0.066 gm/bhp-hr $\%O_2$: 15
Catalyst Life	5 years (expected)
Cost	Capital Cost: ______ Installation Cost: ______ Catalyst Replacement Cost: ______

South Coast Air Quality Management District

Form 400-E-5
Selective Catalytic Reduction (SCR) System, Oxidation Catalyst, and Ammonia Catalyst

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Section B - Equipment Description (cont.)

Ammonia Catalyst

Ammonia Catalyst	Manufacturer: Catalyst Active Material: Model Number: Type: Size of Each Layer or Module: L: ft. in. W: ft. in. H: ft. in. No. of Layers or Modules: Total Volume: cu. ft. Total Weight: lbs.
Space Velocity	Gas Flow Rate/Catalyst Volume: per hour
Manufacturer's Guarantee	NH_3: ppm %O_2:
Catalyst Life	years (expected)
Cost	Capital Cost: Installation Cost: Catalyst Replacement Cost:

Section C - Operation Information

Operating Temperature	Minimum Inlet Temperature: °F (from cold start) Maximum Temperature: 896 °F Warm-up Time: – hr. 30 min. (maximum)
Operating Schedule	Normal: up to 10 hours/day up to 5 days/week up to 50 weeks/yr Maximum: 24 hours/day 7 days/week 52 weeks/yr

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application is true and correct.

Preparer Info	Signature: Nancy L. Matthews Date: 4/29/20 Title: Partner Company Name: Foulweather Consulting	Name: Nancy Matthews Phone #: 9167985665 Fax #: Email: Nancy@foulweatherconsulting.com
Contact Info	Name: Mark Young Title: Deputy General Manager Company Name: Glendale Water & Power	Phone #: 8185483293 Fax #: Email: MYoung@Glendaleca.gov

THIS IS A PUBLIC DOCUMENT

Pursuant to the California Public Records Act, your permit application and any supplemental documentation are public records and may be disclosed to a third party. If you wish to claim certain limited information as exempt from disclosure because it qualifies as a trade secret, as defined in the District's Guidelines for Implementing the California Public Records Act, you must make such claim at the time of submittal to the District.

Check here if you claim that this form or its attachments contain confidential trade secret information. ☐

South Coast Air Quality Management District

Form 400-E-13b
Non-Emergency Internal Combustion Engine

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator That Appears On Permit): Glendale City, Glendale Water & Power

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 800 Air Way, Glendale, CA 91201

● Fixed Location ○ Various Locations

Section B - Equipment Description [Unit 14]

Internal Combustion Engine	Is the ICE an EPA Certified or Qualifying Non-Road Engine? ● No ○ Yes If yes, provide EPA Certificate No., and attach copy: ____ Manufacturer: Wartsila Model: 18V50SG Serial No.: tbd Date of Manufacture: tbd (mm/dd/yyyy) Date of Installation: 06/01/2024 (mm/dd/yyyy) Note: For an ICE manufactured after 7/18/94, please provide manufacturer's specification and guarantee. Manufacturer Maximum Rating: 25,828 BHP@ 514 RPM
ICE Function (Check all that apply)	☒ Electrical Generator ☐ Fire Pump ☐ Compressor ☐ Co-Generation ☐ Flood Control ☐ Pump Driver ☐ Other (specify): ____
Type	● Stationary ○ Portable How Is This Type of Equipment Used? (Check All That Apply) ☒ Within Facility ☐ Off-Site ☐ Rental ☐ Non-Rental
Fuel	☒ Natural Gas ☐ LPG ☐ Refinery Gas* ☐ Digester Gas* ☐ Landfill Gas* ☐ Diesel Oil No. 2 ☐ Other* : ____ *If Digester Gas, Landfill Gas, Refinery Gas, and/or Other are checked, attach fuel analysis indicating higher heating value and sulfur content.
Stand-By Fuel	☐ Natural Gas ☐ LPG ☐ Refinery Gas* ☐ Digester Gas* ☐ Landfill Gas* ☐ Diesel Oil No. 2 ☐ Other* : ____ *If Digester Gas, Landfill Gas, Refinery Gas, and/or Other are checked, attach fuel analysis indicating higher heating value and sulfur content.
Cycle Type	○ Two Cycle ● Four Cycle
Combustion Type	● Lean Burn ○ Rich Burn
No. of Cylinders	○ Four ○ Six ○ Eight ○ Ten ○ Twelve ○ Sixteen ● Other: 18
Aspiration Type	○ Turbocharged ● Turbocharged/Aftercooled ○ Naturally Aspirated ☐ Timing Retarded ≥ 4° (relative to standard timing)
Air Pollution Control (If Applicable)	○ Selective Catalytic Reduction (SCR) * ○ No Controls ○ Selective Non-Catalytic Reduction (SNCR) * ○ Air Fuel Ratio Controller ○ Non-selective Catalytic Reduction (NSCR) ● Other (specify): oxidation catalyst and SCR * Separate application is required. Manufacturer: Umicore, Cormetech or equiv. Model: tbd If already permitted, indicate Permit No.: ____ Device No.: ____

South Coast Air Quality Management District

Form 400-E-13b

Non-Emergency Internal Combustion Engine

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Section C - Operation Information

Fuel Consumption

Maximum Rated Load: ______ **gal./hr. OR** 156,720 **cu.ft./hr**

Average Load: ______ **gal./hr. OR** 156,720 **cu.ft./hr.**

Emissions Data

Pollutants	Maximum Emissions Before Control		Maximum Emissions After Control	
	gm/Bhp-hr	PPM (15% O_2)	gm/Bhp-hr	PPM (15% O_2)
ROG			0.033	9.8
NOx			0.023	2.4
CO			0.066	11.2
PM	0.023	5.0 mg/Nm3	0.023	5.0 mg/Nm3
SOx	0.002	0.029	0.002	0.029

Emissions Reference (attach):

☒ Manufacturer's Guarantee
☐ Catalytic Manufacturer's Guarantee
☐ Source Test Data
☐ EPA Emission Factors
☐ Other (specify): ______

Operating Schedule

Normal: up to 10 hours/day up to 5 days/week up to 50 weeks/yr

Maximum: 24 hours/day 7 days/week 52 weeks/yr

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application is true and correct.

Preparer Info

Signature: Nancy L. Matthews
Date: 4/29/20
Name: Nancy Matthews
Phone #: 9167985665
Fax #:
Title: Partner
Company Name: Foulweather Consulting
Email: Nancy@Foulweatherconsulting.com

Contact Info

Name: Mark Young
Phone #: 8185483293
Fax #:
Title: Deputy General Manager
Company Name: Glendale Water & Power
Email: MYoung@Glendaleca.gov

THIS IS A PUBLIC DOCUMENT

Pursuant to the California Public Records Act, your permit application and any supplemental documentation are public records and may be disclosed to a third party. If you wish to claim certain limited information as exempt from disclosure because it qualifies as a trade secret, as defined in the District's Guidelines for Implementing the California Public Records Act, you must make such claim at the time of submittal to the District.

Check here if you claim that this form or its attachments contain confidential trade secret information. ☐

AQMD

South Coast Air Quality Management District

Form 400-A

Application Form for Permit or Plan Approval

List only one piece of equipment or process per form.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

1. Facility Name (Business Name of Operator to Appear on the Permit): Glendale City, Glendale Water and Power

2. Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

3. Owner's Business Name (if different from Business Name of Operator): [same]

Section B - Equipment Location Address

4. Equipment Location Is: ● Fixed Location ○ Various Location
(For equipment operated at various locations, provide address of initial site.)

Street Address: 800 Air Way
City: Glendale, CA , CA Zip: 91201
Contact Name: Mark Young Title: Deputy General Manager
Phone #: 8185483293 Ext. Fax #:
E-Mail: MYoung@Glendaleca.gov

Section C - Permit Mailing Address

5. Permit and Correspondence Information:
☐ Check here if same as equipment location address

Address: 141 N. Glendale Ave
City: Glendale, CA State: CA Zip: 91206
Contact Name: Mark Young Title: Deputy General Manager
Phone #: 8185483293 Ext. Fax #:
E-Mail: MYoung@Glendaleca.gov

Section D - Application Type

6. The Facility Is: ○ Not In RECLAIM or Title V ○ In RECLAIM ● In Title V ○ In RECLAIM & Title V Programs

7. Reason for Submitting Application (Select only ONE):

7a. New Equipment or Process Application:

- ● New Construction (Permit to Construct)
- ○ Equipment On-Site But Not Constructed or Operational
- ○ Equipment Operating Without A Permit *
- ○ Compliance Plan
- ○ Registration/Certification
- ○ Streamlined Standard Permit

7b. Facility Permits:

- ○ Title V Application or Amendment (Refer to Title V Matrix)
- ○ RECLAIM Facility Permit Amendment

7c. Equipment or Process with an Existing/Previous Application or Permit:

- ○ Administrative Change
- ○ Alteration/Modification
- ○ Alteration/Modification without Prior Approval *
- ○ Change of Condition
- ○ Change of Condition without Prior Approval *
- ○ Change of Location
- ○ Change of Location without Prior Approval *
- ○ Equipment Operating with an Expired/Inactive Permit *

Existing or Previous Permit/Application
If you checked any of the items in 7c., you MUST provide an existing Permit or Application Number: ________

* A Higher Permit Processing Fee and additional Annual Operating Fees (up to 3 full years) may apply (Rule 301(c)(1)(D)(i)).

8a. Estimated Start Date of Construction (mm/dd/yyyy): 06/01/2021

8b. Estimated End Date of Construction (mm/dd/yyyy): 12/01/2024

8c. Estimated Start Date of Operation (mm/dd/yyyy): 12/01/2024

9. Description of Equipment or Reason for Compliance Plan (list applicable rule): Install/operate Wartsila 18V50SG reciprocating IC engines to replace existing generating equipment [Unit 15]

10. For identical equipment, how many additional applications are being submitted with this application? (Form 400-A required for each equipment / process): 4

11. Are you a Small Business as per AQMD's Rule 102 definition? (10 employees or less and total gross receipts are $500,000 or less OR a not-for-profit training center) ● No ○ Yes

12. Has a Notice of Violation (NOV) or a Notice to Comply (NC) been issued for this equipment? ● No ○ Yes
If Yes, provide NOV/NC#:

Section E - Facility Business Information

13. What type of business is being conducted at this equipment location? Electricity generation

14. What is your business primary NAICS Code? (North American Industrial Classification System): 221112

15. Are there other facilities in the SCAQMD jurisdiction operated by the same operator? ○ No ● Yes

16. Are there any schools (K-12) within 1000 feet of the facility property line? ● No ○ Yes

Section F - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application are true and correct.

17. Signature of Responsible Official:

18. Title of Responsible Official: General Manager

19. I wish to review the permit prior to issuance. (This may cause a delay in the application process.) ○ No ● Yes

20. Print Name: Steve Zurn

21. Date: 5·20·2

22. Do you claim confidentiality of data? (If Yes, see instructions.) ● No ○ Yes

23. Check List: ☒ Authorized Signature/Date ☒ Form 400-CEQA ☒ Supplemental Form(s) (ie., Form 400-E-xx) ☒ Fees Enclosed

AQMD USE ONLY	APPLICATION TRACKING #	CHECK #	AMOUNT RECEIVED $	PAYMENT TRACKING #	VALIDATION

DATE	APP REJ	DATE	APP REJ	CLASS I III	BASIC CONTROL	EQUIPMENT CATEGORY CODE	TEAM	ENGINEER	REASON/ACTION TAKEN

South Coast Air Quality Management District

Form 400-CEQA
California Environmental Quality Act (CEQA) Applicability

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

The SCAQMD is required by state law, the California Environmental Quality Act (CEQA), to review discretionary permit project applications for potential air quality and other environmental impacts. This form is a screening tool to assist the SCAQMD in clarifying whether or not the project[1] has the potential to generate significant adverse environmental impacts that might require preparation of a CEQA document [CEQA Guidelines §15060(a)].[2] Refer to the attached instructions for guidance in completing this form.[3] For each Form 400-A application, also complete and submit one Form 400-CEQA. If submitting multiple Form 400-A applications for the same project at the same time, only one 400-CEQA form is necessary for the entire project. If you need assistance completing this form, contact Permit Services at (909) 396-3385 or (909) 396-2668.

Section A - Facility Information

1. Facility Name (Business Name of Operator To Appear On The Permit): Glendale City, Glendale Water & Power

2. Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

3. Project Description:
Grayson Repower Project: replace existing boilers, gas turbine generators (except Unit 9), cooling towers and auxiliary equipment with 5 new reciprocating IC engines, emission control systems, CEMS and other auxiliary equipment. [Unit 15]

Section B - Review For Exemption From Further CEQA Action

Check "Yes" or "No" as applicable

	Yes	No	Is this application for:
1.	●	○	**A CEQA and/or NEPA document previously or currently prepared that specifically evaluates this project?** If yes, attach a copy of the signed Notice of Determination to this form.
2.	○	●	**A request for a change of permittee only (without equipment modifications)?**
3.	○	●	**A functionally identical permit unit replacement with no increase in rating or emissions?**
4.	○	●	**A change of daily VOC permit limit to a monthly VOC permit limit?**
5.	○	●	**Equipment damaged as a result of a disaster during state of emergency?**
6.	○	●	**A Title V** (i.e., Regulation XXX) **permit renewal (without equipment modifications)?**
7.	○	●	**A Title V administrative permit revision?**
8.	○	●	**The conversion of an existing permit into an initial Title V permit?**

If **"Yes"** is checked for any question in Section B, your application does not require additional evaluation for CEQA applicability. Skip to Section D - Signatures on page 2 and sign and date this form.

Section C - Review of Impacts Which May Trigger CEQA

Complete Parts I-VI by checking "Yes" or "No" as applicable. To avoid delays in processing your application(s), explain all "Yes" responses on a separate sheet and attach it to this form.

	Yes	No	Part I - General
1.	○	○	**Has this project generated any known public controversy regarding potential adverse impacts that may be generated by the project?** Controversy may be construed as concerns raised by local groups at public meetings; adverse media attention such as negative articles in newspapers or other periodical publications, local news programs, environmental justice issues, etc.
2.	○	○	**Is this project part of a larger project?** If yes, attach a separate sheet to briefly describe the larger project.
			Part II - Air Quality
3.	○	○	**Will there be any demolition, excavating, and/or grading construction activities that encompass an area exceeding 20,000 square feet?**
4.	○	○	**Does this project include the open outdoor storage of dry bulk solid materials that could generate dust?** If Yes, include a plot plan with the application package.

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[1] A "project" means the whole of an action which has a potential for resulting in physical change to the environment, including construction activities, clearing or grading of land, improvements to existing structures, and activities or equipment involving the issuance of a permit. For example, a project might include installation of a new, or modification of an existing internal combustion engine, dry-cleaning facility, boiler, gas turbine, spray coating booth, solvent cleaning tank, etc.

[2] To download the CEQA guidelines, visit http://ceres.ca.gov/env_law/state.html.

[3] To download this form and the instructions, visit http://www.aqmd.gov/ceqa or http://www.aqmd.gov/permit

Section C - Review of Impacts Which May Trigger CEQA (cont.)

	Yes	No	Part II - Air Quality (cont.)
5.	○	○	**Would this project result in noticeable off-site odors from activities that may not be subject to SCAQMD permit requirements?** For example, compost materials or other types of greenwaste (i.e., lawn clippings, tree trimmings, etc.) have the potential to generate odor complaints subject to Rule 402 – Nuisance.
6.	○	○	**Does this project cause an increase of emissions from marine vessels, trains and/or airplanes?**
7.	○	○	**Will the proposed project increase the QUANTITY of hazardous materials stored aboveground onsite or transported by mobile vehicle to or from the site by greater than or equal to the amounts associated with each compound on the attached Table 1?**[4]
			Part III – Water Resources
8.	○	○	**Will the project increase demand for water at the facility by more than 5,000,000 gallons per day?** The following examples identify some, but not all, types of projects that may result in a "yes" answer to this question: 1) projects that generate steam; 2) projects that use water as part of the air pollution control equipment; 3) projects that require water as part of the production process; 4) projects that require new or expansion of existing sewage treatment facilities; 5) projects where water demand exceeds the capacity of the local water purveyor to supply sufficient water for the project; and 6) projects that require new or expansion of existing water supply facilities.
9.	○	○	**Will the project require construction of new water conveyance infrastructure?** Examples of such projects are when water demands exceed the capacity of the local water purveyor to supply sufficient water for the project, or require new or modified sewage treatment facilities such that the project requires new water lines, sewage lines, sewage hook-ups, etc.
			Part IV – Transportation/Circulation
10.			**Will the project result in** (Check all that apply):
	○	○	**a. the need for more than 350 new employees?**
	○	○	**b. an increase in heavy-duty transport truck traffic to and/or from the facility by more than 350 truck round-trips per day?**
	○	○	**c. increase customer traffic by more than 700 visits per day?**
			Part V – Noise
11.	○	○	**Will the project include equipment that will generate noise GREATER THAN 90 decibels (dB) at the property line?**
			Part VI – Public Services
12.			**Will the project create a permanent need for new or additional public services in any of the following areas** (Check all that apply):
	○	○	**a. Solid waste disposal?** Check "No" if the projected potential amount of wastes generated by the project is less than five tons per day.
	○	○	**b. Hazardous waste disposal?** Check "No" if the projected potential amount of hazardous wastes generated by the project is less than 42 cubic yards per day (or equivalent in pounds).

REMINDER: *For each "Yes" response in Section C, attach all pertinent information including but not limited to estimated quantities, volumes, weights, etc.*

Section D - Signatures

I HEREBY CERTIFY THAT ALL INFORMATION CONTAINED HEREIN AND INFORMATION SUBMITTED WITH THIS APPLICATION IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE. I UNDERSTAND THAT THIS FORM IS A SCREENING TOOL AND THAT THE SCAQMD RESERVES THE RIGHT TO CONSIDER OTHER PERTINENT INFORMATION IN DETERMINING CEQA APPLICABILITY.

1. Signature of Responsible Official of Firm:		**2. Title of Responsible Official of Firm:** General Manager
3. Print Name of Responsible Official of Firm: Steve Zurn		**4. Date Signed:** 5·20·20
5. Phone # of Responsible Official of Firm: (818) 548-2107	**6. Fax # of Responsible Official of Firm:**	**7. Email of Responsible Official of Firm:** SZurn@Glendaleca.gov
8. Signature of Preparer, (If prepared by person other than responsible official of firm): Nancy L. Matthews		**9. Title of Preparer:** Partner, Foulweather Consulting
10. Print Name of Preparer: Nancy Matthews		**11. Date Signed:** 4/29/20
12. Phone # of Preparer: 9167985665	**13. Fax # of Preparer:**	**14. Email of Preparer:** Nancy@foulweatherconsulting.com

THIS CONCLUDES FORM 400-CEQA. INCLUDE THIS FORM AND ANY ATTACHMENTS WITH FORM 400-A.

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[4] Table 1 – Regulated Substances List and Threshold Quantities for Accidental Release Prevention can be found in the Instructions for Form 400-CEQA.

South Coast Air Quality Management District

Form 400-PS Revised June 2021

Plot Plan And Stack Information Form

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Form 400A and Form 400-CEQA.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944
Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator To Appears On The Permit): Glendale City, Glendale Water & Power

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 800 Air Way, Glendale, CA 91201

● **Fixed Location** ○ **Various Locations**

Section B - Location Data [Unit 15]

Plot Plan	Please attach a site map for the project with distances and scales. Identify and locate the proposed equipment on the map. A copy of the appropriate Thomas Brothers page, a web-based map, or a sketch that shows the major streets and location of the equipment is acceptable.
Location of Schools Nearby	**Is the facility located within a 1/4 mile radius (1,320 feet) of the outer boundary of a school?** ○ Yes ● No If yes, please provide name(s) of school(s) below: **School Name:** ______ **School Name:** ______ **School Address:** ______ **School Address:** ______ **Distance from stack or equipment vent to the outer boundary of the school:** ______ feet **Distance from stack or equipment vent to the outer boundary of the school:** ______ feet **CA Health & Safety Code 42301.9:** "School" means any public or private school used for the purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes.
Population Density	● Urban ○ Rural (<50% of land within 3 km radius accounted for by urban land use categories, i.e., multi-family dwelling or industrial.)
Zoning Classification	○ **Mixed Use Residential Commercial Zone (M-U)** ○ **Service and Professional Zone (C-S)** ○ **Medium Commercial (C-3)** ● **Heavy Commercial (C-4)** ○ **Commercial Manufacturing (C-M)**

Section C - Emission Release Parameters - Stacks, Vents

Stack Data	**Stack Height:** 9.67 feet (above ground level) **What is the height of the closest building nearest the stack?** 43 feet **Stack Inside Diameter:** ______ inches **Stack Flow:** ______ acfm **Stack Temperature:** ______ ℉ **Rain Cap Present:** ○ Yes ● No **Stack Orientation:** ● Vertical ○ Horizontal If the stack height is less than 2.5 times the closest building height (H), please provide information on any building within 5xH distance from the stack (attach additional sheet if necessary): **Building #/Name:** Engine Hall **Building #/Name:** ______ **Building Height:** 43 feet (above ground level) **Building Height:** ______ feet (above ground level) **Building Width:** 107 feet **Building Width:** ______ feet **Building Length:** 160 feet **Building Length:** ______ feet
Receptor Distance From Equipment Stack or Roof Vents/Openings	**Distance to nearest residence or sensitive receptor*:** 3064 feet **Distance to nearest business:** 650 feet
Building Information	**Are the emissions released from vents and/or openings from a building?** ○ Yes ● No If yes, please provide: **Building #/Name:** ______ **Building Width:** ______ feet **Building Height:** ______ feet (above ground level) **Building Length:** ______ feet

*AQMD Rule 1470 defines SENSITIVE RECEPTOR as meaning any residence including private homes, condominiums, apartments, and living quarters, schools as defined under paragraph (b)(57), preschools, daycare centers and health facilities such as hospitals or retirement and nursing homes. A sensitive receptor includes long term care hospitals, hospices, prisons, and dormitories or similar live-in housing.

South Coast Air Quality Management District

Form 400-PS

Plot Plan And Stack Information Form

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Form 400A and Form 400-CEQA.

Section D - Authorization/Signature		
I hereby certify that all information contained herein and information submittfgfed with this application is true and correct.		
Signature of Preparer: Nancy Matthews	**Title of Preparer:** Partner, Foulweather Consultin	**Preparer's Phone #:** 916-798-5665 **Preparer's Email:** Nancy@foulweatherconsulting.com
Contact Person: Mark Young **Contact's Email:** MYoung@glendaleca.gov	**Contact's Phone#:** (818) 548-3293 **Contact's Fax#:**	**Date Signed:**

THIS IS A PUBLIC DOCUMENT

Pursuant to the California Public Records Act, your permit application and any supplemental documentation are public records and may be disclosed to a third party. If you wish to claim certain limited information as exempt from disclosure because it qualifies as a trade secret, as defined in the District's Guidelines for Implementing the California Public Records Act, you must make such claim at the time of submittal to the District.

Check here if you claim that this form or its attachments contain confidential trade secret information. ☐

Figure 1-2. Alternative 7 Layout

South Coast Air Quality Management District

Form 400-E-5
Selective Catalytic Reduction (SCR) System, Oxidation Catalyst, and Ammonia Catalyst

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator That Appears On Permit): Glendale City, Glendale Water & Power

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site):
800 Air Way, Glendale, CA 91201

● Fixed Location ○ Various Locations

Section B - Equipment Description [Unit 15]

Selective Catalytic Reduction (SCR)

SCR Catalyst	**Manufacturer:** Umicore, Cormetech or equiv. **Catalyst Active Material:** vanadium **Model Number:** ______ **Type:** ______ **Size of Each Layer or Module:** L: 1 ft. 6.3 in. W: 1 ft. 6.3 in. H: 0 ft. 10.6 in. **No. of Layers or Modules:** 147 **Total Volume:** 304 cu. ft. **Total Weight:** 6157 lbs.
Reducing Agent	○ Urea ○ Anhydrous Ammonia ● Aqueous Ammonia 19 % **Injection Rate:** 220 lb/hr
Reducing Agent Storage*	**Diameter:** 9 ft. ______ in. **Height:** 15 ft. ______ in. **Capacity:** 13209 gal net Pressure Setting: 19.7 psia * A separate permit may be needed for the storage equipment.
Space Velocity	Gas Flow Rate/Catalyst Volume: 11900 per hour
Area Velocity	Gas Flow Rate/Wetted Catalyst Surface Area: ______ ft/hr
Manufacturer's Guarantee	**NOx:** 2.4 ppm **%O_2:** 15 **NOx:** 0.023 gm/bhp-hr **Ammonia Slip:** 5 ppm @ 15 %O_2
Catalyst Life	5 years (expected)
Cost	**Capital Cost:** ______ **Installation Cost:** ______ **Catalyst Replacement Cost:** ______

Oxidation Catalyst

Oxidation Catalyst	**Manufacturer:** Umicore, Cormetech or equiv **Catalyst Active Material:** Palladium, platinum or equiv **Model Number:** ______ **Type:** ______ **Size of Each Layer or Module:** L: 1 ft. 6.3 in. W: 1 ft. 6.3 in. H: 0 ft. 5.1 in. **No. of Layers or Modules:** 98 **Total Volume:** 150 cu. ft. **Total Weight:** 4104 lbs.
Space Velocity	Gas Flow Rate/Catalyst Volume: 24000 per hour
Manufacturer's Guarantee	VOC: 9.8 ppm VOC: 0.033 gm/bhp-hr %O_2: 15 CO: 11.2 ppm CO: 0.066 gm/bhp-hr %O_2: 15
Catalyst Life	5 years (expected)
Cost	**Capital Cost:** ______ **Installation Cost:** ______ **Catalyst Replacement Cost:** ______

South Coast Air Quality Management District

Form 400-E-5
Selective Catalytic Reduction (SCR) System, Oxidation Catalyst, and Ammonia Catalyst

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Section B - Equipment Description (cont.)

Ammonia Catalyst

Ammonia Catalyst	Manufacturer: ______ Catalyst Active Material: ______ Model Number: ______ Type: ______ Size of Each Layer or Module: L: ______ ft. ______ in. W: ______ ft. ______ in. H: ______ ft. ______ in. No. of Layers or Modules: ______ Total Volume: ______ cu. ft. Total Weight: ______ lbs.
Space Velocity	Gas Flow Rate/Catalyst Volume: ______ per hour
Manufacturer's Guarantee	NH_3: ______ ppm %O_2: ______
Catalyst Life	______ years (expected)
Cost	Capital Cost: ______ Installation Cost: ______ Catalyst Replacement Cost: ______

Section C - Operation Information

Operating Temperature	Minimum Inlet Temperature: ______ °F (from cold start) Maximum Temperature: 896 °F Warm-up Time: -- hr. 30 min. (maximum)
Operating Schedule	Normal: up to 10 hours/day up to 5 days/week up to 50 weeks/yr Maximum: 24 hours/day 7 days/week 52 weeks/yr

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application is true and correct.

Preparer Info	Signature: Nancy L. Matthews Date: 4/29/20 Title: Partner Company Name: Foulweather Consulting	Name: Nancy Matthews Phone #: 9167985665 Fax #: Email: Nancy@foulweatherconsulting.com
Contact Info	Name: Mark Young Title: Deputy General Manager Company Name: Glendale Water & Power	Phone #: 8185483293 Fax #: Email: MYoung@Glendaleca.gov

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Check here if you claim that this form or its attachments contain confidential trade secret information. ☐

South Coast Air Quality Management District

Form 400-E-13b
Non-Emergency Internal Combustion Engine

South Coast AQMD

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator That Appears On Permit): Glendale City, Glendale Water & Power

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 800 Air Way, Glendale, CA 91201

● Fixed Location ○ Various Locations

Section B - Equipment Description [Unit 15]

Internal Combustion Engine	Is the ICE an EPA Certified or Qualifying Non-Road Engine? ● No ○ Yes If yes, provide EPA Certificate No., and attach copy: ________ Manufacturer: Wartsila Model: 18V50SG Serial No.: tbd Date of Manufacture: tbd (mm/dd/yyyy) Date of Installation: 06/01/2024 (mm/dd/yyyy) Note: For an ICE manufactured after 7/18/94, please provide manufacturer's specification and guarantee. Manufacturer Maximum Rating: 25,828 BHP@ 514 RPM
ICE Function (Check all that apply)	☒ Electrical Generator ☐ Fire Pump ☐ Compressor ☐ Co-Generation ☐ Flood Control ☐ Pump Driver ☐ Other (specify): ________
Type	● Stationary ○ Portable How Is This Type of Equipment Used? (Check All That Apply) ☒ Within Facility ☐ Off-Site ☐ Rental ☐ Non-Rental
Fuel	☒ Natural Gas ☐ LPG ☐ Refinery Gas* ☐ Digester Gas* ☐ Landfill Gas* ☐ Diesel Oil No. 2 ☐ Other* : ________ *If Digester Gas, Landfill Gas, Refinery Gas, and/or Other are checked, attach fuel analysis indicating higher heating value and sulfur content.
Stand-By Fuel	☐ Natural Gas ☐ LPG ☐ Refinery Gas* ☐ Digester Gas* ☐ Landfill Gas* ☐ Diesel Oil No. 2 ☐ Other* : ________ *If Digester Gas, Landfill Gas, Refinery Gas, and/or Other are checked, attach fuel analysis indicating higher heating value and sulfur content.
Cycle Type	○ Two Cycle ● Four Cycle
Combustion Type	● Lean Burn ○ Rich Burn
No. of Cylinders	○ Four ○ Six ○ Eight ○ Ten ○ Twelve ○ Sixteen ● Other: 18
Aspiration Type	○ Turbocharged ● Turbocharged/Aftercooled ○ Naturally Aspirated ☐ Timing Retarded ≥ 4° (relative to standard timing)
Air Pollution Control (If Applicable)	○ Selective Catalytic Reduction (SCR) * ○ No Controls ○ Selective Non-Catalytic Reduction (SNCR) * ○ Air Fuel Ratio Controller ○ Non-selective Catalytic Reduction (NSCR) ● Other (specify): oxidation catalyst and SCR * Separate application is required. Manufacturer: Umicore, Cormetech or equiv. Model: tbd If already permitted, indicate Permit No.: ________ Device No.: ________

South Coast Air Quality Management District

Form 400-E-13b
Non-Emergency Internal Combustion Engine

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Section C - Operation Information

Fuel Consumption

Maximum Rated Load: ________ gal./hr. OR 156,720 cu.ft./hr

Average Load: ________ gal./hr. OR 156,720 cu.ft./hr.

Emissions Data

Pollutants	Maximum Emissions Before Control		Maximum Emissions After Control	
	gm/Bhp-hr	PPM (15% O_2)	gm/Bhp-hr	PPM (15% O_2)
ROG			0.033	9.8
NOx			0.023	2.4
CO			0.066	11.2
PM	0.023	5.0 mg/Nm3	0.023	5.0 mg/Nm3
SOx	0.002	0.029	0.002	0.029

Emissions Reference (attach):
- ☒ Manufacturer's Guarantee
- ☐ Catalytic Manufacturer's Guarantee
- ☐ Source Test Data
- ☐ EPA Emission Factors
- ☐ Other (specify): ________

Operating Schedule

Normal: up to 10 hours/day up to 5 days/week up to 50 weeks/yr

Maximum: 24 hours/day 7 days/week 52 weeks/yr

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application is true and correct.

Preparer Info

Signature: Nancy L. Matthews Date: 4/29/20

Title: Partner Company Name: Foulweather Consulting

Name: Nancy Matthews

Phone #: 9167985665 Fax #:

Email: Nancy@Foulweatherconsulting.com

Contact Info

Name: Mark Young

Title: Deputy General Manager Company Name: Glendale Water & Power

Phone #: 8185483293 Fax #:

Email: MYoung@Glendaleca.gov

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Pursuant to the California Public Records Act, your permit application and any supplemental documentation are public records and may be disclosed to a third party. If you wish to claim certain limited information as exempt from disclosure because it qualifies as a trade secret, as defined in the District's Guidelines for Implementing the California Public Records Act, you must make such claim at the time of submittal to the District.

Check here if you claim that this form or its attachments contain confidential trade secret information. ☐

South Coast Air Quality Management District

Form 400-A

Application Form for Permit or Plan Approval

List only one piece of equipment or process per form.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944
Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

1. Facility Name (Business Name of Operator to Appear on the Permit): Glendale City, Glendale Water and Power

2. Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

3. Owner's Business Name (If different from Business Name of Operator): [same]

Section B - Equipment Location Address

4. Equipment Location Is: ● Fixed Location ○ Various Location
(For equipment operated at various locations, provide address of initial site.)

800 Air Way
Street Address
Glendale, CA , CA 91201
City Zip
Mark Young — Deputy General Manager
Contact Name Title
8185483293
Phone # Ext. Fax #
E-Mail: MYoung@Glendaleca.gov

Section C - Permit Mailing Address

5. Permit and Correspondence Information:
☐ Check here if same as equipment location address

141 N. Glendale Ave
Address
Glendale, CA , CA 91206
City State Zip
Mark Young — Deputy General Manager
Contact Name Title
8185483293
Phone # Ext. Fax #
E-Mail: MYoung@Glendaleca.gov

Section D - Application Type

6. The Facility Is: ○ Not In RECLAIM or Title V ○ In RECLAIM ● In Title V ○ In RECLAIM & Title V Programs

7. Reason for Submitting Application (Select only ONE):

7a. New Equipment or Process Application:
- ● New Construction (Permit to Construct)
- ○ Equipment On-Site But Not Constructed or Operational
- ○ Equipment Operating Without A Permit *
- ○ Compliance Plan
- ○ Registration/Certification
- ○ Streamlined Standard Permit

7b. Facility Permits:
- ○ Title V Application or Amendment (Refer to Title V Matrix)
- ○ RECLAIM Facility Permit Amendment

7c. Equipment or Process with an Existing/Previous Application or Permit:
- ○ Administrative Change
- ○ Alteration/Modification
- ○ Alteration/Modification without Prior Approval *
- ○ Change of Condition
- ○ Change of Condition without Prior Approval *
- ○ Change of Location
- ○ Change of Location without Prior Approval *
- ○ Equipment Operating with an Expired/Inactive Permit *

Existing or Previous Permit/Application
If you checked any of the items in 7c., you MUST provide an existing Permit or Application Number: ______

* A Higher Permit Processing Fee and additional Annual Operating Fees (up to 3 full years) may apply (Rule 301(c)(1)(D)(i)).

8a. Estimated Start Date of Construction (mm/dd/yyyy): 06/01/2021
8b. Estimated End Date of Construction (mm/dd/yyyy): 12/01/2024
8c. Estimated Start Date of Operation (mm/dd/yyyy): 12/01/2024

9. Description of Equipment or Reason for Compliance Plan (list applicable rule): Install/operate Wartsila 18V50SG reciprocating IC engines to replace existing generating equipment [Unit 16]

10. For identical equipment, how many additional applications are being submitted with this application? (Form 400-A required for each equipment / process) 4

11. Are you a Small Business as per AQMD's Rule 102 definition? (10 employees or less and total gross receipts are $500,000 or less OR a not-for-profit training center) ● No ○ Yes

12. Has a Notice of Violation (NOV) or a Notice to Comply (NC) been issued for this equipment? ● No ○ Yes
If Yes, provide NOV/NC#: ______

Section E - Facility Business Information

13. What type of business is being conducted at this equipment location? Electricity generation

14. What is your business primary NAICS Code? (North American Industrial Classification System) 221112

15. Are there other facilities in the SCAQMD jurisdiction operated by the same operator? ○ No ● Yes

16. Are there any schools (K-12) within 1000 feet of the facility property line? ● No ○ Yes

Section F - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application are true and correct.

17. Signature of Responsible Official:

18. Title of Responsible Official: General Manager

19. I wish to review the permit prior to issuance. (This may cause a delay in the application process.) ○ No ● Yes

20. Print Name: Steve Zurn

21. Date: 5·20·20

22. Do you claim confidentiality of data? (If Yes, see instructions.) ● No ○ Yes

23. Check List: ☒ Authorized Signature/Date ☒ Form 400-CEQA ☒ Supplemental Form(s) (ie., Form 400-E-xx) ☒ Fees Enclosed

AQMD USE ONLY	APPLICATION TRACKING #	CHECK #	AMOUNT RECEIVED $	PAYMENT TRACKING #	VALIDATION

DATE	APP REJ	DATE	APP REJ	CLASS I III	BASIC CONTROL	EQUIPMENT CATEGORY CODE	TEAM	ENGINEER	REASON/ACTION TAKEN

South Coast Air Quality Management District

Form 400-CEQA

California Environmental Quality Act (CEQA) Applicability

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

The SCAQMD is required by state law, the California Environmental Quality Act (CEQA), to review discretionary permit project applications for potential air quality and other environmental impacts. This form is a screening tool to assist the SCAQMD in clarifying whether or not the project[1] has the potential to generate significant adverse environmental impacts that might require preparation of a CEQA document [CEQA Guidelines §15060(a)].[2] Refer to the attached instructions for guidance in completing this form.[3] For each Form 400-A application, also complete and submit one Form 400-CEQA. If submitting multiple Form 400-A applications for the same project at the same time, only one 400-CEQA form is necessary for the entire project. If you need assistance completing this form, contact Permit Services at (909) 396-3385 or (909) 396-2668.

Section A - Facility Information

1. Facility Name (Business Name of Operator To Appear On The Permit): Glendale City, Glendale Water & Power

2. Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

3. Project Description: Grayson Repower Project: replace existing boilers, gas turbine generators (except Unit 9), cooling towers and auxiliary equipment with 5 new reciprocating IC engines, emission control systems, CEMS and other auxiliary equipment. [Unit 16]

Section B - Review For Exemption From Further CEQA Action

Check "Yes" or "No" as applicable

	Yes	No	Is this application for:
1.	●	○	**A CEQA and/or NEPA document previously or currently prepared that specifically evaluates this project?** If yes, attach a copy of the signed Notice of Determination to this form.
2.	○	●	**A request for a change of permittee only (without equipment modifications)?**
3.	○	●	**A functionally identical permit unit replacement with no increase in rating or emissions?**
4.	○	●	**A change of daily VOC permit limit to a monthly VOC permit limit?**
5.	○	●	**Equipment damaged as a result of a disaster during state of emergency?**
6.	○	●	**A Title V** (i.e., Regulation XXX) **permit renewal (without equipment modifications)?**
7.	○	●	**A Title V administrative permit revision?**
8.	○	●	**The conversion of an existing permit into an initial Title V permit?**

If "**Yes**" is checked for any question in Section B, your application does not require additional evaluation for CEQA applicability. Skip to Section D - Signatures on page 2 and sign and date this form.

Section C - Review of Impacts Which May Trigger CEQA

Complete Parts I-VI by checking "Yes" or "No" as applicable. To avoid delays in processing your application(s), explain all "Yes" responses on a separate sheet and attach it to this form.

	Yes	No	Part I - General
1.	○	○	**Has this project generated any known public controversy regarding potential adverse impacts that may be generated by the project?** Controversy may be construed as concerns raised by local groups at public meetings; adverse media attention such as negative articles in newspapers or other periodical publications, local news programs, environmental justice issues, etc.
2.	○	○	**Is this project part of a larger project?** If yes, attach a separate sheet to briefly describe the larger project.
			Part II - Air Quality
3.	○	○	**Will there be any demolition, excavating, and/or grading construction activities that encompass an area exceeding 20,000 square feet?**
4.	○	○	**Does this project include the open outdoor storage of dry bulk solid materials that could generate dust?** If Yes, include a plot plan with the application package.

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[1] A "project" means the whole of an action which has a potential for resulting in physical change to the environment, including construction activities, clearing or grading of land, improvements to existing structures, and activities or equipment involving the issuance of a permit. For example, a project might include installation of a new, or modification of an existing internal combustion engine, dry-cleaning facility, boiler, gas turbine, spray coating booth, solvent cleaning tank, etc.

[2] To download the CEQA guidelines, visit http://ceres.ca.gov/env_law/state.html.

[3] To download this form and the instructions, visit http://www.aqmd.gov/ceqa or http://www.aqmd.gov/permit

Section C - Review of Impacts Which May Trigger CEQA (cont.)

	Yes	No	Part II - Air Quality (cont.)
5.	○	○	**Would this project result in noticeable off-site odors from activities that may not be subject to SCAQMD permit requirements?** For example, compost materials or other types of greenwaste (i.e., lawn clippings, tree trimmings, etc.) have the potential to generate odor complaints subject to Rule 402 – Nuisance.
6.	○	○	**Does this project cause an increase of emissions from marine vessels, trains and/or airplanes?**
7.	○	○	**Will the proposed project increase the QUANTITY of hazardous materials stored aboveground onsite or transported by mobile vehicle to or from the site by greater than or equal to the amounts associated with each compound on the attached Table 1?**[4]
			Part III – Water Resources
8.	○	○	**Will the project increase demand for water at the facility by more than 5,000,000 gallons per day?** The following examples identify some, but not all, types of projects that may result in a "yes" answer to this question: 1) projects that generate steam; 2) projects that use water as part of the air pollution control equipment; 3) projects that require water as part of the production process; 4) projects that require new or expansion of existing sewage treatment facilities; 5) projects where water demand exceeds the capacity of the local water purveyor to supply sufficient water for the project; and 6) projects that require new or expansion of existing water supply facilities.
9.	○	○	**Will the project require construction of new water conveyance infrastructure?** Examples of such projects are when water demands exceed the capacity of the local water purveyor to supply sufficient water for the project, or require new or modified sewage treatment facilities such that the project requires new water lines, sewage lines, sewage hook-ups, etc.
			Part IV – Transportation/Circulation
10.			**Will the project result in** (Check all that apply):
	○	○	**a. the need for more than 350 new employees?**
	○	○	**b. an increase in heavy-duty transport truck traffic to and/or from the facility by more than 350 truck round-trips per day?**
	○	○	**c. increase customer traffic by more than 700 visits per day?**
			Part V – Noise
11.	○	○	**Will the project include equipment that will generate noise GREATER THAN 90 decibels (dB) at the property line?**
			Part VI – Public Services
12.			**Will the project create a permanent need for new or additional public services in any of the following areas** (Check all that apply):
	○	○	**a. Solid waste disposal?** Check "No" if the projected potential amount of wastes generated by the project is less than five tons per day.
	○	○	**b. Hazardous waste disposal?** Check "No" if the projected potential amount of hazardous wastes generated by the project is less than 42 cubic yards per day (or equivalent in pounds).

REMINDER: *For each "Yes" response in Section C, attach all pertinent information including but not limited to estimated quantities, volumes, weights, etc.*

Section D - Signatures

I HEREBY CERTIFY THAT ALL INFORMATION CONTAINED HEREIN AND INFORMATION SUBMITTED WITH THIS APPLICATION IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE. I UNDERSTAND THAT THIS FORM IS A SCREENING TOOL AND THAT THE SCAQMD RESERVES THE RIGHT TO CONSIDER OTHER PERTINENT INFORMATION IN DETERMINING CEQA APPLICABILITY.

1. Signature of Responsible Official of Firm:		**2. Title of Responsible Official of Firm:** General Manager
3. Print Name of Responsible Official of Firm: Steve Zurn		**4. Date Signed:** 5·20·20
5. Phone # of Responsible Official of Firm: (818) 548-2107	**6. Fax # of Responsible Official of Firm:**	**7. Email of Responsible Official of Firm:** SZurn@Glendaleca.gov
8. Signature of Preparer, (If prepared by person other than responsible official of firm): Nancy L. Matthews		**9. Title of Preparer:** Partner, Foulweather Consulting
10. Print Name of Preparer: Nancy Matthews		**11. Date Signed:** 4/29/20
12. Phone # of Preparer: 9167985665	**13. Fax # of Preparer:**	**14. Email of Preparer:** Nancy@foulweatherconsulting.com

THIS CONCLUDES FORM 400-CEQA. INCLUDE THIS FORM AND ANY ATTACHMENTS WITH FORM 400-A.

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[4] Table 1 – Regulated Substances List and Threshold Quantities for Accidental Release Prevention can be found in the Instructions for Form 400-CEQA.

South Coast Air Quality Management District

Form 400-PS Revised June 2021

Plot Plan And Stack Information Form

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Form 400A and Form 400-CEQA.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944
Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator To Appears On The Permit): Glendale City, Glendale Water & Power

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 800 Air Way, Glendale, CA 91201

● **Fixed Location** ○ **Various Locations**

Section B - Location Data [Unit 16]

Plot Plan

Please attach a site map for the project with distances and scales. Identify and locate the proposed equipment on the map. A copy of the appropriate Thomas Brothers page, a web-based map, or a sketch that shows the major streets and location of the equipment is acceptable.

Location of Schools Nearby

Is the facility located within a 1/4 mile radius (1,320 feet) of the outer boundary of a school? ○ Yes ● No

If yes, please provide name(s) of school(s) below:

School Name: ______ **School Name:** ______

School Address: ______ **School Address:** ______

Distance from stack or equipment vent to the outer boundary of the school: ______ feet **Distance from stack or equipment vent to the outer boundary of the school:** ______ feet

CA Health & Safety Code 42301.9: "School" means any public or private school used for the purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes.

Population Density

● Urban ○ Rural (<50% of land within 3 km radius accounted for by urban land use categories, i.e., multi-family dwelling or industrial.)

Zoning Classification

○ **Mixed Use Residential Commercial Zone (M-U)** ○ **Service and Professional Zone (C-S)** ○ **Medium Commercial (C-3)**

● **Heavy Commercial (C-4)** ○ **Commercial Manufacturing (C-M)**

Section C - Emission Release Parameters - Stacks, Vents

Stack Data

Stack Height: 9.67 feet (above ground level) **What is the height of the closest building nearest the stack?** 43 feet

Stack Inside Diameter: ______ inches **Stack Flow:** ______ acfm **Stack Temperature:** ______ ℉

Rain Cap Present: ○ Yes ● No **Stack Orientation:** ● Vertical ○ Horizontal

If the stack height is less than 2.5 times the closest building height (H), please provide information on any building within 5xH distance from the stack (attach additional sheet if necessary):

Building #/Name: Engine Hall **Building #/Name:** ______

Building Height: 43 feet (above ground level) **Building Height:** ______ feet (above ground level)

Building Width: 107 feet **Building Width:** ______ feet

Building Length: 160 feet **Building Length:** ______ feet

Receptor Distance From Equipment Stack or Roof Vents/Openings

Distance to nearest residence or sensitive receptor*: 3064 feet

Distance to nearest business: 650 feet

Building Information

Are the emissions released from vents and/or openings from a building? ○ Yes ● No

If yes, please provide:

Building #/Name: ______ **Building Width:** ______ feet

Building Height: ______ feet (above ground level) **Building Length:** ______ feet

---

*AQMD Rule 1470 defines SENSITIVE RECEPTOR as meaning any residence including private homes, condominiums, apartments, and living quarters, schools as defined under paragraph (b)(57), preschools, daycare centers and health facilities such as hospitals or retirement and nursing homes. A sensitive receptor includes long term care hospitals, hospices, prisons, and dormitories or similar live-in housing.

South Coast Air Quality Management District

Form 400-PS

Plot Plan And Stack Information Form

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Form 400A and Form 400-CEQA.

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submittfgfed with this application is true and correct.

Signature of Preparer: Nancy Matthews

Title of Preparer: Partner, Foulweather Consultin

Preparer's Phone #: 916-798-5665

Preparer's Email: Nancy@foulweatherconsulting.com

Contact Person: Mark Young

Contact's Phone#: (818) 548-3293

Date Signed:

Contact's Email: MYoung@glendaleca.gov

Contact's Fax#:

THIS IS A PUBLIC DOCUMENT

Pursuant to the California Public Records Act, your permit application and any supplemental documentation are public records and may be disclosed to a third party. If you wish to claim certain limited information as exempt from disclosure because it qualifies as a trade secret, as defined in the District's Guidelines for Implementing the California Public Records Act, you must make such claim at the time of submittal to the District.

Check here if you claim that this form or its attachments contain confidential trade secret information. ☐

Figure 1-2. Alternative 7 Layout

South Coast Air Quality Management District

Form 400-E-5
Selective Catalytic Reduction (SCR) System, Oxidation Catalyst, and Ammonia Catalyst

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator That Appears On Permit): Glendale City, Glendale Water & Power

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site):
800 Air Way, Glendale, CA 91201

● Fixed Location ○ Various Locations

Section B - Equipment Description [Unit 16]

Selective Catalytic Reduction (SCR)

SCR Catalyst	Manufacturer: Umicore, Cormetech or equiv. Catalyst Active Material: vanadium Model Number: ______ Type: ______ Size of Each Layer or Module: L: 1 ft. 6.3 in. W: 1 ft. 6.3 in. H: 0 ft. 10.6 in. No. of Layers or Modules: 147 Total Volume: 304 cu. ft. Total Weight: 6157 lbs.
Reducing Agent	○ Urea ○ Anhydrous Ammonia ● Aqueous Ammonia 19 % Injection Rate: 220 lb/hr
Reducing Agent Storage*	Diameter: 9 ft ______ in. Height: 15 ft. ______ in. Capacity: 13209 gal net ft. Pressure Setting: 19.7 psia * A separate permit may be needed for the storage equipment.
Space Velocity	Gas Flow Rate/Catalyst Volume: 11900 per hour
Area Velocity	Gas Flow Rate/Wetted Catalyst Surface Area: ______ ft/hr
Manufacturer's Guarantee	NOx: 2.4 ppm %O2: 15 NOx: 0.023 gm/bhp-hr Ammonia Slip: 5 ppm @ 15 %O2
Catalyst Life	5 years (expected)
Cost	Capital Cost: ______ Installation Cost: ______ Catalyst Replacement Cost: ______

Oxidation Catalyst

Oxidation Catalyst	Manufacturer: Umicore, Cormetech or equiv Catalyst Active Material: Palladium, platinum or equiv Model Number: ______ Type: ______ Size of Each Layer or Module: L: 1 ft. 6.3 in. W: 1 ft. 6.3 in. H: 0 ft. 5.1 in. No. of Layers or Modules: 98 Total Volume: 150 cu. ft. Total Weight: 4104 lbs.
Space Velocity	Gas Flow Rate/Catalyst Volume: 24000 per hour
Manufacturer's Guarantee	VOC: 9.8 ppm VOC: 0.033 gm/bhp-hr %O2: 15 CO: 11.2 ppm CO: 0.066 gm/bhp-hr %O2: 15
Catalyst Life	5 years (expected)
Cost	Capital Cost: ______ Installation Cost: ______ Catalyst Replacement Cost: ______

South Coast Air Quality Management District

Form 400-E-5
Selective Catalytic Reduction (SCR) System, Oxidation Catalyst, and Ammonia Catalyst

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Section B - Equipment Description (cont.)

Ammonia Catalyst

Ammonia Catalyst

Manufacturer: ______ **Catalyst Active Material:** ______

Model Number: ______ **Type:** ______

Size of Each Layer or Module: **L:** ____ ft. ____ in. **W:** ____ ft. ____ in. **H:** ____ ft. ____ in.

No. of Layers or Modules: ______ **Total Volume:** ______ cu. ft. **Total Weight:** ______ lbs.

Space Velocity

Gas Flow Rate/Catalyst Volume: ______ per hour

Manufacturer's Guarantee

NH_3: ______ ppm **%O_2:** ______

Catalyst Life

______ years (expected)

Cost

Capital Cost: ______ **Installation Cost:** ______ **Catalyst Replacement Cost:** ______

Section C - Operation Information

Operating Temperature

Minimum Inlet Temperature: ______ °F (from cold start) **Maximum Temperature:** 896 °F

Warm-up Time: — hr. 30 min. (maximum)

Operating Schedule

Normal:	up to 10 hours/day	up to 5 days/week	up to 50 weeks/yr
Maximum:	24 hours/day	7 days/week	52 weeks/yr

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application is true and correct.

Preparer Info

Signature: Nancy L. Matthews **Date:** 4/29/20

Title: Partner **Company Name:** Foulweather Consulting

Name: Nancy Matthews

Phone #: 9167985665 **Fax #:**

Email: Nancy@foulweatherconsulting.com

Contact Info

Name: Mark Young

Title: Deputy General Manager **Company Name:** Glendale Water & Power

Phone #: 8185483293 **Fax #:**

Email: MYoung@Glendaleca.gov

THIS IS A PUBLIC DOCUMENT

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Check here if you claim that this form or its attachments contain confidential trade secret information. ☐

South Coast Air Quality Management District

Form 400-E-13b
Non-Emergency Internal Combustion Engine

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator That Appears On Permit): Glendale City, Glendale Water & Power

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 800 Air Way, Glendale, CA 91201

● Fixed Location ○ Various Locations

Section B - Equipment Description [Unit 16]

Internal Combustion Engine	Is the ICE an EPA Certified or Qualifying Non-Road Engine? ● No ○ Yes If yes, provide EPA Certificate No., and attach copy: ______ Manufacturer: Wartsila Model: 18V50SG Serial No.: tbd Date of Manufacture: tbd (mm/dd/yyyy) Date of Installation: 06/01/2024 (mm/dd/yyyy) Note: For an ICE manufactured after 7/18/94, please provide manufacturer's specification and guarantee. Manufacturer Maximum Rating: 25,828 BHP@ 514 RPM
ICE Function (Check all that apply)	☒ Electrical Generator ☐ Fire Pump ☐ Compressor ☐ Co-Generation ☐ Flood Control ☐ Pump Driver ☐ Other (specify): ______
Type	● Stationary ○ Portable How Is This Type of Equipment Used? (Check All That Apply) ☒ Within Facility ☐ Off-Site ☐ Rental ☐ Non-Rental
Fuel	☒ Natural Gas ☐ LPG ☐ Refinery Gas* ☐ Digester Gas* ☐ Landfill Gas* ☐ Diesel Oil No. 2 ☐ Other* : ______ *If Digester Gas, Landfill Gas, Refinery Gas, and/or Other are checked, attach fuel analysis indicating higher heating value and sulfur content.
Stand-By Fuel	☐ Natural Gas ☐ LPG ☐ Refinery Gas* ☐ Digester Gas* ☐ Landfill Gas* ☐ Diesel Oil No. 2 ☐ Other* : ______ *If Digester Gas, Landfill Gas, Refinery Gas, and/or Other are checked, attach fuel analysis indicating higher heating value and sulfur content.
Cycle Type	○ Two Cycle ● Four Cycle
Combustion Type	● Lean Burn ○ Rich Burn
No. of Cylinders	○ Four ○ Six ○ Eight ○ Ten ○ Twelve ○ Sixteen ● Other: 18
Aspiration Type	○ Turbocharged ● Turbocharged/Aftercooled ○ Naturally Aspirated ☐ Timing Retarded ≥ 4° (relative to standard timing)
Air Pollution Control (If Applicable)	○ Selective Catalytic Reduction (SCR) * ○ No Controls ○ Selective Non-Catalytic Reduction (SNCR) * ○ Air Fuel Ratio Controller ○ Non-selective Catalytic Reduction (NSCR) ● Other (specify): oxidation catalyst and SCR * Separate application is required. Manufacturer: Umicore, Cormetech or equiv. Model: tbd If already permitted, indicate Permit No.: ______ Device No.: ______

South Coast Air Quality Management District

Form 400-E-13b
Non-Emergency Internal Combustion Engine

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Section C - Operation Information

Fuel Consumption

Maximum Rated Load: ______ gal./hr. OR 156,720 cu.ft./hr

Average Load: ______ gal./hr. OR 156,720 cu.ft./hr.

Emissions Data

Pollutants	Maximum Emissions Before Control		Maximum Emissions After Control	
	gm/Bhp-hr	PPM (15% O_2)	gm/Bhp-hr	PPM (15% O_2)
ROG			0.033	9.8
NOx			0.023	2.4
CO			0.066	11.2
PM	0.023	5.0 mg/Nm3	0.023	5.0 mg/Nm3
SOx	0.002	0.029	0.002	0.029

Emissions Reference (attach):

- ☒ Manufacturer's Guarantee
- ☐ Catalytic Manufacturer's Guarantee
- ☐ Source Test Data
- ☐ EPA Emission Factors
- ☐ Other (specify): ______

Operating Schedule

Normal: up to 10 hours/day up to 5 days/week up to 50 weeks/yr

Maximum: 24 hours/day 7 days/week 52 weeks/yr

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application is true and correct.

Preparer Info

Signature: Nancy L. Matthews

Date: 4/29/20

Title: Partner

Company Name: Foulweather Consulting

Name: Nancy Matthews

Phone #: 9167985665

Fax #:

Email: Nancy@Foulweatherconsulting.com

Contact Info

Name: Mark Young

Title: Deputy General Manager

Company Name: Glendale Water & Power

Phone #: 8185483293

Fax #:

Email: MYoung@Glendaleca.gov

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Check here if you claim that this form or its attachments contain confidential trade secret information. ☐

South Coast Air Quality Management District

Form 400-A

Application Form for Permit or Plan Approval

List only one piece of equipment or process per form.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

1. Facility Name (Business Name of Operator to Appear on the Permit): Glendale City, Glendale Water and Power

2. Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

3. Owner's Business Name (If different from Business Name of Operator): [same]

Section B - Equipment Location Address

4. Equipment Location Is: ● Fixed Location ○ Various Location
(For equipment operated at various locations, provide address of initial site.)

Street Address: 800 Air Way
City: Glendale, CA , CA Zip: 91201
Contact Name: Mark Young Title: Deputy General Manager
Phone #: 8185483293 Ext.: Fax #:
E-Mail: MYoung@Glendaleca.gov

Section C - Permit Mailing Address

5. Permit and Correspondence Information:
☐ Check here if same as equipment location address

Address: 141 N. Glendale Ave
City: Glendale, CA State: CA Zip: 91206
Contact Name: Mark Young Title: Deputy General Manager
Phone #: 8185483293 Ext.: Fax #:
E-Mail: MYoung@Glendaleca.gov

Section D - Application Type

6. The Facility Is: ○ Not In RECLAIM or Title V ○ In RECLAIM ● In Title V ○ In RECLAIM & Title V Programs

7. Reason for Submitting Application (Select only ONE):

7a. New Equipment or Process Application:
- ● New Construction (Permit to Construct)
- ○ Equipment On-Site But Not Constructed or Operational
- ○ Equipment Operating Without A Permit *
- ○ Compliance Plan
- ○ Registration/Certification
- ○ Streamlined Standard Permit

7b. Facility Permits:
- ○ Title V Application or Amendment (Refer to Title V Matrix)
- ○ RECLAIM Facility Permit Amendment

7c. Equipment or Process with an Existing/Previous Application or Permit:
- ○ Administrative Change
- ○ Alteration/Modification
- ○ Alteration/Modification without Prior Approval *
- ○ Change of Condition
- ○ Change of Condition without Prior Approval *
- ○ Change of Location
- ○ Change of Location without Prior Approval *
- ○ Equipment Operating with an Expired/Inactive Permit *

Existing or Previous Permit/Application
If you checked any of the items in 7c., you MUST provide an existing Permit or Application Number:

* A Higher Permit Processing Fee and additional Annual Operating Fees (up to 3 full years) may apply (Rule 301(c)(1)(D)(i)).

8a. Estimated Start Date of Construction (mm/dd/yyyy): 06/01/2021

8b. Estimated End Date of Construction (mm/dd/yyyy): 12/01/2024

8c. Estimated Start Date of Operation (mm/dd/yyyy): 12/01/2024

9. Description of Equipment or Reason for Compliance Plan (list applicable rule): Install/operate aqueous ammonia storage tank

10. For identical equipment, how many additional applications are being submitted with this application? (Form 400-A required for each equipment / process)

11. Are you a Small Business as per AQMD's Rule 102 definition? (10 employees or less and total gross receipts are $500,000 or less OR a not-for-profit training center) ● No ○ Yes

12. Has a Notice of Violation (NOV) or a Notice to Comply (NC) been issued for this equipment? ● No ○ Yes
If Yes, provide NOV/NC#:

Section E - Facility Business Information

13. What type of business is being conducted at this equipment location? Electricity generation

14. What is your business primary NAICS Code? (North American Industrial Classification System) 221112

15. Are there other facilities in the SCAQMD jurisdiction operated by the same operator? ○ No ● Yes

16. Are there any schools (K-12) within 1000 feet of the facility property line? ● No ○ Yes

Section F - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application are true and correct.

17. Signature of Responsible Official:

18. Title of Responsible Official: General Manager

19. I wish to review the permit prior to issuance. (This may cause a delay in the application process.) ○ No ● Yes

20. Print Name: Steve Zurn

21. Date: 5.20.20

22. Do you claim confidentiality of data? (If Yes, see instructions.) ● No ○ Yes

23. Check List: ☒ Authorized Signature/Date ☒ Form 400-CEQA ☒ Supplemental Form(s) (ie., Form 400-E-xx) ☒ Fees Enclosed

AQMD USE ONLY	APPLICATION TRACKING #	CHECK #	AMOUNT RECEIVED	PAYMENT TRACKING #	VALIDATION
			$		

DATE	APP REJ	DATE	APP REJ	CLASS I III	BASIC CONTROL	EQUIPMENT CATEGORY CODE	TEAM	ENGINEER	REASON/ACTION TAKEN

South Coast Air Quality Management District

Form 400-CEQA
California Environmental Quality Act (CEQA) Applicability

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

The SCAQMD is required by state law, the California Environmental Quality Act (CEQA), to review discretionary permit project applications for potential air quality and other environmental impacts. This form is a screening tool to assist the SCAQMD in clarifying whether or not the project[1] has the potential to generate significant adverse environmental impacts that might require preparation of a CEQA document [CEQA Guidelines §15060(a)].[2] Refer to the attached instructions for guidance in completing this form.[3] For each Form 400-A application, also complete and submit one Form 400-CEQA. If submitting multiple Form 400-A applications for the same project at the same time, only one 400-CEQA form is necessary for the entire project. If you need assistance completing this form, contact Permit Services at (909) 396-3385 or (909) 396-2668.

Section A - Facility Information

1. Facility Name (Business Name of Operator To Appear On The Permit):
Glendale City, Glendale Water & Power

2. Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD):
800327

3. Project Description:
Grayson Repowering Project: replace existing boilers, gas turbine generators (except Unit 9), cooling towers and auxiliary equipment with 5 new reciprocating IC engines, emission control systems, CEMS and other auxiliary equipment.

Section B - Review For Exemption From Further CEQA Action

[ammonia storage tank]

Check "Yes" or "No" as applicable

This project is being proposed as an alternative to the Grayson Repowering Project, which is currently undergoing CEQA review. The City of Glendale is the Lead Agency.

	Yes	No	Is this application for:
1.	●	○	**A CEQA and/or NEPA document previously or currently prepared that specifically evaluates this project?** If yes, attach a copy of the signed Notice of Determination to this form.
2.	○	●	**A request for a change of permittee only (without equipment modifications)?**
3.	○	●	**A functionally identical permit unit replacement with no increase in rating or emissions?**
4.	○	●	**A change of daily VOC permit limit to a monthly VOC permit limit?**
5.	○	●	**Equipment damaged as a result of a disaster during state of emergency?**
6.	○	●	**A Title V** (i.e., Regulation XXX) **permit renewal (without equipment modifications)?**
7.	○	●	**A Title V administrative permit revision?**
8.	○	●	**The conversion of an existing permit into an initial Title V permit?**

If "**Yes**" is checked for any question in Section B, your application does not require additional evaluation for CEQA applicability. Skip to Section D - Signatures on page 2 and sign and date this form.

Section C - Review of Impacts Which May Trigger CEQA

Complete Parts I-VI by checking "Yes" or "No" as applicable. To avoid delays in processing your application(s), explain all "Yes" responses on a separate sheet and attach it to this form.

	Yes	No	**Part I - General**
1.	○	○	**Has this project generated any known public controversy regarding potential adverse impacts that may be generated by the project?** Controversy may be construed as concerns raised by local groups at public meetings; adverse media attention such as negative articles in newspapers or other periodical publications, local news programs, environmental justice issues, etc.
2.	○	○	**Is this project part of a larger project?** If yes, attach a separate sheet to briefly describe the larger project.
			Part II - Air Quality
3.	○	○	**Will there be any demolition, excavating, and/or grading construction activities that encompass an area exceeding 20,000 square feet?**
4.	○	○	**Does this project include the open outdoor storage of dry bulk solid materials that could generate dust?** If Yes, include a plot plan with the application package.

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[1] A "project" means the whole of an action which has a potential for resulting in physical change to the environment, including construction activities, clearing or grading of land, improvements to existing structures, and activities or equipment involving the issuance of a permit. For example, a project might include installation of a new, or modification of an existing internal combustion engine, dry-cleaning facility, boiler, gas turbine, spray coating booth, solvent cleaning tank, etc.

[2] To download the CEQA guidelines, visit http://ceres.ca.gov/env_law/state.html.

[3] To download this form and the instructions, visit http://www.aqmd.gov/ceqa or http://www.aqmd.gov/permit

Section C - Review of Impacts Which May Trigger CEQA (cont.)

	Yes	No	Part II - Air Quality (cont.)
5.	○	○	**Would this project result in noticeable off-site odors from activities that may not be subject to SCAQMD permit requirements?** For example, compost materials or other types of greenwaste (i.e., lawn clippings, tree trimmings, etc.) have the potential to generate odor complaints subject to Rule 402 – Nuisance.
6.	○	○	**Does this project cause an increase of emissions from marine vessels, trains and/or airplanes?**
7.	○	○	**Will the proposed project increase the QUANTITY of hazardous materials stored aboveground onsite or transported by mobile vehicle to or from the site by greater than or equal to the amounts associated with each compound on the attached Table 1?**[4]
			Part III – Water Resources
8.	○	○	**Will the project increase demand for water at the facility by more than 5,000,000 gallons per day?** The following examples identify some, but not all, types of projects that may result in a "yes" answer to this question: 1) projects that generate steam; 2) projects that use water as part of the air pollution control equipment; 3) projects that require water as part of the production process; 4) projects that require new or expansion of existing sewage treatment facilities; 5) projects where water demand exceeds the capacity of the local water purveyor to supply sufficient water for the project; and 6) projects that require new or expansion of existing water supply facilities.
9.	○	○	**Will the project require construction of new water conveyance infrastructure?** Examples of such projects are when water demands exceed the capacity of the local water purveyor to supply sufficient water for the project, or require new or modified sewage treatment facilities such that the project requires new water lines, sewage lines, sewage hook-ups, etc.
			Part IV – Transportation/Circulation
10.			**Will the project result in** (Check all that apply):
	○	○	**a. the need for more than 350 new employees?**
	○	○	**b. an increase in heavy-duty transport truck traffic to and/or from the facility by more than 350 truck round-trips per day?**
	○	○	**c. increase customer traffic by more than 700 visits per day?**
			Part V – Noise
11.	○	○	**Will the project include equipment that will generate noise GREATER THAN 90 decibels (dB) at the property line?**
			Part VI – Public Services
12.			**Will the project create a permanent need for new or additional public services in any of the following areas** (Check all that apply):
	○	○	**a. Solid waste disposal?** Check "No" if the projected potential amount of wastes generated by the project is less than five tons per day.
	○	○	**b. Hazardous waste disposal?** Check "No" if the projected potential amount of hazardous wastes generated by the project is less than 42 cubic yards per day (or equivalent in pounds).

****REMINDER**: *For each "Yes" response in Section C, attach all pertinent information including but not limited to estimated quantities, volumes, weights, etc.***

Section D - Signatures

I HEREBY CERTIFY THAT ALL INFORMATION CONTAINED HEREIN AND INFORMATION SUBMITTED WITH THIS APPLICATION IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE. I UNDERSTAND THAT THIS FORM IS A SCREENING TOOL AND THAT THE SCAQMD RESERVES THE RIGHT TO CONSIDER OTHER PERTINENT INFORMATION IN DETERMINING CEQA APPLICABILITY.

1. Signature of Responsible Official of Firm:		**2. Title of Responsible Official of Firm:** General Manager
3. Print Name of Responsible Official of Firm: Steve Zurn		**4. Date Signed:** 5.20.20
5. Phone # of Responsible Official of Firm: (818) 548-2107	**6. Fax # of Responsible Official of Firm:**	**7. Email of Responsible Official of Firm:** SZurn@Glendaleca.gov
8. Signature of Preparer, (If prepared by person other than responsible official of firm): Nancy L. Matthews		**9. Title of Preparer:** Partner, Foulweather Consulting
10. Print Name of Preparer: Nancy Matthews		**11. Date Signed:** 4/29/20
12. Phone # of Preparer: 9167985665	**13. Fax # of Preparer:**	**14. Email of Preparer:** Nancy@foulweatherconsulting.com

THIS CONCLUDES FORM 400-CEQA. INCLUDE THIS FORM AND ANY ATTACHMENTS WITH FORM 400-A.

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[4] Table 1 – Regulated Substances List and Threshold Quantities for Accidental Release Prevention can be found in the Instructions for Form 400-CEQA.

South Coast Air Quality Management District

Form 400-E-18
Storage Tank

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator That Appears On Permit): Glendale City, Glendale Water and Power

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

Address where the equipment will be operated (for equipment which will be moved to various locations in AQMD's jurisdiction, please list the initial location site): 800 Air Way, Glendale, CA 91201

● Fixed Location ○ Various Locations

Tank Type (Select ONE)
○ External Floating Roof Tank (EFRT) ○ Internal Floating Roof Tank (IFRT) ● Horizontal Tank (HT)
○ Vertical Fixed Roof Tank (VFRT) ○ Domed External Roof Tank (DEFRT)

Identification
Tank Identification Number: T1
Tank Contents/Product (include MSDS): aqueous ammonia

Section B - Tank Information

Tank Characteristics

Shell Diameter (ft.): 9.0
Shell Length (ft.): 28.0
Shell Height (ft.): 15.0
Turnovers Per Year: 12

Is Tank Heated? ○ Yes ● No
Is Tank Underground? ○ Yes ● No
Net Throughput (gal/year): 150000
Self Support Roof: ○ Yes ○ No

Number of Columns? ____________
Effective Column Diameter: ○ 9" by 7" Built Up Column - 1.1 ○ 8" Diameter Pipe - 0.7 ○ Unknown - 1

External Shell Condition: ● Good ○ Poor
Internal Shell Color: ○ Light Rust ○ Dense Rust ○ Gunite Lining
External Shell Color: ● White/White ○ Aluminum/Specular ○ Aluminum/Diffuse ○ Gray/Light ○ Gray/Medium ○ Red/Primer

Average Liquid Height (ft.) (Vertical Only): ____________
Maximum Liquid Height (ft.) (Vertical Only): ____________
Working Volume (gal.) (Vertical Only): ____________
Actual Volume (gal.) (Vertical Only): ____________

Paint Condition: ● Good ○ Poor
Paint Color/Shade: ● White/White ○ Aluminum/Diffuse ○ Gray/Light ○ Aluminum/Specular ○ Gray/Medium ○ Red/Primer

Roof Characteristics (Floating Roof Tank)

Roof Type: ○ Pontoon ○ Double Deck ○ Dome Roof (Height________ ft.) ○ Cone Roof (Height________ ft.)
Roof Fitting Category: ○ Typical ○ Detail
Roof Height (ft.): ____________
Roof Paint Condition: ○ Good ○ Poor
Roof Color/Shade: ○ White/White ○ Aluminum/Diffuse ○ Gray/Light ○ Aluminum/Specular ○ Gray/Medium ○ Red/Primer

Deck Characteristics (Floating Roof Tank)

Deck Type: ○ Welded ○ Bolted
Deck Fitting Characteristics: ○ Typical ○ Detailed (Complete Deck Seam)

Construction:	Deck Seam Length (ft.):	Deck Seam:		
○ Sheet	____________	○ 5 ft. wide	○ 6 ft. wide	○ 7 ft. wide
○ Panel	____________	○ 5 x 7.5 ft.	○ 5 x 12 ft.	

Tank Construction and Rim -Seal System (Floating Roof Tank)

Tank Construction: ○ Welded ○ Riveted
Primary Seal: ○ Mechanical Shoe ○ Vapor Mounted ○ Liquid Mounted
Secondary Seal: ○ Rim Mounted ○ Shoe Mounted ○ None

Breather Vent Setting

Vacuum Setting (psig): 16.7
Pressure Setting (psig): 19.7

* Section D of the application MUST be completed.

South Coast Air Quality Management District

Form 400-E-18
Storage Tank

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

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Tel: (909) 396-3385
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Section B - Tank Information (cont.)

Site Selection

Nearest Major City: Burbank

Daily Average Ambient Temperature (˚F): 77.1

Annual Average Minimum Temperature (˚F): 41.7

Annual Average Maximum Temperature (˚F): 89.0

Average Wind Speed (mph): 6.8

Annual Average Solar Insulation Factor (Btu / (ft^3 * ft * day)): 1782

Tank Contents

Chemical Category: ○ Organic Liquids ○ Crude Oil ○ Petroleum Distillates

Liquid: ● Single ○ Multiple

If Multiple, Select Speciation Option: ○ Full Speciation ○ Partial Speciation ○ Various Weight Speciation ○ None

Section C - Operation Information

Vapor Control

Vapor Control During Loading or Unloading: ☐ Sparger ☐ Vapor Balance System ☒ Vapor Return Line ☐ Vented to Air Pollution Control Equipment [1]

[1] A separate permit is required. If APC equipment is already permitted, provide Permit or Device Number:

Vent Valve Data

Indicate Type of Setting and Vapor Disposal

	Number	Pressure Setting	Vaccum Setting	Discharging to (Check Appropriate Box)		
				Atmosphere	Vapor Control	Flare
Combination	1	19.7	16.7	☒	☐	☐
Pressure				☐	☐	☐
Vaccum				☐	☐	☐
Open				☐	☐	☐

Materials

Name all liquids, vapors, gases, or mixtures of such material to be stored in this tank:
aqueous ammonia (19%)

If material is stored in a solution, supply the following information:

Name of Solvent:

Name of Materials Dissolved:

Concentration of Materials Dissolved: 19.00 % by Weight OR ________ % by Volume OR ________ lbs/gal

Section D - Roof/Deck Fitting

Section D is required for the following tanks: External Floating Roof Tank, Internal Floating Roof Tanks, or Domed External Floating Roof Tanks.

Select the number of fittings for each applicable question. Examples: __3__ Unbolted Cover, Ungasketed
________ Unbolted Cover, Gasketed

Roof/Deck Fitting Details

1. Access Hatch (24" diameter well)
   - ________ Bolted Cover, Gasketed
   - ________ Unbolted Cover, UnGasketed
   - ________ Unbolted Cover, Gasketed

2. Automatic Gauge Float Well (20" diameter well)
   - ________ Bolted Cover, Gasketed
   - ________ Unbolted Cover, Ungasketed
   - ________ Unbolted Cover, Gasketed

3. Column Well (24" diameter well)
   - ________ Built-Up Col - Sliding Cover, Gasketed
   - ________ Built-Up Col - Sliding Cover, Ungasketed
   - ________ Pipe Col - Flex, Fabric Sleeve Seal
   - ________ Pipe Col - Sliding Cover, Gasketed
   - ________ Pipe Col - Sliding Cover, Ungasketed

South Coast Air Quality Management District

Form 400-E-18
Storage Tank

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Section D - Roof/Deck Fitting (cont.)

Roof/Deck Fitting Details (cont.)

4. Gauge Hatch/Sample Well (8" diameter well)
- __________ Weighted Mechanical Actuation, Gasketed
- __________ Weighted Mechanical Actuation, Ungasketed

6. Rim Vent (6" diameter)
- __________ Weighted Mechanical Actuation, Gasketed
- __________ Weighted Mechanical Actuation, Ungasketed

8. Roof Leg (3" diameter leg)
- __________ Adjustable, Pontoon Area, Ungasketed
- __________ Adjustable, Center Area, Ungasketed
- __________ Adjustable, Double-Deck Roofs
- __________ Fixed
- __________ Adjustable, Pontoon Area, Gasketed
- __________ Adjustable, Pontoon Area, Sock
- __________ Adjustable, Center Area, Gasketed
- __________ Adjustable, Center Area, Sock

5. Ladder Well (36" diameter)
- __________ Sliding Cover, Gasketed
- __________ Sliding Cover, Ungasketed

7. Roof Drain (3" diameter)
- __________ Open
- __________ 90% Close

9. Roof Leg or Hang Well
- __________ Adjustable
- __________ Fixed

10. Sample Pipe (24" diameter)
- __________ Slotted Pipe – Sliding Cover, Gasketed
- __________ Slotted Pipe – Sliding Cover, Ungasketed
- __________ Slit Fabric Seal, 10% Open

11. Guided Pole/Sample Well
- __________ Ungasketed, Sliding Cover, Without Float
- __________ Ungasketed Sliding Cover, With Float
- __________ Gasketed Sliding Cover, Without Float
- __________ Gasketed Sliding Cover, With Float
- __________ Gasketed Sliding Cover, With Pole Sleeve
- __________ Gasketed Sliding Cover, With Pole Wiper
- __________ Gasketed Sliding Cover, With Float, Wiper
- __________ Gasketed Sliding Cover, With Float, Sleeve, Wiper
- __________ Gasketed Sliding Cover, With Pole Sleeve, Wiper

12. __________ Stub Drain (1" diameter)

13. Unslotted Guide – Pole Well
- __________ Ungasketed, Sliding Cover
- __________ Gasketed Sliding Cover
- __________ Ungasketed Sliding Cover with Sleeve
- __________ Gasketed Sliding Cover with Sleeve
- __________ Gasketed Sliding Cover with Wiper

14. Vacuum Breaker (10" diameter well)
- __________ Weighted Mechanical Actuation, Gasketed
- __________ Weighted Mechanical Actuation, Ungasketed

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application is true and correct.

Preparer Info

Signature: Nancy L. Matthews
Date: 04/29/2020
Name: Nancy Matthews
Title: Partner
Company Name: Foulweather Consulting
Phone #: (916) 798-5665
Fax #:
Email: nancy@foulweatherconsulting.com

Contact Info

Name: Mark Young
Title: Deputy General Mgr
Company Name: Glendale Water & Power
Phone #: (818) 548-3293
Fax #:
Email: MYoung@Glendaleca.gov

THIS IS A PUBLIC DOCUMENT

Pursuant to the California Public Records Act, your permit application and any supplemental documentation are public records and may be disclosed to a third party. If you wish to claim certain limited information as exempt from disclosure because it qualifies as a trade secret, as defined in the District's Guidelines for Implementing the California Public Records Act, you must make such claim at the time of submittal to the District.

Check here if you claim that this form or its attachments contain confidential trade secret information. ☐

South Coast Air Quality Management District

Form 500-B
Title V List of Exempt Equipment

South Coast AQMD

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Use this form for all application submittals requesting an initial Title V permit or permit renewal. If you are applying for a permit revision, you may also use this form to have your exempt equipment listing updated prior to renewing your permit.

This form is designed to summarize all of the equipment at a facility that is exempt per SCAQMD Rule 219 from SCAQMD permit requirements (e.g., I.C. Engines ≤ 50 BHP, Boilers < 2 MM BTU/hr etc.). This equipment can be listed according to category. However, if there is a specific device that is vented to control equipment, then the equipment must be listed separately. Trivial activities listed on the back of this form or the Technical Guidance Document do not have to be listed on this form. Note: If your facility is in the RECLAIM program, it is <u>not</u> necessary to repeat any equipment currently listed in Appendix A of the RECLAIM permit.

Section I - Operator Information

1. Facility Name (Business Name of Operator That Appears On Permit): Glendale City, Glendale Water & Power

2. Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

3. Check box if facility is in RECLAIM program: ☐

4. Provide Current Permit Issue Date: 12/04/2014

5. Permit Revision No.: 7

Section II - Summary of Equipment Exempt from Permit Requirements (Including Portable)

Exempt Equipment Description [e.g., Small Boilers (75,000 BTU/hr-2,000,000 BTU/hr)]	**Venting to Control** (Device# or Application#)	**Control Device Description**	**Basis for Exemption** [e.g., Rule 219 (b)(2), 05/19/00]	**Source Specific Rule** [e.g., Rule 1146.2]
Coating Equipment - Architectural			219(l)(9)	1113, 1171
Mobile Equipment			219(a)	
Portable Cleaning Equipment			219(o)(1)(a)	1171
Abrasive Blasting Equipment			219(f)(2)	1140,404,405
Rental Equipment (various)			219(p)(17)	various
Utility Equipment, Air Conditioning			219(d)(1)	1415
Utility Equipment, Space Heating			219(d)(6)	1111
Clean Lube Oil Storage Tank			219(m)(7)	
Used Lube Oil Storage Tank			219(m)(7)	
Sludge Tank (5283 gal)			219(m)(4)	
Oily Water Collecting Sump (660 g			219(m)(4)	
Glycol Storage Tanks			219(m)(4)	

Trivial Activities

- Combustion emissions from propulsion of mobile sources, except for vessel emissions from Outer Continental Shelf sources
- Air-conditioning units used for human comfort that do not have applicable requirements under Title VI of the Act
- Ventilating units used for human comfort that do not exhaust air pollutants into the ambient air from any manufacturing/industrial or commercial process
- Non-commercial food preparation
- Consumer use of office equipment and products, not including printers or businesses primarily involved in photographic reproduction
- Janitorial services and consumer use of janitorial products
- Internal combustion engines used for landscaping purposes
- Laundry activities, except for dry-cleaning and steam boilers
- Bathroom/toilet vent emissions
- Emergency (backup) electrical generators at residential locations
- Tobacco smoking rooms and areas
- Blacksmith forges
- Plant maintenance and upkeep activities (e.g., grounds-keeping, general repairs, cleaning, painting, welding, plumbing, re-tarring roofs, installing insulation, and paving parking lots) provided these activities are not conducted as part of a manufacturing process, are not related to the source's primary business activity, and not otherwise triggering a permit modification[1]
- Repair or maintenance shop activities not related to the source's primary business activity, not including emissions from surface coating or de-greasing (solvent metal cleaning) activities, and not otherwise triggering a permit modification
- Portable electrical generators that can be moved by hand from one location to another[2]
- Hand-held equipment for buffing, polishing, cutting, drilling, sawing, grinding, turning or machining wood, metal or plastic
- Brazing, soldering and welding equipment, and cutting torches related to manufacturing and construction activities that do not result in emission of HAP metals[3]
- Bench-scale laboratory equipment used for physical or chemical analysis, but not lab fume hoods or vents[4]
- Routine calibration and maintenance of laboratory equipment or other analytical instruments
- Equipment used for quality control/assurance or inspection purposes, including sampling equipment used to withdraw materials for analysis
- Hydraulic and hydrostatic testing equipment
- Environmental chambers not using hazardous air pollutant (HAP) gasses
- Shock chambers
- Humidity chambers
- Solar simulators
- Fugitive emission related to movement of passenger vehicles, provided any required fugitive dust control plan or its equivalent is submitted
- Process water filtration systems and demineralizers
- Demineralized water tanks and demineralizer vents Air compressors and pneumatically operated equipment, including hand tools
- Batteries and battery charging stations, except at battery manufacturing plants
- Storage tanks, vessels and containers holding or storing liquid substances that will not emit any VOC or HAP[5]
- Storage tanks, reservoirs, and pumping and handling equipment of any size containing soaps, vegetable oil, grease, animal fat and nonvolatile aqueous salt solutions, provided appropriate lids and covers are utilized
- Equipment used to mix and package soaps, vegetable oil, grease, animal fat, and nonvolatile aqueous salt solutions, provided appropriate lids and covers are utilized
- Drop hammers or hydraulic presses for forging or metalworking
- Equipment used exclusively to slaughter animals, but not including other equipment at slaughterhouses, such as rendering cookers, boilers, heating plants, incinerators, and electrical power generating equipment
- Vents from continuous emissions monitors and other analyzers
- Natural gas pressure regulator vents, excluding venting at oil and gas production facilities
- Hand-held applicator equipment for hot melt adhesives with no VOC in the adhesive formulation
- Equipment used for surface coating, painting, dipping or spraying operations, except those that will emit VOC or HAP
- CO_2 lasers, used only on metals and other materials which do not emit HAP in the process
- Consumer use of paper trimmers/binders
- Electric or steam-heated drying ovens and autoclaves, but not the emissions from the articles or substance being processed in the ovens or autoclaves or the boilers delivering the steam
- Salt baths using nonvolatile salts that do not result in emissions of any regulated air pollutants
- Laser trimmers using dust collection to prevent fugitive emissions
- Boiler water treatment operations, not including cooling towers
- Oxygen scavenging (de-aeration) of water
- Ozone generators
- Fire suppression systems
- Emergency road flares
- Steam vents and safety relief valves
- Steam leaks
- Steam cleaning operations
- Steam sterilizers

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[1] Cleaning and painting activities qualify as trivial if they are not subject to VOC or HAP control requirements. Asphalt batch plant owners/operators must still get a permit if otherwise required.

[2] "Moved by hand" means it can be moved without the assistance of any motorized or non-motorized vehicle, conveyance or device.

[3] Brazing, soldering and welding equipment, and cutting torches related to manufacturing and construction activities that emit HAP metals are more appropriate for treatment as unpermitted equipment. Brazing, soldering, welding and cutting torches directly related to plant maintenance and upkeep and repair or maintenance shop activities that emit HAP metals are treated as trivial and listed separately in this appendix.

[4] Many lab fume hoods or vents might qualify for treatment as unpermitted equipment.

[5] Exemptions for storage tanks containing petroleum liquids or other volatile organic liquids should be based on size limits such as storage tank capacity and vapor pressure of liquids stored and are not appropriate for this list.

South Coast Air Quality Management District

Form 500-F3 (Title V)

Title IV - Acid Rain Phase II New Unit Exemption Request

See application instructions.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section I - New Unit Exemption Request

1. Facility Name (Business Name of Operator That Appears On Permit): Glendale City, Glendale Water & Power

2. ORIS Code (5-Digit): 377

3. Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 800327

4. This New Unit Exemption Request is (Check one): a. ● New b. ○ Revised

New Unit Data		Connected Generator Data		Current Fuels Used				Expected Fuels to be Used			
AQMD Device #	EPA Unit #	Connected to Generator Device #	Capacity (MWe)	Fuel Burned #1 (Name)	SO_2 in Fuel #1 (%)	Fuel Burned #2 (Name)	SO_2 in Fuel #2 (%)	Fuel Burned #1 (Name)	SO_2 in Fuel #1 (%)	Fuel Burned #2 (Name)	SO_2 in Fuel #2 (%)
11-1		11-1	18.8					natural gas			
11-2		11-2	18.8					natural gas			
11-3		11-3	18.8					natural gas			
11-4		11-4	18.8					natural gas			
11-5		11-5	18.8					natural gas			

To complete this application, type or print the information in the appropriate blanks.

This form shall be completed by Acid Rain facilities ONLY. Attach this form to a completed Form 500-A1, Form 500-A2, Form 500-F1 if an initial permit, permit renewal, or permit revision is requested and any other supplemental Acid Rain forms (Forms 500-F2 and 500-F4) as appropriate.

The Acid Rain Program regulations allow any new, affected utility unit that serves generators with total nameplate capacity not greater than 25 MWe and that burns only fuels with sulfur content of 0.05 percent or less to be exempted from the requirements to obtain an Acid Rain permit, monitor emissions, and hold allowances.

Section I - Facility Information

1. **Facility Name:** Provide the name of the legal entity that operates the facility.

   AQMD Facility ID: Complete only if the facility has been issued a 6-digit identification or ID number by AQMD. If not, leave these boxes blank. An ID number will be assigned when the application is submitted.
   ORIS Code: Provide the 5-digit code that has been assigned to facility by Department of Energy.

Section II - New Unit Exemption Request

1. Check one box to indicate whether this is a new application or a revision.

   The Acid Rain Program regulations allow any new, affected utility unit that serves generators with total nameplate capacity not greater than 25 MWe and that burns only fuels with sulfur content of 0.05 percent by weight or less to be exempted from the requirements to obtain an Acid Rain permit, monitor emissions, and hold allowances. The designated representative of such a unit may qualify the unit for the exemption by submitting the New Unit Exemption form. The provisions governing new unit exemption are found at 40 CFR 72.7.

New Unit Data	
AQMD Device #:	Provide the identification number for each AQMD-assigned device that is expected to be modified with repowering technology or replaced with a device that is already equipped with repowering technology.
EPA Unit #:	Provide the identification number for each EPA-assigned device that is expected to be modified with repowering technology or replaced with a device that is already equipped with repowering technology.
Connected Generator Data	
Connected to Generator Device #:	Provide the AQMD-assigned device number of each generator that is served by the unit for which the exemption is sought.
Capacity:	List to one decimal place the nameplate capacity of each generator served by the unit. The total of these entries must be 25 MWe or less in order to qualify for the exemption from the requirements of the Acid Rain Program. Nameplate capacity is defined in 40 CFR 72.2 as the maximum electrical generating output (in MW) that a generator can sustain over a specified period of time when not restricted by seasonal or other deratings, as listed in NADB or, if not in NADB, as measured in accordance with the United States Department of Energy standards.
Current Fuels Used and Expected Fuels to be Used	
Fuel Burned #1-2:	List the primary and secondary fuels that is currently burned and expected to be burned by the unit.
% S02 in Fuel #1-2:	Provide the percent of sulfur (S) for each fuel that is currently burned and expected to be burned by the device. To qualify for the exemption, the device must currently burn only fuels with a sulfur content of 0.05% or less by weight, as determined using the test methods (and, for natural gas, the assumption is 0.4 grains/ 100 cu. ft.) specified in 40 CFR 72.7(d)(2). To maintain the exemption, the device must continue to burn only fuels of this sulfur content and demonstrate compliance through the tests (and, for natural gas, the assumption is 0.4 grains/ 100 cu. ft.) under 40 CFR 72.7(d)(2) on fuels burned at any time during the period that the exemption is in effect.List the percent sulfur content by weight of the primary fuel. Note: The fuel sulfur content must be 0.05% or less for all fuels burned for the unit to qualify for the exemption.

Appendix B

Detailed Emissions Calculations

Appendix Table B-1
Wärtsilä 18V50SG Pollutant Emission Rate Calculations

			Wärtsilä 18V50SG			
			100% Load	75% Load	40% Load	
Parameter	Variable	Units	Value	Value	Value	Data Source
			Performance Data			
Generation (Gross)	G	kW_e	18,817	14,113	7,527	Supplied by Wärtsilä
Engine Heat Rate (HHV)	HR_{HHV}	Btu/kW_e-hr	8,588	8,510	9,287	G/HI_{HHV}*10^6
Heat Input (HHV)	HI_{HHV}	MMBtu/hr	161.6	120.1	69.9	Supplied by Wärtsilä
Fuel Heat Content (HHV)	HHV	Btu/ft^3	1,031	1,031	1,031	Calculated from Wärtsilä fuel analysis
Fuel Flow	$FF_{ft3/hr}$	ft^3/hr	156,741	116,489	67,798	HI_{HHV}/(HHV/10^6)
Fuel Density	$F_{density}$	lb/ft^3	0.0447	0.0447	0.0447	Density of CH_4 at 0 °C and 1 atm
			Exhaust Data			
Exhaust Temp (post-HRSG)	--	°F	697	753	829	Supplied by Wärtsilä
	T_{stack}	°R	1,157	1,213	1,289	Converted from °F
	--	°C	369.44	400.56	442.78	Converted from °F
	--	K	642.59	673.71	715.93	Converted from °F
Exhaust Pressure	--	kPa	99.5	99.5	99.5	Supplied by Wärtsilä
	P_{stack}	psia	14.431	14.431	14.431	Converted from kPa
Universal Gas Constant	R	psia-ft^3/lbmol-R	10.73	10.73	10.73	https://www.engineeringtoolbox.com
Standard Pressure	P_{std}	psia	14.696	14.696	14.696	40 CFR Part 60, Appendix A, Method 5
Standard Temperature	T_{std}	K	293.15	293.15	293.15	40 CFR Part 60, Appendix A, Method 5
Exhaust Volumetric Flow (actual)	Q_{f3s}	ft^3/s	2,059	1,620	1,013	Supplied by Wärtsilä
	Q_{m3s}	m^3/s	58.30	45.87	28.68	Converted from ft^3/s
	Q_{acfm}	acfm	123,540	97,200	60,780	Converted from ft^3/s
Exhaust H_2O Content	$\%H_2O$	% by Vol	10.1%	10.4%	10.2%	Supplied by Wärtsilä
Exhaust O_2 Content	$\%O_2$	% by Vol	10.2%	9.75%	9.98%	Supplied by Wärtsilä
Dry Exhaust Volumetric Flow @ 32° F and Std. P.		ft^3/s	802	600	354	$Q_{f3s}*(492/T_{stack})*(P^{std}/P_{stack})*(1-\%H_2O)$
	$Q_{dry-32F}$	m^3/s	22.70	16.98	10.01	Converted from ft^3/s
Dry Exhaust Volumetric Flow	Q_{dry}	dcf/min	113,116	88,702	55,590	$Q_{dry-32F}*(T_{stack}/492)$*60*3.281^3
$\%O_2$ Dry Basis	$\%O_{2-Dry}$	%	11.3%	10.9%	11.1%	$\%O_2/(1-\%H_2O)$
Dry Exhaust Volumetric Flow (Std)	$Q_{dry-std}$	dscf/min	51,604	38,597	22,762	$Q_{dry}*(T_{std}/T_{stack})$
Dry Exhaust Volumetric Flow (32 °F)	$Q_{dry-32F}$	Nm^3/min	1,362	1,018	601	$Q_{dry}*(273.15/T_{stack})*.3048^3$
Stack Diameter	D_{ft}	ft	5.25	5.25	5.25	Supplied by Wärtsilä
	D_m	m	1.60	1.60	1.60	Converted from ft.
Stack Area	A_{m2}	m^2	2.01	2.01	2.01	$(\pi*D_m^2)/4$
Stack Velocity	$V_{m/sec}$	m/sec	29.00	22.82	14.27	Q_{m3s}/A_{m2}
	$V_{ft/sec}$	ft/sec	95.14	74.85	46.81	Converted from m/s

Appendix Table B-1
Wärtsilä 18V50SG Pollutant Emission Rate Calculations

			Wärtsilä 18V50SG			
			100% Load	75% Load	40% Load	
Parameter	Variable	Units	Value	Value	Value	Data Source
			Emission Rates			
Max Sulfur	--	ppm-v	5	5	5	Supplied by Wärtsilä
	FS	gr/100 SCF	0.318	0.318	0.318	Converted from ppm-v
SO_2 Emission Rates	--	g/s	0.0180	0.0133	0.0078	Converted from lb/hr
	M_{SO2}	lb/hr	0.1425	0.1059	0.0616	Calculated using mass balance (100% conversion of fuel S)
SO_2 Emission Factors	--	lb/MMBtu	0.00088	0.00088	0.00088	M_{SO2}/HI_{HHV}
SO_2 Molecular Weight	MW_{SO2}	lb/lbmol	64.1	64.1	64.1	http://www.webelements.com/
S Molecular Weight	MW_S	lb/lbmol	32.1	32.1	32.1	http://www.webelements.com/
$PM/PM_{10}/PM_{2.5}$ Stack Conc.	$C_{d15\text{-}PM10}$	mg/Nm^3 @ 15% O_2	5.0	6.0	7.5	Supplied by Wärtsilä
	$C_{d\text{-}PM10}$	mg/Nm^3	8.1	10.2	12.4	$C_{d15\text{-}PM10}$*((20.9-%$O_{2\text{-}dry}$*100)/(20.9-15))
$PM/PM_{10}/PM_{2.5}$ Emission Rates	$M_{PM\text{-}g/s}$	g/s	0.166	0.159	0.114	Converted from lb/hr
	$M_{PM10\text{-}lb/hr}$	lb/hr	1.32	1.26	0.905	Supplied by Wärtsilä
NO_X as NO_2 Stack Conc.	$C_{d15\text{-}NOX}$	ppmvd @ 15% O_2	2.4	2.3	2.2	Supplied by Wärtsilä
	$C_{d\text{-}NOX}$	ppmvd	3.89	3.91	3.65	$C_{d15\text{-}NOX}$*((20.9-%$O_{2\text{-}dry}$*100)/(20.9-15))
NO_2 Molecular Weight	MW_{NO2}	lb/lbmol	46.0	46.0	46.0	http://www.webelements.com/
NO_X as NO_2 Emission Rates	$M_{NOX\text{-}lb/hr}$	lb/hr	1.33	0.985	0.528	Supplied by Wärtsilä
	$M_{NOX\text{-}g/s}$	g/s	0.168	0.124	0.067	Converted from lb/hr
CO Stack Conc.	$C_{d15\text{-}CO}$	ppmvd @ 15% O_2	11.2	10.8	10.0	Supplied by Wärtsilä
	$C_{d\text{-}CO}$	ppmvd	18.1	18.3	16.6	$C_{d15\text{-}CO}$*((20.9-%$O_{2\text{-}dry}$*100)/(20.9-15))
CO Molecular Weight	MW_{CO}	lb/lbmol	28.0	28.0	28.0	http://www.webelements.com/
CO Emission Rates	$M_{CO\text{-}lb/hr}$	lb/hr	3.74	2.82	1.50	Supplied by Wärtsilä
	$M_{CO\text{-}g/s}$	g/s	0.471	0.355	0.189	Converted from lb/hr
VOC (as CH_4) Stack Conc.	$C_{d15\text{-}VOC}$	ppmvd @ 15% O_2	9.8	9.4	8.8	Supplied by Wärtsilä
	$C_{d\text{-}VOC}$	ppmvd	15.9	16.0	14.6	$C_{d15\text{-}VOC}$*((20.9-%$O_{2\text{-}dry}$*100)/(20.9-15))
VOC (as CH_4) Molecular Weight	MW_{CH4}	lb/lbmol	16.0	16.0	16.0	http://www.webelements.com/
VOC (as CH_4) Emission Rates	$M_{VOC\text{-}lb/hr}$	lb/hr	1.88	1.41	0.751	Supplied by Wärtsilä
	$M_{VOC\text{-}g/s}$	g/s	0.237	0.178	0.095	Converted from lb/hr
NH_3 Slip	$C_{d15\text{-}NH3}$	ppmvd @ 15% O_2	5	5	5	Supplied by Wärtsilä
	$C_{d\text{-}NH3}$	ppmvd	8.1	8.5	8.3	$C_{d15\text{-}NH3}$*((20.9-%$O_{2\text{-}Dry}$*100)/(20.9-15))
NH_3 Molecular Weight	MW_{NH3}	lb/lbmol	17.0	17.0	17.0	http://www.webelements.com/
NH_3 Emission Rate	$M_{NH3\text{-}lb/hr}$	lb/hr	1.02	0.82	0.46	Supplied by Wärtsilä
	$M_{NH3\text{-}g/s}$	g/s	1.29E-01	1.03E-01	5.80E-02	Converted from lb/hr
Formaldehyde (CH_2O)	$C_{d15\text{-}CH2O}$	ppmvd @ 15% O_2	1.1	1.1	1.1	Supplied by Wärtsilä
	$C_{d\text{-}CH2O}$	ppmvd	1.78	1.87	1.82	$C_{d15\text{-}CH2O}$*((20.9-%$O_{2\text{-}Dry}$*100)/(20.9-15))
CH_2O Molecular Weight	MW_{CH2O}	lb/lbmol	30.0	30.0	30.0	http://www.webelements.com/
CH_2O Emission Rate	$M_{CH2O\text{-}lb/hr}$	lb/hr	0.41	0.32	0.19	(($C_{d\text{-}CH2O}$*(1-%H_2O))*$Q_{acfm}/10^6$)*P_{stack}*MW_{NH3}/(R*T_{stack})*60
	$M_{CH2O\text{-}g/s}$	g/s	5.17E-02	4.03E-02	2.39E-02	Converted from lb/hr

Appendix Table B-2
Emissions and Operating Parameters for the Wärtsilä 18V50SG Engine Generators

Device	Wartsila 18V50SG
Fuel	Natural Gas
Gross Output (MW)	18.8
Net Output (MW)	18.5
Engine Shaft Power (bhp)	25,828
Maximum Heat Input (MMBtu/hr each)	161.6
Maximum Heat Input (MMscf/hr each)	0.1567
F-factor (dscf/MMBtu)	8,710
Reference O2	15%
Actual O2 (dry basis)	11.3%
Exhaust Temperature (F)	697
Exhaust Flow Rate (dscfm)	51,604
Exhaust Flow Rate (wacfm @ actual O2)	123,540

Pollutant	Emission Rate, ppmvd @ 15% O2	Emission Factors (lb/MMBtu)	Maximum Emissions				
			lb/hr	lb/MMscf	g/bhp-hr	g/kW-h	lb/MW-h
NOx	2.4	0.009	1.33	8.45	0.023	0.032	0.070
SOx	0.18	0.0009	0.143	0.91			
CO	11.2	0.025	3.74	23.86	0.066	0.090	0.20
VOC	9.8	0.0123	1.88	12.00	0.033	0.045	0.10
PM10	0.003 gr/dscf	0.0082	1.32	8.42	0.023	0.032	
NH3	5.0	0.0067	1.02	6.51	0.018	0.025	

Notes:

lb/hr and ppmc emission rates guaranteed by manufacturer

lb/MMscf calculated from lb/hr and maximum hourly heat input (at 1031 Btu/scf)

g/bhp-hr calculated from lb/hr and engine shaft power

g/kW-h calculated from lb/hr and gross output

lb/MW-hr calculated from lb/hr and net output for compliance with SCAQMD Rule 1110.2

Appendix Table B-3
Startup Emissions for the Wärtsilä 18V50SG Engine Generators

	Duration,	Emissions, lb/event				Emissions, lb/hr			
Event	**minutes**	**NOx**	**CO**	**VOC**	**PM10/PM2.5**	**NOx**	**CO**	**VOC**	**PM10/PM2.5**
Cold Start	30	11.1	12.1	4.7	1.8	11.77	13.97	5.67	2.46
Warm Start	30	6.75	4.2	4.5	1.8	7.42	6.07	5.44	2.46
Hot Start	30	4.7	2.8	4.4	1.8	5.37	4.67	5.37	2.46

Appendix Table B-4
Hourly, Daily, Monthly and Annual Criteria Pollutant Emissions for the 5-Engine Project

	Operating Schedule				Emission Rate, lb/event					
	Max hourly	Max daily	Max monthly	Max annual	NOx	SOx	CO	VOC	PM10	NH3
Normal/full load operating hours	0.5	22.5	225	1120	1.33	0.14	3.74	1.88	1.32	1.02
Cold starts (events)	1	1	5	50	11.1	0.07	12.1	4.7	1.8	0.51
Warm starts (events)	0	0	20	80	6.8	0.07	4.2	4.5	1.8	0.51
Hot starts (events)	0	2	25	150	4.7	0.07	2.8	4.4	1.8	0.51
Total operating hours, incl SU	1.0	24	250	1260						
Total SU events	1.0	3	50	280						
Check total SU events	1.0	3	50	280						

	NOx				SOx				CO			
Equipment	Max lb/hr	Max lb/day	Max lb/month	Total ton/yr	Max lb/hr	Max lb/day	Max lb/month	Total ton/yr	Max lb/hr	Max lb/day	Max lb/month	Total ton/yr
Normal Operations, per engine	0.66	29.8	298.1	0.74	0.07	3.21	32.09	0.08	1.9	84.2	841.5	2.1
Startup, per engine	11.10	20.5	308.0	0.90	0.07	0.21	3.57	0.01	12.1	17.7	214.5	0.7
Total emissions per engine	11.76	50.3	606.1	1.64	0.14	3.42	35.7	0.09	14.0	101.9	1,056.0	2.8
Normal Operations for plant	3.3	149.1	1,490.6	3.7	0.36	16.0	160.4	0.40	9.4	420.8	4,207.5	10.5
Startups for plant	55.5	102.5	1,540.0	4.5	0.36	1.1	17.8	0.05	60.5	88.5	1,072.5	3.4
Total emissions for plant	58.8	251.6	3,030.6	8.2	0.71	17.1	178.3	0.45	69.9	509.3	5,280.0	13.9
	lb/hr	lb/day	lb/month	ton/yr	lb/hr	lb/day	lb/month	ton/yr	lb/hr	lb/day	lb/month	ton/yr

	VOC				PM10				NH3			
Equipment	Max lb/hr	Max lb/day	Max lb/month	Total ton/yr	Max lb/hr	Max lb/day	Max lb/month	Total ton/yr	Max lb/hr	Max lb/day	Max lb/month	Total ton/yr
Normal Operations, per engine	0.9	42.3	423.0	1.1	0.7	29.7	297.0	0.74	0.51	23.0	229.5	0.6
Startup, per engine	4.7	13.6	224.3	0.6	1.8	5.4	90.0	0.25	0.51	1.5	25.5	0.1
Total emissions per engine	5.7	55.9	647.3	1.68	2.5	35.1	387.0	0.99	1.02	24.5	255.0	0.6
Normal Operations for plant	4.7	211.5	2,115.0	5.3	3.3	148.5	1,485.0	3.7	2.6	114.8	1,147.5	2.9
Startups for plant	23.6	67.9	1,121.3	3.2	9.0	27.0	450.0	1.3	2.6	7.7	127.5	0.4
Total emissions for plant	28.3	279.4	3,236.3	8.4	12.3	175.5	1,935.0	5.0	5.1	122.4	1,275.0	3.2
	lb/hr	lb/day	lb/month	ton/yr	lb/hr	lb/day	lb/month	ton/yr	lb/hr	lb/day	lb/month	ton/yr

Appendix Table B-5
Greenhouse Gas Emissions for the Wärtsilä 18V50SG Engine Generators

	Rated Capacity, MMBtu/hr	Equivalent Full-Load Operating Hours per year (1)	Maximum Fuel Use, MMBtu/yr	Maximum Gross Generation, MWh	GHG Potential to Emit				
					metric tons/yr			CO2e, tons/yr	CO2, lb/MWh
					CO2	CH4	N2O		
Per Engine	161.60	1,260	203,616	23,709	10,804	0.20	0.02		
Five Engines			1,018,080	118,547	54,019	1.02	0.10		
CO2eq					54,019	25.5	30.3		
						TOTAL	54,075	59,608	1005.6

	Emission Factors, kg/MMBtu (2)		
	CO2 (3)	CH4 (4)	N2O (4)
Natural Gas	53.06	1.00E-03	1.00E-04
GWP (5)	1	25	298

Notes:
1. Includes 1120 normal operating hours and 280 30-minute startups.
2. Calculation methods and emission factors from 40 CFR 98 Subpart C.
3. Table C-1.
4. Table C-2.
5. Global Warming Potential; 40 CFR 98 Table A-1.

Appendix C

Commissioning Schedule and Emissions

Engine commissioning consists of no-load, partial-load and full-load testing performed immediately after construction for the purpose of optimizing engine operations, followed by installation of the emission control systems and optimizing and testing of the SCR systems. Several parameters—such as engine load, engine tuning, and degree of SCR control—may be varied simultaneously during testing at the discretion of the applicant and in accordance with the commissioning program laid out by the engine and control equipment manufacturers. Table C-1 shows the expected sequence and approximate timing of each commissioning event, as well as estimated monthly and maximum hourly emissions for a single engine. Wärtsilä estimates that approximately 218 hours of operating time will be required to complete the commissioning process for each engine, and that all five engines will be commissioned within a four-month period. The duration shown for each event is for a typical engine; the actual duration required to complete each event may vary from engine to engine.

Emissions during the commissioning year may be higher than those during a non-commissioning year for some pollutants due to the fact that the engines may not be optimally tuned and the SCR systems may be only partially operational or not operational at all. However, monthly emissions during the commissioning period will not exceed the proposed monthly limits in effect during normal project operation.

The CEMS will be installed and calibrated on each engine prior to the first start of each engine, and NOx and CO emissions will be continuously monitored during the commissioning phase. Estimated NOx and CO emissions prior to catalyst installation are shown in Table C-2, in the columns labeled "Failed Start (full RPM not achieved)," "Start with No Sync/Load (2 minutes)," and "Normal Start with Load (first 10 minutes)" and reflect the higher emissions that occur during the first few minutes of uncontrolled startups and during engine idle. Prior to installation and tuning of the emission control systems, VOC emissions calculations will be based on AP-42 emission factors[1] and fuel consumption to represent the best estimate of uncontrolled emissions from the engines. After the oxidation catalysts are installed, VOC emission factors reflecting normal operations, including startups, will be used to track emissions of these pollutants (see Table C-3). $PM_{10}/PM_{2.5}$ and SO_2 emissions are assumed not to be controlled by the SCR systems or oxidation catalysts, so the emission factors used for those pollutants will be the same during uncontrolled engine operation as they are during normal operation.

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[1] From AP-42, Section 3 (Table 3.2-2, "Uncontrolled Emission Factors for 4-Stroke Lean-Burn Engines": VOC, 0.118 lb/MMBtu.

Table C-1. Estimated Emissions for Each Engine During the Commissioning Process
(Averaged over all engines; individual engines may vary)

Event	Running Profile Description	Engine Running		Engine Startups		Total Estimated Monthly Hours	Estimated Monthly Emissions for a Single Engine (lb)				
		Estimated Duration (hours)	Avg Load (%)	Estimated Number of Starts	Estimated Minutes per Startup Event		NOx	CO	VOC	SOx	PM10/2.5
First start of engine	Bearing run 5 minutes	0	n/a	1	5	0.1	13.0	0.7	0.2	0.0	0.0
Failed start	1 minute ramp up	0	n/a	5	1	0.1	8.0	0.7	0.2	0.0	0.0
Safety stops check	20-25 safety stops check, to nominal rpm 2 minutes	0	n/a	25	2	0.8	167.5	7.1	1.5	0.0	0.1
Synchronization & relay setting	No load 5 minutes	0	n/a	6	5	0.5	78.0	4.3	0.9	0.0	0.1
Engine loading and run-in	20%, 40%, 60%, 80%, 100% steps	7	75	2	2	7.1	286.4	385.0	81.6	0.4	6.9
Initial SCR system tuning prior to catalyst loading	1 hour for initial tuning, up to 100% load (average 75% load)	1	75	1	10	1.2	50.2	92.6	19.6	0.1	1.7
Subtotal Prior to Catalyst Loading		**8**		**40**		**9.7**	**603.1**	**490.4**	**103.9**	**0.5**	**8.8**
Catalyst Loaded											
SCR tuning	Average 75% load	8	75	2	30	9.0	30.2	46.8	20.7	0.6	10.7
Engine loading and run-in (cont'd)	Various loads, 40%-100%, majority at full load	20	100	10	30	25.0	137.7	196.2	84.7	1.7	28.7
Engine tuning	Various loads, 40%-100%, majority at full load	25	100	6	30	28.0	99.9	166.6	75.3	1.9	32.5
Plant optimization testing	Various loads, 40%-100%, majority at full load	16	100	4	30	18.0	65.7	108.6	49.0	1.2	20.9
CEMS RATA	100% load	6	100	2	30	7.0	30.2	46.8	20.7	0.6	10.5
Output/heat rate/emissions tests	Depending on performance test procedure	20	100	4	30	22.0	71.0	123.6	56.5	1.6	27.7
Other misc tests	Average 75% load	5	75	5	30	7.5	60.5	74.6	30.6	0.5	8.6
Subtotal Following Catalyst Loading		**100**	**97**	**33**		**116.5**	**495.3**	**763.2**	**337.5**	**8.2**	**139.4**
Total Prior to Substantial Completion		**108**		**73**		**126**	**1,098.4**	**1,253.6**	**441.4**	**8.7**	**148.2**
Substantial Completion											
Reliability test	100% load	72		1		72.5	106.9	282.9	140.4	10.3	111.0
Project Demonstration test	100% load	10		4		12.0	57.7	86.0	37.7	1.7	17.9
Grid code test	100% load	5		5		7.5	62.2	79.3	32.9	1.1	10.9
Subtotal		**87**		**10**		**92.0**	**226.8**	**448.3**	**211.0**	**13.1**	**139.8**
Final Acceptance											
Total		**195**		**83**		**218**	**1,325.2**	**1,701.9**	**652.4**	**21.8**	**288.0**

Table C-1. Estimated Emissions for Each Engine During the Commissioning Process (continued)

Event	Running Profile Description	Estimated Max Hourly Em (lb/hr)		
		NOx	CO	VOC
First start of engine	Bearing run 5 minutes	13.0	0.7	0.2
Failed start	1 minute ramp up	8.0	0.7	0.2
Safety stops check	20-25 safety stops check, to nominal rpm 2 minutes	67.0	2.8	0.6
Synchronization & relay setting	No load 5 minutes	39.0	2.1	0.5
Engine loading and run-in	20%, 40%, 60%, 80%, 100% steps	40.5	54.5	11.5
Initial SCR system tuning prior to catalyst loading	1 hour for initial tuning, up to 100% load (average 75% load)	43.0	79.4	16.8
Subtotal Prior to Catalyst Loading				
Catalyst Loaded				
SCR tuning	Average 75% load	11.8	14.0	5.6
Engine loading and run-in (cont'd)	Various loads, 40%-100%, majority at full load	11.8	14.0	5.6
Engine tuning	Various loads, 40%-100%, majority at full load	11.8	14.0	5.6
Plant optimization testing	Various loads, 40%-100%, majority at full load	11.8	14.0	5.6
CEMS RATA	100% load	11.8	14.0	5.6
Output/heat rate/emissions tests	Depending on performance test procedure	11.8	14.0	5.6
Other misc tests	Average 75% load	11.8	14.0	5.6
Subtotal Following Catalyst Loading				
Total Prior to Substantial Completion				
Substantial Completion				
Reliability test	100% load	11.8	14.0	5.6
Project Demonstration test	100% load	11.8	14.0	5.6
Grid code test	100% load	11.8	14.0	5.6
Subtotal				
		Max Hourly Em (lb/hr)		
Total		**67.0**	**79.4**	**16.8**

Table C-2. Estimated Emission Factors for Uncontrolled Operation During the Commissioning Period

Pollutant		Emission Factors, Running			Emission Factors, Startup			
		lb/MWh	lb/MMBtu (HHV)	lb/hr (full load)	Full Start, lb/30 min	Failed Start (full RPM not achieved)	Start with No Sync/Load (2 minutes)	Normal Start with Load (first 10 minutes)
NOx	(as NO2)	2.638	0.3236	49.6	24.8	1.6	6.7	13.0
CO		2.356	0.2891	44.3	22.1	4.5	13.3	10.6
VOC	(as CH4)	0.590	0.0724	11.1	5.6	3.9	10.5	4.0
SOx		0.007	0.0009	0.135	0.0675			
PM		0.070	0.0086	1.32	1.8			
NH3		0.000	0.0000	0	0			

Table C-3. Estimated Emission Factors for Controlled Operation During the Commissioning Period

Pollutant		Emission Factors, Running			Emission Factors, Startup
		lb/MWh	lb/MMBtu (HHV)	lb/hr (full load)	lb/30 min
NOx	(as NO2)	0.071	0.0087	1.33	11.11
CO		0.200	0.0245	3.76	12.1
VOC	(as CH4)	0.100	0.0123	1.89	4.7
SOx		0.008	0.0009	0.14	0.0675
PM		0.070	0.0086	1.32	1.8
NH3		0.054	0.0067	1.02	0.51

Appendix D1

May 2020 Air Dispersion Modeling Report and Health Risk Assessment

AIR DISPERSION MODELING AND HEALTH RISK ASSESSMENT REPORT

Glendale Water & Power

Grayson Repowering Project

Glendale, CA

TRINITY CONSULTANTS
12700 Park Central Dr.
Suite 2100
Dallas, TX 75251

April 2020

Trinity Consultants

Environmental solutions delivered uncommonly well

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1. INTRODUCTION

This report is submitted to the South Coast Air Quality Management District (SCAQMD) to provide the results of the air quality impact analysis (AQIA) and a screening health risk assessment (HRA) for the application for a Permit to Construct (PTC) the Grayson Repowering Project (alternative configuration). The proposed project would be located at the City of Glendale, Department of Water and Power's (GWP's) existing Grayson Power Plant, in an industrial area of the City of Glendale at 800 Air Way, Glendale, California 91201, just northeast of the Interstate 5 and Highway 134 interchange.

GWP is proposing to replace all the existing generation facilities, units at the Grayson Power Plant, with the exception of Unit 9, by removing existing above-ground and below-ground equipment and facilities, and building new generation and energy storage facilities. This includes demolishing the Grayson Power Plant Boiler Building and Cooling Towers 1 through 5 and replacing the generating units (Units 1, 2, 3, 4, 5, 8A, and 8B/C). The 238 megawatts (MW) of existing generation facilities would be replaced with five Wärtsilä 18V50SG natural gas-fired reciprocating internal combustion engine generators and battery storage, for a total of 94 MW (gross) of replacement generation and up to 75 MW (300 MW-hours) of battery storage capacity.

The Wärtsilä generators are four-stroke, lean burn spark ignition engines, each rated at 18.8 MW (gross). Each natural gas-fueled generator is equipped with an emission control system consisting of a Selective Catalyst Reduction system (SCR) for oxides of nitrogen (NOx) emissions control and oxidation catalysts to control carbon monoxide (CO), volatile organic compound (VOC) and hazardous air pollutant (HAP) emissions; continuous emissions monitoring system (CEMS); and associated support equipment.

Other equipment and facilities to be constructed include water treatment facilities, fire protection and emergency services, a new 69 kilovolt (kV) air-insulated switchgear (GIS) switchyard, other electrical switchgear and transformers, and an operations and maintenance building.

The Project will be permitted through the South Coast Air Quality Management District (SCAQMD) New Source Review (NSR) permitting process. The modification does not result in emissions increases exceeding the Prevention Significant Deterioration (PSD) significant emission increase thresholds for any regulated pollutants.

As required by SCAQMD Rule 1304, the application for a PTC includes a dispersion modeling analysis to demonstrate that the Project will neither cause a new violation of a state or federal ambient air quality standard nor make an existing violation significantly worse for nitrogen dioxide (NO_2), CO, sulfur dioxide (SO_2), particulate matter less than 10 microns in diameter (PM_{10}) or particulate matter less than 2.5 microns in diameter ($PM_{2.5}$). In addition, an assessment of the cumulative air quality impacts analysis and the potential human health risks associated with the operation of the proposed project is provided.

Key components of this report include:

- Project emissions.
- Modeling procedures for the project—specifically:
  - The modeling was performed consistent with the protocol submitted on September 27, 2019 and approved by the SCAQMD on November 15, 2019;
  - AERMOD was used to determine the project's ambient impact;
  - National Weather Service (NWS) meteorological data, processed by the SCAQMD, was used as input into AERMOD; and
  - Monitoring data collected at nearby ambient air quality monitors defines the background concentrations.
- Methods used to complete the screening health risk assessment.
- The results of the AQIA and HRA.

2. APPLICABILITY OF NEW SOURCE REVIEW AND PREVENTION OF SIGNIFICANT DETERIORATION REQUIREMENTS

SCAQMD Rule 1304 requires an applicant for a Permit to Construct a modified source that results in a net emissions increase of any nonattainment air contaminant to validate with modeling that "the…modification will not cause a violation, or make significantly worse an existing violation…of any state or national ambient air quality standards at any receptor location in the District."

The PSD regulations define a major modification as a modification to an existing major source that results in any increase in emissions that exceed significance thresholds. The federal PSD regulations (Title 40, Code of Federal Regulations, Part 52, Section 21 (40 CFR §52.21) require a new or modified major stationary source in an area designated attainment or unclassifiable to demonstrate compliance with all national ambient air quality standards.

The SCAQMD is designated as nonattainment for the federal ozone, $PM_{2.5}$[1], and lead[2] standards and for the state ozone, $PM_{2.5}$, and PM_{10} standards. Therefore, PSD review would be required for NO_2, CO, SO_2 and PM_{10} if project emissions are above the applicable PSD significance levels. Table 2-1 shows the proposed project is not subject to PSD review for any pollutants. Appendix A contains the emission calculations.

Table 2-1. Project Emissions

Pollutant	Expected Emissions, tons per year	PSD Significant Modification Thresholds, tons per year
NOx	8.22	40
SO_2	0.45	40
VOC	8.40	n/a
CO	13.87	100
PM_{10}	4.96	15
$PM_{2.5}$	4.96	n/a
CO_2e	56,608	75,000

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[1] All particulate matter emitted from the proposed engines is assumed to be in the $PM_{2.5}$ size range. Therefore, PM emissions are equivalent to directly emitted PM_{10} and $PM_{2.5}$ emissions and PM will not be discussed further.

[2] Los Angeles County only.

All modeling was performed in compliance with SCAQMD guidance [3] and the approved modeling protocol.

3.1. MODEL SELECTION

EPA's recommended dispersion model, AERMOD (version 19191), was used in the modeling analysis. AERMOD is a steady-state plume model capable of modeling simple, intermediate, and complex terrain receptors. In the stable boundary layer (nighttime), it assumes the concentration distribution to be Gaussian in both the vertical and horizontal. In the convective boundary layer (daytime) the probability density function describing the horizontal distribution is assumed to be Gaussian, while the vertical distribution is assumed to be bi-Gaussian. AERMOD also contains the PRIME algorithm, which incorporates the two fundamental features associated with building downwash: (1) enhanced plume dispersion coefficients due to the turbulent wake, and (2) reduced plume rise caused by a combination of the descending streamlines in the lee of the building and the increased entrainment in the wake. The Building Profile Input Program for PRIME (BPIPPRM version 04274) was used to account for building downwash effects.

The modeling was conducted using AERMOD's regulatory default options. In accordance with SCAQMD modeling guidance, these options include the following:

- Urban dispersion option with a population of 9,818,605[4];
- A uniform Cartesian receptor grid with spacing of 100 meters or less within one kilometer of the source and finer resolution as required to identify maximum impacts; and
- Terrain data developed through AERMAP.

Additional details regarding these options are provided later in this section.

In accordance with SCAQMD guidance, the NO_2 modeling followed the three tier NO_2 modeling approach for the conversion of nitric oxide (NO) to NO_2 described in EPA's *Guideline on Air Quality Models* Section 4.2.3.4 (*Guideline*). The three tiers are:

- Tier 1 – Assume total conversion of NO to NO_2.
- Tier 2 – The Ambient Ratio Method 2 (ARM2), which multiplies the modeled NO_X impacts by estimates of representative NO_2/NO_X equilibrium ratios based on ambient levels of NO_2 and NO_X. The national default for ARM2 includes a minimum ambient NO_2/NO_X ratio of 0.5 and a maximum ambient ratio of 0.9.
- Tier 3 – Detailed screening analysis on a case-by-case basis. EPA has implemented two Tier 3 options, Ozone Limiting Method (OLM) and Plume Volume Molar Ratio Method (PVMRM), into AERMOD as regulatory options.

The NO_2 modeling was conducted using ARM2 (Tier 2) with the default minimum ambient NO_2/NO_X ratio of 0.5 and maximum ambient ratio of 0.9.

AERMOD (starting with version 11059) is capable of calculating the distribution of daily maximum 1-hour values. The daily maximum 1-hour values are calculated when the pollutant ID is either "SO2" or "NO2" and the only short-term averaging period specified is "1-hour." When modeling with 5 years of NWS meteorological

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[3] Accessed at http://www.aqmd.gov/home/air-quality/meteorological-data/modeling-guidance#Conversion

[4] http://www.aqmd.gov/home/air-quality/meteorological-data/modeling-guidance

data, the receptor-by-receptor 5-year average serves as an unbiased estimate of the 3-year average for comparison to the 1-hour SO_2, 1-hour NO_2, and 24-hour $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS).

Controlling modeled concentrations for the percentile based 1-hour SO_2, 1-hour NO_2, and 24-hour $PM_{2.5}$ NAAQS are as follows:

- The 1-hour SO_2 NAAQS controlling modeled concentration is the 99th percentile (4th high for one year) daily maximum 1-hour average SO_2 concentration.
- The 1-hour NO_2 NAAQS controlling modeled concentration is the 98th percentile (8th high for one year) daily maximum 1-hour average NO_2 concentration.
- The 24-hour $PM_{2.5}$ NAAQS controlling modeled concentration is the 98th percentile (8th high for one year) daily $PM_{2.5}$ concentration.

For comparison to the NAAQS, the background concentrations described in Section 3.5 were added to the controlling modeled concentrations.

3.2. PROJECT EMISSIONS

The project is comprised of five Wärtsilä 18V50SG generating units. The *Guideline* (Section 8.2.2.d) requires changes in operating conditions that affect the physical emission parameters (e.g., release height, initial plume volume, and exit velocity) of the project sources be considered to ensure that maximum project impacts are determined. Therefore, stack parameters and emissions were developed for full load, minimum load, and startup. Table 3-3 lists the UTM coordinates of the proposed stacks. Table 3-4 lists the modeled emission rates and stack parameters.

During startup, the unit is expected to reach full load within 5 to 10 minutes of the initial firing. The SCR and oxidation catalyst systems become fully functional once the respective catalyst reaches the operating temperature, within approximately 30 minutes following initiation of fuel flow. The time for each catalyst to reach the operating temperature is dependent on how long the unit was shut down. The oxidation catalysts reach their operating temperature before the SCR catalysts. For the start-up scenario, startup emissions were evaluated for the following scenarios:

- Cold Startup – when the catalyst temperature is close to ambient temperature. Cold starts are expected after overhaul periods or when the engine has not been operated during the last 24 hours.
- Warm Startup – when the catalyst temperature is above ambient but less than 100 °C. Warm starts are expected after the engine has not been operated for 12 hours, but less than 24 hours.
- Hot Startup – when the catalyst temperature is greater than 100 °C. Hot starts are expected after the engine has been operated within the previous 12 hours.

The short-term startup emissions listed in Appendix A are based on the worst-case startup scenario (cold catalysts). The long-term startup emissions listed in Appendix A are based the worst-case combination of 3 startups per day (1 cold startup, 1 warm startup, and 1 hot startup). Unit shutdowns occur very quickly and emissions greater than normal levels during shutdowns are not expected. Appendix A contains the emission rate calculations.

Table 3-1. Stack Locations

Model		NAD 83 - Zone 11 UTM Coordinates		Base Elevation [A]	
ID	Description	Easting (m)	Northing (m)	(ft)	(m)
1	Unit 1	382122.5	3780085.0	43.49	142.67
2	Unit 2	382126.3	3780078.9	43.48	142.64
3	Unit 3	382130.0	3780072.5	43.46	142.58
4	Unit 4	382134.0	3780066.5	43.46	142.57
5	Unit 5	382137.5	3780060.5	43.51	142.74

[A] Base elevations obtained from AERMAP

Table 3-2. Modeled Stack Parameters and Emissions

	Stack Parameters [A]							Per Unit Modeled Emissions (g/s) [A]							NO_2/NO_X
Load/	Diameter		Height		Flow	Velocity	Temp.	SO_2 [B]		NO_X			$PM_{10}/PM_{2.5}$		In-Stack
Scenario	(ft)	(m)	(ft)	(m)	(m^3/s)	(m/s)	(K)	Short-Term	Annual [C]	Short-Term	Annual [C]	CO [B]	Short-Term	Annual [C]	Ratio [E]
Natural Gas															
Startup [D]	5.25	1.60	80.0	24.38	58.30	29.00	642.59	0.0180	0.0026	1.4824	0.0473	1.7602	0.1843	0.0285	50%
Full (100%)	5.25	1.60	80.0	24.38	58.30	29.00	642.59	0.0180	0.0026	0.1676	0.0241	0.4712	0.1663	0.0239	50%
Min. (40%)	5.25	1.60	80.0	24.38	28.68	14.27	715.93	0.0078	0.0011	0.0665	0.0096	0.0665	0.1140	0.0164	50%

[A] See Appendix A for data sources and supporting calculations. The listed modeled emissions are the total emissions from the multiple units.

[B] The maximum hourly SO_2 and CO emission rates was modeled for all short-term averaging periods.

[C] The modeled annual emission rates for the startup scenario are based on the proposed PTE. The modeled annual emission rates for the full and min. load scenarios are based on the proposed annual operating hour limit.

[D] During startup, the units reach the 100% load within 5 minutes of the initial firing. Therefore, the stack parameters are based on the 100% load. The modeled short-term (24-hour) $PM_{10}/PM_{2.5}$ emissions rate is based on 3 startup hours and 21 hours of 100% load operation.

[E] The default NO_2/NO_X in-stack ratios are used in NO_2 modeling.

3.3. AERMOD METEOROLOGICAL DATA

AERMOD uses several different boundary layer parameters to model how pollutants disperse in the atmosphere. Many of these parameters are not directly measured but are calculated from other variables that are more easily measured. AERMET, EPA's meteorological processor for AERMOD, uses observed near-surface wind and temperature and site-specific surface characteristics to estimate these boundary layer parameters (EPA, 2018b). The following surface characteristics are input into AERMET during the stage 3 processing:

- Surface roughness length (z_o) – the height above the ground at which horizontal wind velocity is typically zero,
- Noon-time albedo (r) – the fraction of radiation reflected by the surface, and
- Daytime Bowen ratio (B_o) – the ratio of the sensible heat flux (H) to the latent heat flux (λE).

In the AERMOD Implementation Guide, EPA recommends the following methodology to determine these surface characteristics:

1. *The determination of the surface roughness length should be based on an inverse-distance weighted geometric mean for a default upwind distance of 1 kilometer relative to the measurement site. Surface roughness length may be varied by sector to account for variations in land cover near the measurement site; however, the sector widths should be no smaller than 30 degrees.*
2. *The determination of the Bowen ratio should be based on a simple unweighted geometric mean (i.e., no direction or distance dependency) for a representative domain, with a default domain defined by a 10km by 10km region centered on the measurement site.*
3. *The determination of the albedo should be based on a simple unweighted arithmetic mean (i.e., no direction or distance dependency) for the same representative domain as defined for Bowen ratio, with a default domain defined by a 10km by 10km region centered on the measurement site.*

EPA developed AERSURFACE to calculate the surface characteristics based on this recommended methodology. AERSURFACE reads land cover values from the United States Geological Survey (USGS) 1992 National Land Cover Dataset (NLCD92). Meteorological data collected at the SCAQMD Burbank (KBUR) meteorological monitoring station was used to model the ambient air quality impacts. In the *Guideline*, EPA states that five (5) years of NWS meteorological data are adequate to ensure that worst-case meteorological conditions are represented in the model results. A five-year dataset is also recommended by SCAQMD guidance. The meteorological data used for this analysis was compiled by SCAQMD using EPA's AERMOD processor and pre-processors AERMINUTE (version 15181) and AERSURFACE (version 13016) using the ADJ_U* option, and includes the period of January 1, 2012, through December 31, 2016.[5] A wind rose for the Burbank monitoring station is presented in Figure 3-2. The hourly values of wind speed and direction were measured at 10 m (32.8 ft).

The SCAQMD's modeling guidance states that the determination of representativeness of meteorological data should include a comparison of factors such as surface characteristics of the measurement site and source locations, surrounding land use, wind roses and significant terrain features.

The meteorological data monitoring site is located approximately 2.5 miles northwest of the existing Grayson Power Plant. No major geographic features impacting the surface conditions or wind patterns exist between the two locations. The facility location with historical prevailing wind direction predominantly southerly/southeasterly winds is consistent with local terrain considerations. The land uses surrounding the

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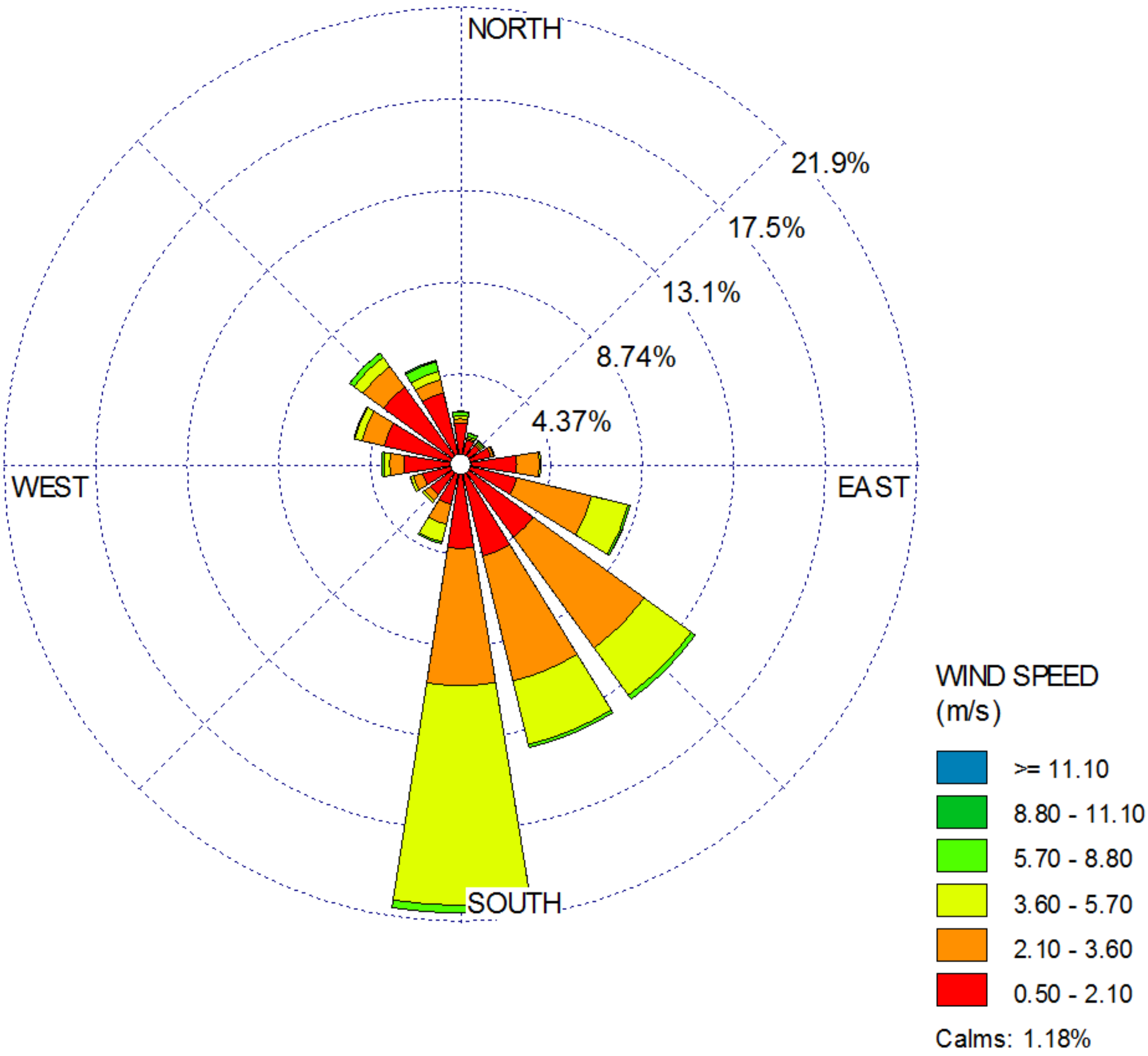
[5] http://www.aqmd.gov/home/air-quality/meteorological-data/data-for-aermod

meteorological monitoring site and the existing Grayson Power Plant are similar and have been categorized as industrial and medium density residential. Finally, the District staff have previously determined that the meteorological data from Burbank can be considered representative of the project site.

Figure 3-1. Project Site and Monitoring Station Locations

Figure 3-2. KBUR Wind Rose (2012-2016)[6]



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[6] SCAQMD, accessed at http://www.aqmd.gov/home/air-quality/meteorological-data/aermod-table-1.

3.4. AERMOD RECEPTOR DATA AND MODELING DOMAIN

The modeling grid consists of:

- 25-m spaced receptors along the fence line (i.e., that area to which public access is physically restricted),
- 50-m spaced receptors centered at the project property to 1.0 km,
- 100-m spaced receptors from 1.0 km to 2.5 km,
- 250-m spaced receptors from 2.5 km to 5 km,
- 500-m spaced receptors from 5.0 km to 7.5 km, and
- 1,000-m spaced receptors from 7.5 km to 20 km.

EPA's AERMAP (version 18081) program was used to determine the receptor elevations and height scales. AERMOD uses the receptor's height scale to determine if the plume is terrain following or terrain impacting. The AERMAP User's Guide (EPA, 2018c) states that the domain boundary must include all terrain features that exceed a 10% elevation slope from any given receptor. USGS National Elevation Dataset (NED) 1/3 arc-second data was used to identify all terrain features surrounding the project site.

3.5. BACKGROUND CONCENTRATIONS

The impacts of existing sources were represented by the existing ambient air quality data collected at nearby monitoring stations. In accordance with Section 8.3.1 of Appendix W to 40 CFR Part 51:

Background concentrations are an essential part of the total air quality concentration to be considered in determining source impacts. Background air quality includes pollutant concentrations due to: (1) nearby sources, and (2) other sources, the portion of the background attributable to natural sources, other unidentified sources in the vicinity of the project, and regional transport contributions from more distant sources (domestic and international). Typically, air quality data should be used to establish background concentrations in the vicinity of the source(s) under consideration.

As outlined in 40 CFR 51, Appendix W, Section 8.2, the background data used to evaluate the potential air quality impacts need not be collected on a project site, as long as the data are representative of the air quality in the subject area. The following three criteria were used for determining whether the background data is representative: (1) location, (2) data quality, and (3) data currentness. These criteria are defined and apply to the Project as follows:

- Location: The measured data must be representative of the areas where the maximum concentration occurs for the proposed stationary source, existing sources, and a combination of the proposed and existing sources. The nearest ambient monitoring station to the Project site is the Los Angeles – North Main Street station (ARB Monitoring Site 70087 and EPA Site ID 060371103). This site is located approximately 6.9 miles from the Project site. Based on a review of meteorological data collected at the Burbank monitoring station, the Los Angeles ambient monitoring station is upwind of the Project site for most meteorological conditions. However, the Los Angeles monitoring station is exposed to similar emissions sources—in particular, both the project site and the Los Angeles monitoring station are located near high volume freeways. The nearest upwind ambient monitoring site is the Burbank station (EPA Site ID 06371002). However, this station was shut down in 2014. Figure 3-1 shows the location of the Project relative to the monitoring stations that were used in this analysis.

- Data quality: Data must be collected and equipment must be operated in accordance with the requirements of 40 CFR Part 58, Appendices A and B, and PSD monitoring guidance. The SCAQMD, ARB, and EPA ambient air quality data summaries were used as the primary sources of data. Therefore, the data listed in Table 3-3 meets the data quality requirements of 40 CFR Part 58, Appendices A and B, and PSD monitoring guidance.

- Data currentness: The data are current if they have been collected within the preceding 3 years and are representative of existing conditions. The maximum ambient background concentrations from the period 2016 – 2018 were combined with the modeled concentrations and used for comparison to the ambient air quality standards. Therefore, the data listed in Table 3-3 represents the three most recent years of data available.

Based on the criteria presented above, the maximum of the three most recent years of background NO$_2$, CO, SO$_2$, PM$_{10}$ and PM$_{2.5}$ data from the Los Angeles—North Main Street monitoring station was combined with the modeled concentrations and used for comparison to the ambient air quality standards. A summary of the background concentrations for 2016 through 2018 are presented in Table 3-3 below. Background values for state and federal standards are shown separately when necessary to reflect the form of the standard and the monitor sampling methods.

In accordance with USEPA guidelines, the highest second-high modeled concentrations are used to demonstrate compliance with the short-term federal standards (except for the statistically based federal one-hour NO$_2$ and SO$_2$, and 24-hour PM$_{2.5}$ standards, discussed in Section 3.1 above) and the highest modeled concentration are used to demonstrate compliance with the federal annual standards and all state standards. In this report, the highest modeled short-term concentrations are used to demonstrate compliance with the not statistically based federal standards.

Table 3-3. Background Concentrations from the Los Angeles-North Main Street Monitoring Station

Pollutant	Averaging Period	Monitored Background Concentration			Maximum Concentration	
		2016	2017	2018		
NO$_2$	1-hour [a] – state std	64.7 ppb	80.6 ppb	70.0 ppb	80.6 ppb	151.5 μg/m^3
	1-hour [b] – federal std	61.0 ppb	61.7 ppb	57.2 ppb	61.7 ppb	116.0 μg/m^3
	Annual – state std	20 ppb	20 ppb	18 ppb	20 ppb	37.6 μg/m^3
	Annual – federal std	21 ppb	21 ppb	19 ppb	21 ppb	39.5 μg/m^3
SO$_2$	1-hour – state std	13.4 ppb	5.7 ppb	17.9 ppb	17.9 ppb	46.9 μg/m^3
	1-hour [c] – federal std	2.5 ppb	2.6 ppb	2.8 ppb	2.8 ppb	7.3 μg/m^3
	24-hour - state std	1.3 ppb	1.5 ppb	1.3 ppb	1.5 ppb	3.9 μg/m^3
	Annual	0.34 ppb	0.36 ppb	0.30 ppb	0.36 ppb	0.9 μg/m^3
CO	1-hour	1.9 ppm	1.9 ppm	1.9 ppm	1.9 ppm	2,174 μg/m^3
	8-hour	1.4 ppm	1.6 ppm	1.4 ppm	1.6 ppm	1,830 μg/m^3
PM$_{10}$	24-hour – state std	67 μg/m^3	96 μg/m^3	81 μg/m^3	96 μg/m^3	
	24-hour – federal std	64.0 μg/m^3	64.6 μg/m^3	68.2 μg/m^3	68.2 μg/m^3	
	Annual[d] - state std	32.4 μg/m^3	34.4 μg/m^3	34.1 μg/m^3	34.4 μg/m^3	
PM$_{2.5}$	24-hour [f]	27.3 μg/m^3	27.8 μg/m^3	30.5 μg/m^3	30.5 μg/m^3	
	Annual [d] – state std	12.0 μg/m^3	16.3 μg/m^3	16.0 μg/m^3	16.3 μg/m^3	
	Annual [e] – federal std	11.8 μg/m^3	11.9 μg/m^3	12.6 μg/m^3	12.6 μg/m^3	

Sources:

SCAQMD Historical Air Quality Data Tables; NO$_2$, PM$_{10}$ and PM$_{2.5}$ from CARB iADAM; SO$_2$ and CO from U.S. EPA Monitor Values Report.

Notes:

[a] California 1-hour standard design value.

[b] 98th percentile value.

[c] 99th percentile value.

[d] Three-year maximum annual average.

[e] Three-year average.

[f] 24-hour standard 98th percentile.

3.6. GEP STACK HEIGHT AND BUILDING DOWNWASH

For air quality modeling purposes, the proposed new units were evaluated in terms of their proximity to nearby structures to determine whether stack effluents may be affected by downwash in the turbulent wake of such structures. AERMOD uses the following building parameters to account for downwash:

- BUILDHGT, the building height,
- BUILDWID, the projected width of the building perpendicular to the flow,
- BUILDLEN, the projected length of the building along the flow,
- XBADJ, the along-flow distance from the stack to the center of the upwind face of the projected building, and
- YBADJ, the across-flow distance from the stack to the center of the upwind face of the projected building.

Building parameters were obtained using EPA's Building Profile Input Program designed for AERMOD (BPIPPRM – version 04274). BPIPPRM calculates the building parameters for 36 wind directions based on the physical dimensions of the structures surrounding a source. Trinity reviewed information from Google Earth and determined that off-site buildings do not need to be included in the modeling. Table 3-4 lists the structures and heights entered into BPIPPRM and the BPIPPRM input and output files are included with the modeling files.

The *Guideline* states the use of stack heights greater than the Good Engineering Practice (GEP) stack height in the modeling is prohibited (40 CFR §51.118 and 40 CFR §51.164). Per 40 CFR §51.100 the GEP stack height limit for this project is the greater of:

- 65 meters, measured from the ground-level elevation at the base of the stack, or
- The formula GEP stack height ($GEP_f = H + 1.5L$). Where, H is the structure height, and L is the lesser dimension of the structure (height or projected width).

The proposed stack height of 24.38 meters (80.0 ft) is less than the formula GEP stack height and less than 65-meter limit.

Table 3-4. Downwash Structures

ID	Description	Height (m)
Existing Buildings		
TGPP9_1	Unit 9 Gas Turbine - Tier 1	10.36
TGPP9_2	Unit 9 Gas Turbine - Tier 2	17.07
UNIT9SUP	Gas Turbine Unit 9 Support Building	5.49
GARAGE_1	Garage - Tier 1	4.57
GARAGE_2	Garage - Tier 2	6.10
SHOP	Superintent and Shop Building	6.10
New Buildings		
WORKSHOP	Workshop	6.10
UTILBLK	Utility Block	7.93
ENGHALL	Engine Hall	13.03

This section describes the modeling methodology used to demonstrate that the proposed project does not cause or contribute to the violation of any NAAQS or state AAQS. Appendix A contains a catalogue of modeling input and output files.

4.1. PROJECT IMPACT ANALYSIS

The project impact analysis determines the potential of the project to cause or contribute to a violation of any national or state AAQS. If screening or refined modeling indicates that the project will not cause or contribute to any potential violation of any applicable standard, then the project impact analysis would generally be sufficient for the required demonstration. Table 4-1 lists the air quality significance thresholds that were used to determine if the project has the potential to cause or contribute to a violation.

As previously discussed, the project impact analysis will evaluate the units while operating under full load, minimum load, and startup conditions. The following steps were followed for the project impact analysis:

1. Determine the project's maximum impact for all receptors for all averaging periods for the three operating scenarios (full load, minimum load, and startup) with all five units operating simultaneously.
2. Compare the project's impacts identified in step 1 with the corresponding SCAQMD significant changes concentrations in Table 4-1 or the federal modeling significant impact levels.

For any pollutant averaging periods for which ambient background concentrations are below the corresponding ambient standard, the modeled increase in concentration resulting from the project is added to the background concentrations shown in Table 3-3. For $PM_{2.5}$ and PM_{10} the ambient background concentrations are already above the applicable state standard, so the modeled project concentrations are compared to the respective significance thresholds in Table 4-1.

Table 4-1. SCAQMD Air Quality Significance Thresholds

Pollutant	Averaging Period	Significant Change in Concentration [A]
NO_2	1-hour average	20 μg/m^3
	Annual arithmetic mean	1 μg/m^3
CO	1-hour average	1.1 mg/m^3
	8-hour average	0.50 mg/m^3
$PM_{10}/PM_{2.5}$	24-hour average	2.5 μg/m^3
	Annual average	1 μg/m^3

[A] SCAQMD Rule 1303, Table A-2.

Since the project consist of five identical units, the project impact modeling, except for the 1-hour NO_2 modeling using ARM2, was conducted using unit impact modeling. During startup the units are expected to reach full load within 5 to 10 minutes of the initial firing. Therefore, the modeled stack parameters and resulting normalized unit impact for the startup and full load scenarios are identical. Table 4-2 lists the unit impacts for the startup/full load and minimum load scenarios. The project's secondary $PM_{2.5}$ impact was included based on

EPA's worst-case Modeled Emission Modeled Emission Rates for Precursors (MERPs)[7] for the climate zone. Table 4-3 shows the project's secondary $PM_{2.5}$ impact calculation. Table 4-4 shows the modeled project emission rates, unit impact multiplier and the resulting project impacts for the startup, full load, and minimum load scenarios. Also, Table 4-4 shows the comparison of the project impacts to the respective SCAQMD air quality significance threshold or modeling significant impact level.

Table 4-2. Summary of Unit Impacts

	Source	Maximum Unit Impact ($\mu g/m^3$ per g/s) - Across 5-Yrs				
Scenario	**Group**	**1-hr**	**3-hr**	**8-hr**	**24-hr**	**Annual**
Startup/Full Load	FULL	5.46033	4.90765	3.57537	1.35827	0.47431
Min. Load	MIN	8.18447	7.36406	5.35102	2.03490	0.70813
	Source	**Maximum Annual Unit Impact ($\mu g/m^3$ per g/s)**				
Scenario	**Group**	**2012**	**2013**	**2014**	**2015**	**2016**
Startup/Full Load	FULL	0.45565	0.47431	0.47057	0.43416	0.47015
Min. Load	MIN	0.67745	0.70813	0.69827	0.65229	0.70256
	Source	**Maximum Unit Impact ($\mu g/m^3$) - 5-Yrs Average**				
Scenario	**Group**				**24-Hr**	**Annual**
Startup/Full Load	FULL				1.29725	0.46075
Min. Load	MIN				1.93128	0.68774

The modeling was conducted using EPA's AERMOD dispersion model (version 19191).

Table 4-3. MERP Based Estimated Secondary $PM_{2.5}$ (Worst-Case Emissions)

	Precursor	MERP [B]	
Precursor	**Emissions [A] (tpy)**	**Daily PM (tpy)**	**Annual PM (tpy)**
NO_X	8.22	1,073	3,182
SO_2	0.45	188	2,331
MERP Critical Threshold ($\mu g/m^3$)		1.2	0.2
Project % of MERP		1.0%	0.3%
MERP Secondary $PM_{2.5}$		0.012	0.001

[A] The listed precursor emissions are the worst-case project emissions.

[B] The listed MERPs are from EPA's *Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier I Demonstration Tool for Ozone and PM $_{2.5}$ under the PSD Permitting Program* (EPA 454/R-19-003), Table 4.1 for the West climate zone (lowest).

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[7] EPA's Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier I Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program (EPA 454/R-19-003)

Table 4-4. Project Impact Modeling Results

Scenario	Pollutant	Averaging Period	Total Emission Rate (g/s)	80-Foot Stacks		Significant Impact/Change Level (μg/m^3)	Notes
				Unit Impact [A] (μg/m^3 per g/s)	Total Impact (μg/m^3)		
Startup	SO_2	1-hr	0.090	5.46033	0.490	7.8	Max (H1H)
		3-hr	0.090	4.90765	0.441	25	
		24-hr	0.090	1.35827	0.122	5	
		Annual	0.013	0.47431	0.006	1	
	$PM_{10}/PM_{2.5}$	24-hr	0.921	1.35827	1.251	2.5	24-hr average emissions
		Annual	0.143	0.47431	0.068	1	
	$PM_{2.5}$ [B]	24-hr	0.921	1.29725	1.207	2.5	24-hr average emissions
		Annual	0.143	0.46075	0.066	0.2	
	NO_2 as NO_X	1-hr	7.412	5.46033	40.472	20.0	Max (H1H) - Continuous Startup
		Annual	0.237	0.47431	0.112	1	
	NO_2 (ARM2) [C]	1-hr			35.758	7.5	Continuous Startup
	CO	1-hr	8.801	5.46033	48.057	1,100	Continuous Startup
		8-hr	8.801	3.57537	31.467	500	Continuous Startup
100% Load	SO_2	1-hr	0.090	5.46033	0.490	7.8	Max (H1H)
		3-hr	0.090	4.90765	0.441	25	
		24-hr	0.090	1.35827	0.122	5	
		Annual	0.013	0.47431	0.006	1	
	$PM_{10}/PM_{2.5}$	24-hr	0.832	1.35827	1.130	2.5	
		Annual	0.120	0.47431	0.057	1	
	$PM_{2.5}$ [B]	24-hr	0.832	1.29725	1.091	2.5	
		Annual	0.120	0.46075	0.056	0.2	
	NO_2 as NO_X	1-hr	0.838	5.46033	4.575	20.0	Max (H1H)
		Annual	0.121	0.47431	0.057	1	
	NO_2 (ARM2) [C]	1-hr			4.042	7.5	
	CO	1-hr	2.356	5.46033	12.866	1,100	
		8-hr	2.356	3.57537	8.424	500	
Min. Load	SO_2	1-hr	0.039	8.18447	0.318	7.8	Max (H1H)
		3-hr	0.039	7.36406	0.286	25	
		24-hr	0.039	2.03490	0.079	5	
		Annual	0.006	0.70813	0.004	1	
	$PM_{10}/PM_{2.5}$	24-hr	0.570	2.03490	1.160	2.5	
		Annual	0.082	0.70813	0.058	1	
	$PM_{2.5}$ [B]	24-hr	0.570	1.93128	1.113	1.2	
		Annual	0.082	0.68774	0.057	0.2	
	NO_2 as NO_X	1-hr	0.333	8.18447	2.722	20.0	Max (H1H)
		Annual	0.048	0.70813	0.034	1	
	NO_2 (ARM2) [C]	1-hr			2.384	7.5	
	CO	1-hr	0.333	8.18447	2.722	1,100	
		8-hr	0.333	5.35102	1.780	500	

[A] The modeling was conducted using EPA's AERMOD dispersion model (version 19191).

[B] Includes secondary $PM_{2.5}$, based on EPA's worst-case MERPs for the climate zone.

[C] Maximum daily 1-hr concentration averaged over 5 years

🟩 Below Significant Impact/Change Level

🟨 Above Significant Impact/Change Level

4.2. NAAQS AND STATE AAQS ANALYSIS

Table 4-5 compares the maximum project impacts plus background to the respective NAAQS or State AAQS and shows the project does not cause or contribute to an exceedance for any NAAQS or State AAQS.

Table 4-5. NAAQS and State AAQS Analysis Modeling Results

Scenario	Pollutant	Averaging Period	Concentration ($\mu g/m^3$)			SAAQS/ NAAQS ($\mu g/m^3$)	% of Standard
			Project [A]	Background Sources [B]	Total		
Worst-Case Scenario	SO_2	1-hr - state std [C]	0.490	46.9	47.4	655	7%
		1-hr - federal std [C]	0.490	7.34	7.83	196	4%
		3-hr - federal std [C]	0.441	46.9	47.3	1200	4%
		24-hr - state std [C]	0.122	3.93	4.05	105	4%
		Annual - federal std	0.006	0.94	0.95	80	1%
	PM_{10}	24-hr - federal std [C]	1.251	68.2	69.5	150	46%
		24-hr - state std [C]	1.251	96.0	97.3	50	195%
		Annual - state std	0.068	34.4	34.5	20	172%
	$PM_{2.5}$	24-hr - federal std [D]	1.207	30.5	31.7	35	91%
		Annual - state std	0.068	16.3	16.4	12	136%
		Annual – federal std [D]	0.066	12.6	12.7	12.0	106%
	NO_2 (ARM)	1-hr - federal std [E,F]	33.48	116.0	149.5	188	80%
	NO_2 as NO_X	1-hr - state std [C]	40.47	151.5	192.0	339	57%
		Annual - state std	0.112	37.6	37.7	57	66%
		Annual – federal std	0.112	37.6	37.7	100	38%
	CO	1-hr - state std [C]	48.06	2,174	2,222	23,000	10%
		8-hr - state std [C]	31.47	1,830	1,862	10,000	19%

[A] The modeling was conducted using EPA's AERMOD dispersion model (version 19191).

[B] See Table 3.3 for the background concentrations. The 1-hour SO_2 state background is conservatively used for the 3-hour background.

[C] The listed modeled concentrations are the maximum highest first-high (H1H) concentrations.

[D] The listed 24-hour modeled concentration is the overall highest 24-hr concentration, averaged over 5 years. The listed annual modeled concentration is the overall highest annual concentration, averaged over 5 years. Both listed modeled concentrations Include secondary $PM_{2.5}$, based on EPA's worst-case MERPs for the climate zone.

[E] Per EPA's March 1, 2011 memorandum, the listed modeled concentration is the highest 98th percentile maximum daily 1-hr concentration averaged over 5 years.

[F] The 1-hour federal NO_2 modeling was based on ARM2 to model the NO_X to NO_2 conversion.

5. HEALTH RISK ASSESSMENT

A health risk assessment was performed according to the SCAQMD AB 2588 and Rule 1402 Supplemental Guidelines and the Office of Environmental Health Hazard Analysis "Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments" (OEHHA, 2015). The HRA modeling was prepared using the Risk Assessment Standalone Tool (RAST) module of CARB's Hotspots Analysis and Reporting Program (HARP) computer program (Version 19121, May 1, 2019). The RAST model was used to assess cancer risk as well as non-cancer chronic and acute health hazards. SCAQMD's supplemental risk assessment guidance[8] was followed, with HARP settings following the options described in Appendix II of the guidance.

The emission rates used in the health risk assessment, except for formaldehyde, are based on uncontrolled emission factors from the California Air Toxics Emission Factor (CATEF) database. The generating units will be equipped with oxidation catalysts to control VOC emissions. However, with the exception of formaldehyde, credit for the oxidation catalysts is not included. Formaldehyde emissions are based on data provided by Wartsila. Appendix Table A-4 lists the non-criteria emissions used in the health risk assessment.

Additional receptors, with the exception of census receptors, were not placed into the model as the Zone of Impact (ZOI) only extended 500 meters from the center of the facility, and the maximum receptor impacts were determined by choosing the receptors closest to the nearest residences and workplaces with the highest impact. No sensitive receptors are located within the ZOI.

SCAQMD Rule 1401 requires that the health risk from a proposed project must not exceed the levels shown in Table 5-1.

Table 5-1. Screening Health Risk Assessment Limits

Risk Category	Limit
Maximum Individual Cancer Risk (MICR)[a]	1×10^{-5}
Non-Cancer Acute Health Hazard Index (HI)[b]	1.0
Non-Cancer Chronic Health Hazard Index (HI)[a]	1.0
Cancer Burden[c]	0.5

Notes:

a. At the most exposed residential and most exposed commercial/industrial receptors.

b. At the offsite point of maximum impact (PMI).

c. Required to be calculated within the zone of influence.

The HRA modeling evaluated annual average concentrations (to calculate MICR, maximum chronic HI, zones of impact and excess cancer burden, if required) and peak hourly and 8-hour average concentrations (as appropriate, to calculate maximum acute HI). As a conservative estimate, the unit emission rate plot-files for the

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[8] SCAQMD, *AB 2588 and Rule 1402 Supplemental Guidelines (Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics "HotSpots" Information and Assessment Act)*, September 2018. Accessed at *http://www.aqmd.gov/docs/default-source/planning/risk-assessment/ab-2588-supplemental-guidelines-201809.pdf?sfvrsn=6*

minimum operating capacity modeling iteration were utilized along with maximum hourly emission rates and total annual emissions. Additionally, because the facility is only going to operate 1,260 hours per year, a worker adjustment factor of 7 (8,760/1,260) was applied to estimate worker impacts as if all 1,260 coincided with the work schedules of all offsite workers.

Table 5-2 below summarizes the health risk impacts at the relevant receptors.

Table 5-2. HRA Results Summary

	Cancer Risk		Chronic		Acute		Chronic 8-hr	
Receptor Type	**Receptor ID**	**One in a million**	**Receptor ID**	**Hazard Index**	**Receptor ID**	**Hazard Index**	**Receptor ID**	**Hazard Index**
Point of Maximum Impact	5,284	2.0	5,284	<0.01	5,329	0.06	5,284	0.03
Maximum Exposed Individual Resident	600	1.5	600	<0.01	744	0.04	N/A	N/A
Maximum Exposed Individual Worker	599	1.0	599	<0.01	632	0.05	599	0.02

The coordinates for each of the receptors in Table 5-2 are listed in Table 5-3 below. Appendix C contains a plot of the relevant receptors.

Table 5-3. Maximum Receptor Locations

Receptor ID	X (m)	Y (m)
5,284	382,122	3,780,378
5,329	382,032	3,780,172
600	382,150	3,780,500
744	382,350	3,780,200
599	382,150	3,780,450
632	382,200	3,780,350

As shown in Table 5-2, all points of maximum impact are below the Rule 1401 limits. Additionally, the Chronic, Acute, and Chronic 8-hr impacts are all below relevant thresholds for the generation of isopleths (0.5). As such, the only isopleths generated were those of cancer risks above one in a million, attached in Appendix C. The resident cancer risk isopleth has the largest extent for the purposes of determining the ZOI, at approximately 500 meters from the center of the facility. Given this ZOI, the list of census receptors within that radius is listed in Table 5-4 below. Please note, all census receptors with a population of 0 were removed from the analysis.

Table 5-4. Census Receptors

Tract No.	Block No.	X (m)	Y (m)	Population
301601	2025	381,655	3,780,287	46
301701	2011	382,156	3,780,704	134
301701	2015	382,147	3,780,576	34
301701	2016	382,237	3,780,634	24
301701	2017	382,270	3,780,474	69
301701	2018	382,325	3,780,541	54
301701	2019	382,390	3,780,634	44
301701	2022	382,503	3,780,463	81
301701	2023	382,471	3,780,380	82
301701	2024	382,490	3,780,233	61
301701	2025	382,407	3,780,310	68
301701	2026	382,264	3,780,388	17
301701	2027	382,175	3,780,492	8
301701	2032	382,032	3,780,595	12
301701	2034	382,350	3,780,240	36

The information in Table 5-4 shows that a total population of 770 individuals is exposed to a cancer risk greater than one in a million, and no individuals are exposed to a hazard index above 0.5, as no hazard indices are above 0.5 in the analysis. Table 5-5 summarizes the population-wide cancer risk at each receptor and sums the products of the populations and cancer risks to determine the cancer burden.

Table 5-5. Cancer Burden Calculation

Tract No.	Block No.	X (m)	Y (m)	Population	Excess Cancer Risk
301601	2025	381,655	3,780,287	46	1.62E-04
301701	2011	382,156	3,780,704	134	5.15E-04
301701	2015	382,147	3,780,576	34	1.75E-04
301701	2016	382,237	3,780,634	24	9.80E-05
301701	2017	382,270	3,780,474	69	2.90E-04
301701	2018	382,325	3,780,541	54	1.73E-04
301701	2019	382,390	3,780,634	44	1.06E-04
301701	2022	382,503	3,780,463	81	1.26E-04
301701	2023	382,471	3,780,380	82	1.53E-04
301701	2024	382,490	3,780,233	61	1.58E-04
301701	2025	382,407	3,780,310	68	1.44E-04
301701	2026	382,264	3,780,388	17	6.86E-05
301701	2027	382,175	3,780,492	8	4.96E-05
301701	2032	382,032	3,780,595	12	5.72E-05
301701	2034	382,350	3,780,240	36	8.52E-05
				Total	0.002

The sum product of the population and excess cancer risk is below the Rule 1401 limit of 0.5.

No impacts are above relevant Rule 1401 thresholds, and Appendix Tables D-1 through D-8 outline the results and specific pollutant impacts at each receptor.

Appendix A: EMISSION CALCULATIONS

Appendix Table A-1
Project Emissions

		Generating Units				PSD Significant Level [C]	Significant Increase
		Unit 1, 2, 3, 4 or 5 [A,B]		Number of Units	Total		
Pollutant	Scenario	(lb/hr)	(tpy)		(tpy)	(tpy)	(Yes/No)
SO_2	Normal	0.14	0.07	5	0.35		
	Startup	0.14	0.02	5	0.10		
	Total		0.09		0.45	40	No
CO	Normal	3.74	1.83	5	9.16		
	Startup	13.97	0.94	5	4.71		
	Total		2.77		13.87	100	No
NO_X	Normal	1.33	0.65	5	3.26		
	Startup	11.77	0.99	5	4.97		
	Total		1.64		8.22	40	No
PM	Normal	1.32	0.65	5	3.23		
	Startup	2.46	0.34	5	1.72		
	Total		0.99		4.96	25	No
PM_{10} [D]	Normal	1.32	0.65	5	3.23		
	Startup	2.46	0.34	5	1.72		
	Total		0.99		4.96	15	No
$PM_{2.5}$ [D,E]	Normal	1.32	0.65	5	3.23		
	Startup	2.46	0.34	5	1.72		
	Total		0.99		4.96	10	No
VOC	Normal	1.88	0.92	5	4.61		
	Startup	5.64	0.76	5	3.80		
	Total		1.68		8.40	40	No
O_3 [F]	(NO_X)			5		40	No
	(VOC)			5		40	
CO_2e		18,923	11,922	5	59,608	75,000	No

[A] See Appendix Tables A-2 and A-3 for the emission calculations.

[B] The listed project emissions (i.e., short-term emissions) represent the project's potential to emit (PTE) emissions. Annual tpy values are based on each unit operating 980 hours per year at normal conditions and 280 hours per year in startup mode.

[C] Non-GHG significant levels from 40 CFR §52.21(b)(23)(i). GHG (i.e., CO_2e) significant level from 40 CFR §52.21(b)(49)(iv).

[D] Per 40 CFR §52.21(b)(50)(i)(a) $PM_{2.5}$ emissions and PM_{10} emissions shall include gaseous emissions from a source or activity which condense to form particulate matter at ambient temperatures. On or after January 1, 2011, such condensable particulate matter shall be accounted for in applicability determinations and in establishing emissions limitations for $PM_{2.5}$ and PM_{10} in PSD permits.

[E] In addition to the 10 tpy significant level for direct $PM_{2.5}$ emissions, the project is significant for $PM_{2.5}$ if SO_2 or NO_X emissions exceed 40 tpy (40 CFR §52.21(b)(23)(i)).

[F] The project is significant for O_3 if NO_X or VOC emissions exceed 40 tpy (40 CFR §52.21(b)(23)(i)).

Appendix Table A-2
Wärtsilä 18V50SG Pollutant Emission Rate Calculations

			Wärtsilä 18V50SG			
			100% Load	75% Load	40% Load	
Parameter	**Variable**	**Units**	**Value**	**Value**	**Value**	**Data Source**
			Performance Data			
Generation	G	kW_e	18,817	14,113	7,527	Supplied by Wärtsilä
Engine Heat Rate (HHV)	HR_{HHV}	Btu/kW_e-hr	8,588	8,510	9,287	G/HI_{HHV}*10^6
Heat Input (HHV)	HI_{HHV}	MMBtu/hr	161.6	120.1	69.9	Supplied by Wärtsilä
Fuel Heat Content (HHV)	HHV	Btu/ft^3	1,031	1,031	1,031	Calculated from Wärtsilä fuel analysis
Fuel Flow	$FF_{ft3/hr}$	ft^3/hr	156,741	116,489	67,798	HI_{HHV}/(HHV/10^6)
Fuel Density	$F_{density}$	lb/ft^3	0.0447	0.0447	0.0447	Density of CH_4 at 0 °C and 1 atm
			Exhaust Data			
Exhaust Temp (post-HRSG)	--	°F	697	753	829	Supplied by Wärtsilä
	T_{stack}	°R	1,157	1,213	1,289	Converted from °F
	--	°C	369.44	400.56	442.78	Converted from °F
	--	K	642.59	673.71	715.93	Converted from °F
Exhaust Pressure	--	kPa	99.5	99.5	99.5	Supplied by Wärtsilä
	P_{stack}	psia	14.431	14.431	14.431	Converted from kPa
Universal Gas Constant	R	psia-ft^3/lbmol-R	10.73	10.73	10.73	https://www.engineeringtoolbox.com
Standard Pressure	P_{std}	psia	14.696	14.696	14.696	40 CFR Part 60, Appendix A, Method 5
Standard Temperature	T_{std}	K	293.15	293.15	293.15	40 CFR Part 60, Appendix A, Method 5
Exhaust Volumetric Flow (actual)	Q_{f3s}	ft^3/s	2,059	1,620	1,013	Supplied by Wärtsilä
	Q_{m3s}	m^3/s	58.30	45.87	28.68	Converted from ft^3/s
	Q_{acfm}	acfm	123,540	97,200	60,780	Converted from ft^3/s
Exhaust H_2O Content	%H_2O	% by Vol	10.1%	10.4%	10.2%	Supplied by Wärtsilä
Exhaust O_2 Content	%O_2	% by Vol	10.2%	9.75%	9.98%	Supplied by Wärtsilä
Dry Exhaust Volumetric Flow @ 32° F and Std. P.		ft^3/s	802	600	354	Q_{f3s}*(492/T_{stack})*(P^{std}/P_{stack})*(1-%H_2O)
	$Q_{dry-32F}$	m^3/s	22.70	16.98	10.01	Converted from ft^3/s
Dry Exhaust Volumetric Flow	Q_{dry}	dcf/min	113,116	88,702	55,590	$Q_{dry-32F}$*(T_{stack}/492)*60*3.281^3
%O_2 Dry Basis	%O_{2-Dry}	%	11.3%	10.9%	11.1%	%O_2/(1-%H_2O)
Dry Exhaust Volumetric Flow (Std)	$Q_{dry-std}$	dscf/min	51,604	38,597	22,762	Q_{dry}*(T_{std}/T_{stack})
Dry Exhaust Volumetric Flow (32 °F)	$Q_{dry-32F}$	Nm^3/min	1,362	1,018	601	Q_{dry}*(273.15/T_{stack})*.3048^3
Stack Diameter	D_{ft}	ft	5.25	5.25	5.25	Supplied by Wärtsilä
	D_m	m	1.60	1.60	1.60	Converted from ft.
Stack Area	A_{m2}	m^2	2.01	2.01	2.01	(π*D_m^2)/4
Stack Velocity	$V_{m/sec}$	m/sec	29.00	22.82	14.27	Q_{m3s}/A_{m2}
	$V_{ft/sec}$	ft/sec	95.14	74.85	46.81	Converted from m/s

Appendix Table A-2
Wärtsilä 18V50SG Pollutant Emission Rate Calculations

			Wärtsilä 18V50SG			
			100% Load	75% Load	40% Load	
Parameter	Variable	Units	Value	Value	Value	Data Source
			Emission Rates			
Max Sulfur	--	ppm-v	5	5	5	Supplied by Wärtsilä
	FS	gr/100 SCF	0.318	0.318	0.318	Converted from ppm-v
SO_2 Emission Rates	--	g/s	0.0180	0.0133	0.0078	Converted from lb/hr
	M_{SO2}	lb/hr	0.1425	0.1059	0.0616	Calculated using mass balance (100% conversion of fuel S)
SO_2 Emission Factors	--	lb/MMBtu	0.00088	0.00088	0.00088	M_{SO2}/HI_{HHV}
SO_2 Molecular Weight	MW_{SO2}	lb/lbmol	64.1	64.1	64.1	http://www.webelements.com/
S Molecular Weight	MW_S	lb/lbmol	32.1	32.1	32.1	http://www.webelements.com/
$PM/PM_{10}/PM_{2.5}$ Stack Conc.	$C_{d15\text{-}PM10}$	mg/Nm^3 @ 15% O_2	5.0	6.0	7.5	Supplied by Wärtsilä
	$C_{d\text{-}PM10}$	mg/Nm^3	8.1	10.2	12.4	$C_{d15\text{-}PM10}$*((20.9-%$O_{2\text{-}dry}$*100)/(20.9-15))
$PM/PM_{10}/PM_{2.5}$ Emission Rates	$M_{PM\text{-}g/s}$	g/s	0.166	0.159	0.114	Converted from lb/hr
	$M_{PM10\text{-}lb/hr}$	lb/hr	1.32	1.26	0.905	Supplied by Wärtsilä
NO_X as NO_2 Stack Conc.	$C_{d15\text{-}NOX}$	ppmvd @ 15% O_2	2.4	2.3	2.2	Supplied by Wärtsilä
	$C_{d\text{-}NOX}$	ppmvd	3.89	3.91	3.65	$C_{d15\text{-}NOX}$*((20.9-%$O_{2\text{-}dry}$*100)/(20.9-15))
NO_2 Molecular Weight	MW_{NO2}	lb/lbmol	46.0	46.0	46.0	http://www.webelements.com/
NO_X as NO_2 Emission Rates	$M_{NOX\text{-}lb/hr}$	lb/hr	1.33	0.985	0.528	Supplied by Wärtsilä
	$M_{NOX\text{-}g/s}$	g/s	0.168	0.124	0.067	Converted from lb/hr
CO Stack Conc.	$C_{d15\text{-}CO}$	ppmvd @ 15% O_2	11.2	10.8	10.0	Supplied by Wärtsilä
	$C_{d\text{-}CO}$	ppmvd	18.1	18.3	16.6	$C_{d15\text{-}CO}$*((20.9-%$O_{2\text{-}dry}$*100)/(20.9-15))
CO Molecular Weight	MW_{CO}	lb/lbmol	28.0	28.0	28.0	http://www.webelements.com/
CO Emission Rates	$M_{CO\text{-}lb/hr}$	lb/hr	3.74	2.82	1.50	Supplied by Wärtsilä
	$M_{CO\text{-}g/s}$	g/s	0.471	0.355	0.189	Converted from lb/hr
VOC (as CH_4) Stack Conc.	$C_{d15\text{-}VOC}$	ppmvd @ 15% O_2	9.8	9.4	8.8	Supplied by Wärtsilä
	$C_{d\text{-}VOC}$	ppmvd	15.9	16.0	14.6	$C_{d15\text{-}VOC}$*((20.9-%$O_{2\text{-}dry}$*100)/(20.9-15))
VOC (as CH_4) Molecular Weight	MW_{CH4}	lb/lbmol	16.0	16.0	16.0	http://www.webelements.com/
VOC (as CH_4) Emission Rates	$M_{VOC\text{-}lb/hr}$	lb/hr	1.88	1.41	0.751	Supplied by Wärtsilä
	$M_{VOC\text{-}g/s}$	g/s	0.237	0.178	0.095	Converted from lb/hr
NH_3 Slip	$C_{d15\text{-}NH3}$	ppmvd @ 15% O_2	5	5	5	Supplied by Wärtsilä
	$C_{d\text{-}NH3}$	ppmvd	8.1	8.5	8.3	$C_{d15\text{-}NH3}$*((20.9-%$O_{2\text{-}Dry}$*100)/(20.9-15))
NH_3 Molecular Weight	MW_{NH3}	lb/lbmol	17.0	17.0	17.0	http://www.webelements.com/
NH_3 Emission Rate	$M_{NH3\text{-}lb/hr}$	lb/hr	1.02	0.82	0.46	Supplied by Wärtsilä
	$M_{NH3\text{-}g/s}$	g/s	1.29E-01	1.03E-01	5.80E-02	Converted from lb/hr
Formaldehyde (CH_2O)	$C_{d15\text{-}CH2O}$	ppmvd @ 15% O_2	1.1	1.1	1.1	Supplied by Wärtsilä
	$C_{d\text{-}CH2O}$	ppmvd	1.78	1.87	1.82	$C_{d15\text{-}CH2O}$*((20.9-%$O_{2\text{-}Dry}$*100)/(20.9-15))
CH_2O Molecular Weight	MW_{CH2O}	lb/lbmol	30.0	30.0	30.0	http://www.webelements.com/
CH_2O Emission Rate	$M_{CH2O\text{-}lb/hr}$	lb/hr	0.41	0.32	0.19	(($C_{d\text{-}CH2O}$*(1-%H_2O))*$Q_{acfm}/10^6$)*P_{stack}*MW_{NH3}/(R*T_{stack})*60
	$M_{CH2O\text{-}g/s}$	g/s	5.17E-02	4.03E-02	2.39E-02	Converted from lb/hr

Appendix Table A-3
Wärtsilä 18V50SG Startup Emission Rates

Cold Start[1]

Time (min.)	Operating Mode	Emissions (lb)					
		SO_2	**NO_X**	**CO**	**PM**	**$PM_{10}/PM_{2.5}$**	**VOC**
1 - 30	Startup	0.0713	11.10	12.10	1.80	1.80	4.70
31 - 60	Normal (Worst-case load)	0.0713	0.67	1.87	0.66	0.66	0.94
Total	**(lb/hr)**	**0.1425**	**11.77**	**13.97**	**2.46**	**2.46**	**5.64**
	(g/s)	**1.796E-02**	**1.48**	**1.760**	**3.100E-01**	**3.100E-01**	**0.711**

[1] A cold catalyst start is when the temperature of the catalyst is close to the ambient temperature.

Warm Start[2]

Time (min.)	Operating Mode	Emissions (lb)					
		SO_2	**NO_X**	**CO**	**PM**	**$PM_{10}/PM_{2.5}$**	**VOC**
1 - 30	Startup	0.0713	6.75	4.20	1.80	1.80	4.50
31 - 60	Normal (Worst-case load)	0.0713	0.67	1.87	0.66	0.66	0.94
Total	**(lb/hr)**	**0.1425**	**7.42**	**6.07**	**2.46**	**2.46**	**5.44**
	(g/s)	**1.796E-02**	**0.93**	**0.7648**	**3.100E-01**	**3.100E-01**	**0.685**

[2] A warm catalyst start is when the unit is started within 12 hours of shutdown.

Hot Start[3]

Time (min.)	Operating Mode	Emissions (lb)					
		SO_2	**NO_X**	**CO**	**PM**	**$PM_{10}/PM_{2.5}$**	**VOC**
1 - 30	Startup	0.0713	4.70	2.80	1.80	1.80	4.40
31 - 60	Normal (Worst-case load)	0.0713	0.67	1.87	0.66	0.66	0.94
Total	**(lb/hr)**	**0.1425**	**5.37**	**4.67**	**2.46**	**2.46**	**5.34**
	(g/s)	**1.796E-02**	**0.68**	**0.5884**	**3.100E-01**	**3.100E-01**	**0.673**

[3] A hot catalyst start is when the unit is started within 6 hours of shutdown and the catalyst temperature is above 100°F.

Annual Per Unit Startup Emissions

Startup Scenario	Startups Per Year	Emissions Per Unit (tpy)					
		SO_2	**NO_X**	**CO**	**PM**	**$PM_{10}/PM_{2.5}$**	**VOC**
Cold	50	0.00356	0.294	0.349	0.062	0.062	0.141
Warm	80	0.00570	0.297	0.243	0.098	0.098	0.218
Hot	150	0.01069	0.402	0.350	0.185	0.185	0.401
Total	**280**	**0.01995**	**0.99**	**0.94**	**0.344**	**0.344**	**0.759**

Appendix Table A-4
Non-Criteria Emissions

CAS	Substance	Emission Factor		Reference	Maximum Per Unit Fuel Input (MMcf/hr)	Per Unit Emissions (lb/hr)	Per Unit Emissions (lb/yr)	(TPY)
207-08-9	Benzo(k)fluoranthene	7.83E-06	lbs/MMcf	1	0.157	1.23E-06	1.55E-03	7.73E-07
218-01-9	Chrysene	1.43E-05	lbs/MMcf	1	0.157	2.24E-06	2.82E-03	1.41E-06
53-70-3	Dibenz(a,h)anthracene	2.70E-06	lbs/MMcf	1	0.157	4.23E-07	5.33E-04	2.67E-07
100-41-4	Ethylbenzene	7.11E-02	lbs/MMcf	1	0.157	1.11E-02	1.40E+01	7.02E-03
206-44-0	Fluoranthene	2.91E-04	lbs/MMcf	1	0.157	4.56E-05	5.75E-02	2.87E-05
86-73-7	Fluorene	4.36E-04	lbs/MMcf	1	0.157	6.83E-05	8.61E-02	4.31E-05
50-00-0	Formaldehyde	2.62E+00	lbs/MMcf	2	0.157	4.10E-01	5.17E+02	2.58E-01
193-39-5	Indeno(1,2,3-cd)pyrene	7.17E-06	lbs/MMcf	1	0.157	1.12E-06	1.42E-03	7.08E-07
91-20-3	Naphthalene	2.51E-02	lbs/MMcf	1	0.157	3.93E-03	4.96E+00	2.48E-03
85-01-8	Phenanthrene	1.85E-03	lbs/MMcf	1	0.157	2.90E-04	3.65E-01	1.83E-04
115-07-1	Propylene	5.38E+00	lbs/MMcf	1	0.157	8.43E-01	1.06E+03	5.31E-01
129-00-0	Pyrene	1.87E-04	lbs/MMcf	1	0.157	2.93E-05	3.69E-02	1.85E-05
108-88-3	Toluene	2.39E-01	lbs/MMcf	1	0.157	3.75E-02	4.72E+01	2.36E-02
1330-20-7	Xylene (Total)	6.46E-01	lbs/MMcf	1	0.157	1.01E-01	1.28E+02	6.38E-02
106-99-0	1,3-Butadiene	3.67E-01	lbs/MMcf	1	0.157	5.75E-02	7.25E+01	3.62E-02
83-32-9	Acenaphthene	1.51E-04	lbs/MMcf	1	0.157	2.37E-05	2.98E-02	1.49E-05
208-96-8	Acenaphthylene	5.25E-04	lbs/MMcf	1	0.157	8.23E-05	1.04E-01	5.18E-05
75-07-0	Acetaldehyde	5.29E-01	lbs/MMcf	1	0.157	8.29E-02	1.04E+02	5.22E-02
107-02-8	Acrolein	5.90E-02	lbs/MMcf	1	0.157	9.25E-03	1.17E+01	5.83E-03
120-12-7	Anthracene	1.19E-04	lbs/MMcf	1	0.157	1.87E-05	2.35E-02	1.18E-05
71-43-2	Benzene	2.18E-01	lbs/MMcf	1	0.157	3.42E-02	4.31E+01	2.15E-02
56-55-3	Benzo(a)anthracene	5.88E-05	lbs/MMcf	1	0.157	9.22E-06	1.16E-02	5.81E-06
50-32-8	Benzo(a)pyrene	2.70E-06	lbs/MMcf	1	0.157	4.23E-07	5.33E-04	2.67E-07
205-99-2	Benzo(b)fluoranthene	4.09E-05	lbs/MMcf	1	0.157	6.41E-06	8.08E-03	4.04E-06
191-24-2	Benzo(g,h,i)perylene	7.54E-06	lbs/MMcf	1	0.157	1.18E-06	1.49E-03	7.45E-07
								1.00

[1] California Air Toxics Emission Factor (CATEF) database, mean emission factors for a natural gas 4S/Lean/>650Hp engine. (https://ww3.arb.ca.gov/ei/catef/catef.htm)

[2] Based on an emission rate of 1.1 ppm (Supplied by Wärtsilä)

Appendix B: MODELING RUN LOGS

Appendix Table B-1. AERMAP Run Log

Grid Name	Filename	File Type	Description
Grid 1	n34w118.tif	Input	USGS 1/3 Degree NED
	n34w119.tif	Input	
	n35w118.tif	Input	
	n35w119.tif	Input	
	AERMAP.INP	Input	AERMAP input file (includes receptor locations, building locations, and project source locations)
	AERMAP.OUT	Output	AERMAP output file
	GR_AERMAP.APR	Output	Receptor location file with elevations and hill height scales
	GR_AERMAP.APS	Output	Source and building location file with elevations
	DOMDETAIL.OUT	Output	Summary file of Domain details
	MAPDETAIL.OUT	Output	Summary file of NED details
	MAPPARAMS.OUT	Output	Summary file of NED parameters

Appendix Table B-2. BPIPPRM Run Log

Filename	File Type	Description
Bpip input file	Input	Input BPIPPRM file containing the project and exisitng sources
Bpip output file	Output	BPIPPRM output information (the output is input directly into AERMOD)
Bpip summary file	Output	BPIPPRM summary file

Appendix Table B-3. AERMOD Run Log

Pollutant	Averaging Period	Scenario	Run ID	Comments
Unit	1-hr, 3-hr, 8-hr, and 24-hr	Full/Startup and Min. Loads	UER1216HTED05	Maximum short-term modeled impacts for 100% and minimum loads, across 5 years.
Unit	24-hr and Annual	Full/Startup and Min. Loads	UER1216HA05	Maximum 24-hr and annual modeled impacts for 100% and minimum loads, averaged over 5 years.
Unit	Annual	Full/Startup and Min. Loads	UER12A05 UER13A05 UER14A05 UER15A05 UER16A05	Maximum annual modeled impacts for 100% and minimum loads, across 5 years.
NO_2	1-hr	Full/Startup (Worst-Case)	NS1216H05a	Maximum and 98th percentile (H8H) 1-hour modeled impacts for the startup scenario, averaged over 5 years.
	1-hr	Full Load	NS1216H05c	Maximum and 98th percentile (H8H) 1-hour modeled impacts for the full load scenario, averaged over 5 years.
	1-hr	Min. Load	NS1216H05b	Maximum and 98th percentile (H8H) 1-hour modeled impacts for the minimun load scenario, averaged over 5 years.

Appendix C: HRA FIGURES

Grayson Repowering Project - Max Receptors

Project Number:
194401.0262

Grayson Repowering Project - Resident Cancer Risk

Project Number:
194401.0262

Grayson Repowering Project - Worker Cancer Risk

Trinity Consultants

Project Number:
194401.0262

Appendix D: HRA TABLES

Table D-1. Summary of Maximum Cancer Health Risk Impacts

Receptor type	Cancer Risk (in a million)	Significance Threshold	Receptor Number	UTME (m)	UTMN (m)
PMI	2.0	N/A	5,284	382,122	3,780,378
MEIR	1.5	≥10	600	382,150	3,780,500
MEIW	1.0	≥10	599	382,150	3,780,450

Table D-2. Summary of Maximum Chronic Non-cancer Health Risk Impacts

Receptor type	Chronic Non-Cancer HI	Significance Threshold	Receptor Number	UTME (m)	UTMN (m)
PMI	<0.01	N/A	5,284	382,122	3,780,378
MEIR	<0.01	≥1	600	382,150	3,780,500
MEIW	<0.01	≥1	599	382,150	3,780,450

Table D-3. Summary of Maximum Acute Non-cancer Health Risk Impacts

Receptor type	Acute Non-Cancer HI	Significance Threshold	Receptor Number	UTME (m)	UTMN (m)
PMI	0.06	≥1	5,329	382,032	3,780,172
MEIR	0.04	≥1	744	382,350	3,780,200
MEIW	0.05	≥1	632	382,200	3,780,350

Table D-4. Summary of Worker 8-hr Non-cancer Health Risk Impacts

Receptor type	Worker 8-hr Non-Cancer HI	Significance Threshold	Receptor Number	UTME (m)	UTMN (m)
PMI	0.03	≥1	5,284	382,122	3,780,378
MEIW	0.02	≥1	599	382,150	3,780,450

Table D-5. Census Block Receptors and Impacts

Track:	Block:	X (m)	Y (m)	Population:	AERMOD Description	Excess Cancer Risk	Burden
301601	2025	381,655	3,780,287	46	Track: 301601, Block: 2025, Population: 46	3.52E-06	1.62E-04
301701	2011	382,156	3,780,704	134	Track: 301701, Block: 2011, Population: 134	3.85E-06	5.15E-04
301701	2015	382,147	3,780,576	34	Track: 301701, Block: 2015, Population: 34	5.16E-06	1.75E-04
301701	2016	382,237	3,780,634	24	Track: 301701, Block: 2016, Population: 24	4.08E-06	9.80E-05
301701	2017	382,270	3,780,474	69	Track: 301701, Block: 2017, Population: 69	4.21E-06	2.90E-04
301701	2018	382,325	3,780,541	54	Track: 301701, Block: 2018, Population: 54	3.20E-06	1.73E-04
301701	2019	382,390	3,780,634	44	Track: 301701, Block: 2019, Population: 44	2.42E-06	1.06E-04
301701	2022	382,503	3,780,463	81	Track: 301701, Block: 2022, Population: 81	1.55E-06	1.26E-04
301701	2023	382,471	3,780,380	82	Track: 301701, Block: 2023, Population: 82	1.87E-06	1.53E-04
301701	2024	382,490	3,780,233	61	Track: 301701, Block: 2024, Population: 61	2.59E-06	1.58E-04
301701	2025	382,407	3,780,310	68	Track: 301701, Block: 2025, Population: 68	2.12E-06	1.44E-04
301701	2026	382,264	3,780,388	17	Track: 301701, Block: 2026, Population: 17	4.03E-06	6.86E-05
301701	2027	382,175	3,780,492	8	Track: 301701, Block: 2027, Population: 8	6.19E-06	4.96E-05
301701	2032	382,032	3,780,595	12	Track: 301701, Block: 2032, Population: 12	4.77E-06	5.72E-05
301701	2034	382,350	3,780,240	36	Track: 301701, Block: 2034, Population: 36	2.37E-06	8.52E-05
						Total:	0.002

Table D-6. PMI Risk Drivers

Receptor Type	PMI - Cancer	PMI - NC Chronic	PMI - NC Acute	PMI - 8hr Chronic
Total Impact (1 in 10^6)	2.0	<0.01	0.06	0.03
Receptor Number	5,284	5,284	5,329	5,284
UTME (m)	382,122.0	382,122.0	382,032.0	382,032.0
UTMN (m)	3,780,378.0	3,780,378.0	3,780,172.0	3,780,172.0
Driving Pollutant	1,3-Butadiene	Formaldehyde	Formaldehyde	Formaldehyde
B[k]fluoranthen Impact	4.66E-10	0	0	0
Chrysene Impact	8.51E-11	0	0	0
D[a,h]anthracen Impact	5.85E-10	0	0	0
Ethyl Benzene Impact	4.09E-09	0	0	0
Fluoranthene Impact	0	0	0	0
Fluorene Impact	0	0	0	0
Formaldehyde Impact	3.63E-07	2.84E-03	3.84E-02	2.84E-03
In[1,2,3-cd]pyr Impact	4.27E-10	0	0	0
Naphthalene Impact	1.99E-08	2.73E-05	0	0
Phenanthrene Impact	0	0	0	0
Propylene Impact	0	1.75E-05	0	0
Pyrene Impact	0	0	0	0
Toluene Impact	0	7.78E-06	5.21E-06	0
Xylenes Impact	0	9.02E-06	2.37E-05	0
1,3-Butadiene Impact	1.45E-06	0	0	0
Acenaphthene Impact	0	0	0	0
Acenaphthylene Impact	0	0	0	0
Acetaldehyde Impact	3.49E-08	3.69E-05	9.11E-04	1.72E-05
Acrolein Impact	0	1.65E-03	1.91E-02	8.24E-04
Anthracene Impact	0	0	0	0
Benzene Impact	1.44E-07	0	0	0
B[a]anthracene Impact	3.51E-09	0	0	0
B[a]P Impact	1.61E-09	0	0	0
B[b]fluoranthen Impact	2.44E-09	0	0	0
B[g,h,i]perylen Impact	0	0	0	0

Table D-7. MEIR Risk Drivers

Receptor Type	MEIR - Cancer	MEIR - NC Chronic	MEIR - NC Acute
Total Impact (1 in 10^6)	1.5	<0.01	0.04
Receptor Number	600	600	744
UTME (m)	382,150.0	382,150.0	382,350.0
UTMN (m)	3,780,500.0	3,780,500.0	3,780,200.0
Driving Pollutant	1,3-Butadiene	Formaldehyde	Formaldehyde
B[k]fluoranthen Impact	3.49E-10	0	0
Chrysene Impact	6.37E-11	0	0
D[a,h]anthracen Impact	4.38E-10	0	0
Ethyl Benzene Impact	3.06E-09	0	0
Fluoranthene Impact	0	0	0
Fluorene Impact	0	0	0
Formaldehyde Impact	2.71E-07	2.12E-03	2.91E-02
In[1,2,3-cd]pyr Impact	3.20E-10	0	0
Naphthalene Impact	1.49E-08	2.04E-05	0
Phenanthrene Impact	0	0	0
Propylene Impact	0	1.31E-05	0
Pyrene Impact	0	0	0
Toluene Impact	0	5.82E-06	3.95E-06
Xylenes Impact	0	6.75E-06	1.80E-05
1,3-Butadiene Impact	1.09E-06	0	0
Acenaphthene Impact	0	0	0
Acenaphthylene Impact	0	0	0
Acetaldehyde Impact	2.61E-08	2.76E-05	6.90E-04
Acrolein Impact	0	1.23E-03	1.44E-02
Anthracene Impact	0	0	0
Benzene Impact	1.08E-07	0	0
B[a]anthracene Impact	2.62E-09	0	0
B[a]P Impact	1.21E-09	0	0
B[b]fluoranthen Impact	1.82E-09	0	0
B[g,h,i]perylen Impact	0	0	0

Table D-8. MEIW Risk Drivers

Receptor Type	MEIW - Cancer	MEIW - NC Chronic	MEIW - NC Acute	MEIW - 8hr Chronic
Total Impact (1 in 10^6)	1.0	<0.01	0.05	0.02
Receptor Number	599	599	632	599
UTME (m)	382,150.0	382,150.0	382,200.0	382,150.0
UTMN (m)	3,780,450.0	3,780,450.0	3,780,350.0	3,780,450.0
Driving Pollutant	1,3-Butadiene	Formaldehyde	Formaldehyde	Formaldehyde
B[k]fluoranthen Impact	1.60E-11	0	0	0
Chrysene Impact	2.92E-12	0	0	0
D[a,h]anthracen Impact	4.26E-11	0	0	0
Ethyl Benzene Impact	1.96E-09	0	0	0
Fluoranthene Impact	0	0	0	0
Fluorene Impact	0	0	0	0
Formaldehyde Impact	1.74E-07	2.33E-03	3.02E-02	2.33E-03
In[1,2,3-cd]pyr Impact	1.46E-11	0	0	0
Naphthalene Impact	9.55E-09	2.24E-05	0	0
Phenanthrene Impact	0	0	0	0
Propylene Impact	0	1.44E-05	0	0
Pyrene Impact	0	0	0	0
Toluene Impact	0	6.41E-06	4.10E-06	0
Xylenes Impact	0	7.42E-06	1.86E-05	0
1,3-Butadiene Impact	6.97E-07	0	0	0
Acenaphthene Impact	0	0	0	0
Acenaphthylene Impact	0	0	0	0
Acetaldehyde Impact	1.67E-08	3.04E-05	7.16E-04	1.42E-05
Acrolein Impact	0	1.36E-03	1.50E-02	6.78E-04
Anthracene Impact	0	0	0	0
Benzene Impact	6.90E-08	0	0	0
B[a]anthracene Impact	1.20E-10	0	0	0
B[a]P Impact	5.52E-11	0	0	0
B[b]fluoranthen Impact	8.35E-11	0	0	0
B[g,h,i]perylen Impact	0	0	0	0

Appendix D2

Air Dispersion Modeling Report and Health Risk Assessment: Alternative 6 and 7 Addendum

AIR DISPERSION MODELING AND HEALTH RISK ASSESSMENT REPORT

ALTERNATIVE 6 AND 7 ADDENDUM

Glendale Water & Power

Grayson Repowering Project

Glendale, CA

TRINITY CONSULTANTS
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Dallas, TX 75251

May 2021

Environmental solutions delivered uncommonly well

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1. INTRODUCTION

This addendum provides the updated results of the air quality impact analysis (AQIA) and a screening health risk assessment (HRA) for the application to the South Coast Air Quality Management District (SCAQMD) for a Permit to Construct (PTC) the Grayson Repowering Project. Since the PTC application was submitted on May 19, 2020, the proposed layout (Alternative 6) was updated, and a second configuration (Alternative 7) has been added as an alternative site layout.

The engine generators, technical specifications and operating assumptions are identical for both alternative configurations; only the equipment layouts differ. The layouts for Alternatives 6 and 7 are shown in Figures 1-1 and 1-2, respectively. The modeling methods are identical to the methods described in the September 27, 2019, protocol and used in the May 19, 2020, submittal.

As required by SCAQMD Rule 1304, the addendum includes a dispersion modeling results to demonstrate that the Project will neither cause a new violation of a state or federal ambient air quality standard nor make an existing violation significantly worse for nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter less than 10 microns in diameter (PM_{10}) or particulate matter less than 2.5 microns in diameter ($PM_{2.5}$). In addition, an assessment of the cumulative air quality impacts analysis and of the potential human health risks associated with the operation of the proposed project in the revised configurations is provided.

Figure 1-1. Alternative 6 Layout

Figure 1-2. Alternative 7 Layout

2. AMBIENT IMPACT MODELING INPUT UPDATES

Table 2-1 lists the UTM coordinates of the proposed stacks for Alternatives 6 and 7.

Table 2-1. Stack Locations

Model		NAD 83 - Zone 11 UTM Coordinates		Base Elevation [A]	
ID	**Description**	**Easting (m)**	**Northing (m)**	**(ft)**	**(m)**
Alternative 6					
1	Unit 1	382122.5	3780085.0	43.49	142.67
2	Unit 2	382126.3	3780078.9	43.48	142.64
3	Unit 3	382130.0	3780072.5	43.46	142.58
4	Unit 4	382134.0	3780066.5	43.46	142.57
5	Unit 5	382137.5	3780060.5	43.51	142.74
Alternative 7					
1	Unit 1	382118.5	3780125.0	43.49	142.70
2	Unit 2	382125.0	3780128.5	43.49	142.69
3	Unit 3	382131.0	3780132.5	43.47	142.63
4	Unit 4	382137.0	3780136.0	43.45	142.55
5	Unit 5	382143.5	3780139.5	43.44	142.51

[A] Base elevations obtained from AERMAP

Tables 2-2 and 2-3 list the structures and heights entered into BPIPPRM and the BPIPPRM input and output files and are included with the modeling files for Alternative 6 and Alternative 7, respectively.

Table 2-2. Downwash Structures (Alternative 6)

ID	Description	Height (m)
Existing Buildings		
TGPP9_1	Unit 9 Gas Turbine - Tier 1	10.36
TGPP9_2	Unit 9 Gas Turbine - Tier 2	17.07
UNIT9SUP	Gas Turbine Unit 9 Support Building	5.49
GARAGE_1	Garage - Tier 1	4.57
GARAGE_2	Garage - Tier 2	6.10
SHOP	Superintent and Shop Building	6.10
New Buildings		
WORKSHOP	Workshop	6.10
UTILBLK	Utility Block	7.93
ENGHALL	Engine Hall	13.03

Table 2-3. Downwash Structures (Alternative 7)

ID	Description	Height (m)
Existing Buildings		
TGPP9_1	Unit 9 Gas Turbine - Tier 1	10.36
TGPP9_2	Unit 9 Gas Turbine - Tier 2	17.07
UNIT9SUP	Gas Turbine Unit 9 Support Building	5.49
GARAGE_1	Garage - Tier 1	4.57
GARAGE_2	Garage - Tier 2	6.1
SHOP	Superintent and Shop Building	6.1
New Buildings		
UTILBLK	Utility Block	7.93
ENGHALL	Engine Hall	13.03

3. AMBIENT IMPACT MODELING RESULTS UPDATES

3.1. ALTERNATIVE 6

Table 3-1 lists the unit impacts for the startup/full load and minimum load scenarios. Table 3-2 shows the modeled project emission rates, unit impact multiplier and the resulting project impacts for the startup, full load, and minimum load scenarios. Also, Table 3-2 shows the comparison of the project impacts to the respective SCAQMD air quality significance threshold or modeling significant impact level.

Table 3-1. Summary of Unit Impacts (Alternative 6)

Scenario [A]	Source Group	Maximum Unit Impact ($\mu g/m^3$ per g/s) - Across 5-Yrs [B]				
		1-hr	**3-hr**	**8-hr**	**24-hr**	**Annual [C]**
Startup/Full Load	FULL	5.46033	4.90765	3.57537	1.35827	0.47431
Min. Load	MIN	8.18447	7.36406	5.35102	2.03490	0.70813
Scenario	**Source Group**	**Maximum Annual Unit Impact ($\mu g/m^3$ per g/s) [C]**				
		2012	**2013**	**2014**	**2015**	**2016**
Startup/Full Load	FULL	0.45565	0.47431	0.47057	0.43416	0.47015
Min. Load	MIN	0.67744	0.70813	0.69826	0.65227	0.70254
Scenario	**Source Group**	**Maximum Unit Impact ($\mu g/m^3$) - 5-Yrs Average [D]**				
					24-Hr	**Annual**
Startup/Full Load	FULL				1.29725	0.46075
Min. Load	MIN				1.93128	0.68773

[A] The modeling was conducted using EPA's AERMOD dispersion model (version 19191). The modeling is based on the same methodology described in Sections 3 and 4 of Appendix D of the PTC Application, submitted May 19, 2020.

[B] The listed values are the maximum unit impacts from the 5 years (2012-2016) of modeled meteorological data.

[C] The listed values are the maximum annual unit impacts from each of the 5 years (2012-2016) of modeled meteorological data.

[D] The listed values are the maximum 5-year (2012-2016) average impacts used for the $PM_{2.5}$ project impact modeling.

Table 3-2. Project Impact Modeling Results (Alternative 6)

	Pollutant	Averaging Period	Total Emission Rate [A] (g/s)	Unit Impact [B] (μg/m^3 per g/s)	Total Impact [A] (μg/m^3)	Significant Impact/Change Level (μg/m^3)	Notes
Startup	SO_2	1-hr	0.090	5.46033	0.490	7.8	Max (H1H)
		3-hr	0.090	4.90765	0.441	25	
		24-hr	0.090	1.35827	0.122	5	
		Annual	0.013	0.47431	0.006	1	
	$PM_{10}/PM_{2.5}$	24-hr	0.921	1.35827	1.251	2.5	24-hr average emissions
		Annual	0.143	0.47431	0.068	1	
	$PM_{2.5}$ [C]	24-hr	0.921	1.29725	1.207	2.5	24-hr average emissions
		Annual	0.143	0.46075	0.066	0.2	
	NO_2 as NO_X	1-hr	7.412	5.46033	40.472	20.0	Max (H1H) - Continuous Startup [E]
		Annual	0.237	0.47431	0.112	1	
	NO_2 (ARM2) [D]	1-hr			35.758	7.5	Continuous Startup [E]
	CO	1-hr	8.801	5.46033	48.057	1,100	Continuous Startup [E]
		8-hr	8.801	3.57537	31.467	500	Continuous Startup [E]
100% Load	SO_2	1-hr	0.090	5.46033	0.490	7.8	Max (H1H)
		3-hr	0.090	4.90765	0.441	25	
		24-hr	0.090	1.35827	0.122	5	
		Annual	0.013	0.47431	0.006	1	
	$PM_{10}/PM_{2.5}$	24-hr	0.832	1.35827	1.130	2.5	
		Annual	0.120	0.47431	0.057	1	
	$PM_{2.5}$ [C]	24-hr	0.832	1.29725	1.091	2.5	
		Annual	0.120	0.46075	0.056	0.2	
	NO_2 as NO_X	1-hr	0.838	5.46033	4.575	20.0	Max (H1H)
		Annual	0.121	0.47431	0.057	1	
	NO_2 (ARM2) [D]	1-hr			4.042	7.5	
	CO	1-hr	2.356	5.46033	12.866	1,100	
		8-hr	2.356	3.57537	8.424	500	
Min. Load	SO_2	1-hr	0.039	8.18447	0.318	7.8	Max (H1H)
		3-hr	0.039	7.36406	0.286	25	
		24-hr	0.039	2.03490	0.079	5	
		Annual	0.006	0.70813	0.004	1	
	$PM_{10}/PM_{2.5}$	24-hr	0.570	2.03490	1.160	2.5	
		Annual	0.082	0.70813	0.058	1	
	$PM_{2.5}$ [C]	24-hr	0.570	1.93128	1.113	2.5	
		Annual	0.082	0.68773	0.057	0.2	
	NO_2 as NO_X	1-hr	0.333	8.18447	2.722	20.0	Max (H1H)
		Annual	0.048	0.70813	0.034	1	
	NO_2 (ARM2) [D]	1-hr			2.384	7.5	
	CO	1-hr	0.333	8.18447	2.722	1,100	
		8-hr	0.333	5.35102	1.780	500	

[A] The listed total emission rate and total impact reflects the total from all 5 units.

[B] The modeling was conducted using EPA's AERMOD dispersion model (version 19191). The modeling is based on the same methodology described in Sections 3 and 4 of Appendix D of the PTC Application, submitted May 19, 2020.

[C] Includes secondary $PM_{2.5}$, based on EPA's worst-case MERPs for the climate zone. See Table 4-3 in Appendix D of the PTC Application, submitted May 19, 2020, for the MERP calculations.

[D] Maximum daily 1-hr concentration averaged over 5 years

[E] The startup scenario modeling is based on all 5 units starting in the same hour and an unlimited number of startups.

🟩 Below Significant Impact/Change Level

🟨 Above Significant Impact/Change Level

Table 3-3 compares the maximum project impacts plus background to the respective NAAQS or State AAQS and shows the project does not cause or contribute to an exceedance for any NAAQS or State AAQS.

Table 3-3. NAAQS and State AAQS Analysis Modeling Results (Alternative 6)

Scenario	Pollutant	Averaging Period	Concentration (μg/m³) Project [A]	Concentration (μg/m³) Background Sources [B]	Concentration (μg/m³) Total	SAAQS/ NAAQS (μg/m³)	% of Standard
Worst-Case Scenario	SO_2	1-hr - state std [C]	0.490	46.9	47.4	655	7%
		1-hr - federal std [C]	0.490	7.34	7.83	196	4%
		3-hr - federal std [C]	0.441	46.9	47.3	1,300	4%
		24-hr - state std [C]	0.122	3.93	4.05	105	4%
		Annual - federal std	0.006	0.94	0.95	80	1%
	PM_{10}	24-hr - federal std [C]	1.251	68.2	69.5	150	46%
		24-hr - state std [C]	1.251	96.0	97.3	50	195%
		Annual - state std	0.068	34.4	34.5	20	172%
	$PM_{2.5}$	24-hr - federal std [D]	1.207	30.5	31.7	35	91%
		Annual - state std [E]	0.068	16.3	16.4	12	136%
		Annual – federal std [D]	0.066	12.6	12.7	12.0	106%
	NO_2 (ARM)	1-hr - federal std [F,G]	33.48	116.0	149.5	188	80%
	NO_2 as NO_X	1-hr - state std [C]	40.47	151.5	192.0	339	57%
		Annual - state std	0.112	37.6	37.7	57	66%
		Annual – federal std	0.112	37.6	37.7	100	38%
	CO	1-hr - state std [C]	48.06	2,174	2,222	23,000	10%
		8-hr - state std [C]	31.47	1,830	1,862	10,000	19%

[A] The modeling was conducted using EPA's AERMOD dispersion model (version 19191). The modeling is based on the same methodology described in Sections 3 and 4 of Appendix D of the PTC Application, submitted May 19, 2020.

[B] See Table 3-3 in Appendix D of the PTC Application, submitted May 19, 2020, for the background concentrations. The 1-hour SO_2 state background is conservatively used for the 3-hour background.

[C] The listed modeled concentrations are the maximum highest first-high (H1H) concentrations.

[D] The listed 24-hour modeled concentration is the overall highest 24-hr concentration, averaged over 5 years. The listed annual modeled concentration is the overall highest annual concentration, averaged over 5 years. Both listed modeled concentrations Include secondary $PM_{2.5}$, based on EPA's worst-case MERPs for the climate zone. See Table 4-3 in Appendix D of the PTC Application, submitted May 19, 2020, for the MERP calculations.

[E] The listed modeled concentration is the maximum annual concentration across 5-years and does not include secondary $PM_{2.5}$.

[F] Per EPA's March 1, 2011 memorandum, the listed modeled concentration is the highest 98th percentile maximum daily 1-hr concentration averaged over 5 years.

[G] The NO_X to NO_2 conversion is based in EPA's ARM2 with the default minimum ambient NO_2/NO_X ratio of 0.5 and maximum ambient ratio of 0.9.

3.2. ALTERNATIVE 7

Table 3-4 lists the unit impacts for the startup/full load and minimum load scenarios. Table 3-5 shows the modeled project emission rates, unit impact multiplier and the resulting project impacts for the startup, full load, and minimum load scenarios. Also, Table 3-5 shows the comparison of the project impacts to the respective SCAQMD air quality significance threshold or modeling significant impact level.

Table 3-4. Summary of Unit Impacts (Alternative 7)

Scenario [A]	Source Group	Maximum Unit Impact ($\mu g/m^3$ per g/s) - Across 5-Yrs [B]				
		1-hr	**3-hr**	**8-hr**	**24-hr**	**Annual [C]**
Startup/Full Load	FULL	5.33484	4.88772	3.71477	1.35097	0.48772
Min. Load	MIN	7.97019	7.04216	5.71976	2.09708	0.74962
Scenario	**Source Group**	**Maximum Annual Unit Impact ($\mu g/m^3$ per g/s) [C]**				
		2012	**2013**	**2014**	**2015**	**2016**
Startup/Full Load	FULL	0.47464	0.48772	0.48642	0.44626	0.48451
Min. Load	MIN	0.72822	0.74782	0.74422	0.69047	0.74962
Scenario	**Source Group**	**Maximum Unit Impact ($\mu g/m^3$) - 5-Yrs Average [D]**				
					24-Hr	**Annual**
Startup/Full Load	FULL				1.29339	0.47527
Min. Load	MIN				1.97013	0.73202

[A] The modeling was conducted using EPA's AERMOD dispersion model (version 19191). The modeling is based on the same methodology described in Sections 3 and 4 of Appendix D of the PTC Application, submitted May 19, 2020.

[B] The listed values are the maximum unit impacts from the 5 years (2012-2016) of modeled meteorological data.

[C] The listed values are the maximum annual unit impacts from each of the 5 years (2012-2016) of modeled meteorological data.

[D] The listed values are the maximum 5-year (2012-2016) average impacts used for the $PM_{2.5}$ project impact modeling.

Table 3-5. Project Impact Modeling Results (Alternative 7)

	Pollutant	Averaging Period	Total Emission Rate [A] (g/s)	Unit Impact [B] ($\mu g/m^3$ per g/s)	Total Impact [A] ($\mu g/m^3$)	Significant Impact/Change Level ($\mu g/m^3$)	Notes
Startup	SO_2	1-hr	0.090	5.33484	0.479	7.8	Max (H1H)
		3-hr	0.090	4.88772	0.439	25	
		24-hr	0.090	1.35097	0.121	5	
		Annual	0.013	0.48772	0.006	1	
	$PM_{10}/PM_{2.5}$	24-hr	0.921	1.35097	1.245	2.5	24-hr average emissions
		Annual	0.143	0.48772	0.070	1	
	$PM_{2.5}$ [C]	24-hr	0.921	1.29339	1.204	2.5	24-hr average emissions
		Annual	0.143	0.47527	0.068	0.2	
	NO_2 as NO_X	1-hr	7.412	5.33484	39.542	20.0	Max (H1H) - Continuous Startup [E]
		Annual	0.237	0.48772	0.115	1	
	NO_2 (ARM2) [D]	1-hr			34.922	7.5	Continuous Startup [E]
	CO	1-hr	8.801	5.33484	46.952	1,100	Continuous Startup [E]
		8-hr	8.801	3.71477	32.694	500	Continuous Startup [E]
100% Load	SO_2	1-hr	0.090	5.33484	0.479	7.8	Max (H1H)
		3-hr	0.090	4.88772	0.439	25	
		24-hr	0.090	1.35097	0.121	5	
		Annual	0.013	0.48772	0.006	1	
	$PM_{10}/PM_{2.5}$	24-hr	0.832	1.35097	1.123	2.5	
		Annual	0.120	0.48772	0.058	1	
	$PM_{2.5}$ [C]	24-hr	0.832	1.29339	1.088	2.5	
		Annual	0.120	0.47527	0.057	0.2	
	NO_2 as NO_X	1-hr	0.838	5.33484	4.470	20.0	Max (H1H)
		Annual	0.121	0.48772	0.059	1	
	NO_2 (ARM2) [D]	1-hr			3.948	7.5	
	CO	1-hr	2.356	5.33484	12.570	1,100	
		8-hr	2.356	3.71477	8.753	500	
Min. Load	SO_2	1-hr	0.039	7.97019	0.309	7.8	Max (H1H)
		3-hr	0.039	7.04216	0.273	25	
		24-hr	0.039	2.09708	0.081	5	
		Annual	0.006	0.74962	0.004	1	
	$PM_{10}/PM_{2.5}$	24-hr	0.570	2.09708	1.196	2.5	
		Annual	0.082	0.74962	0.061	1	
	$PM_{2.5}$ [C]	24-hr	0.570	1.97013	1.135	2.5	
		Annual	0.082	0.73202	0.061	0.2	
	NO_2 as NO_X	1-hr	0.333	7.97019	2.651	20.0	Max (H1H)
		Annual	0.048	0.74962	0.036	1	
	NO_2 (ARM2) [D]	1-hr			2.321	7.5	
	CO	1-hr	0.333	7.97019	2.651	1,100	
		8-hr	0.333	5.71976	1.903	500	

[A] The listed total emission rate and total impact reflects the total from all 5 units.

[B] The modeling was conducted using EPA's AERMOD dispersion model (version 19191). The modeling is based on the same methodology described in Sections 3 and 4 of Appendix D of the PTC Application, submitted May 19, 2020.

[C] Includes secondary $PM_{2.5}$, based on EPA's worst-case MERPs for the climate zone. See Table 4-3 in Appendix D of the PTC Application, submitted May 19, 2020, for the MERP calculations.

[D] Maximum daily 1-hr concentration averaged over 5 years

[E] The startup scenario modeling is based on all 5 units starting in the same hour and an unlimited number of startups.

🟩 Below Significant Impact/Change Level

🟨 Above Significant Impact/Change Level

Table 3-6 compares the maximum project impacts plus background to the respective NAAQS or State AAQS and shows the project does not cause or contribute to an exceedance for any NAAQS or State AAQS.

Table 3-6. NAAQS and State AAQS Analysis Modeling Results (Alternative 7)

Scenario	Pollutant	Averaging Period	Concentration ($\mu g/m^3$)			SAAQS/ NAAQS ($\mu g/m^3$)	% of Standard
			Project [A]	Background Sources [B]	Total		
Worst-Case Scenario	SO_2	1-hr - state std [C]	0.479	46.9	47.4	655	7%
		1-hr - federal std [C]	0.479	7.34	7.81	196	4%
		3-hr - federal std [C]	0.439	46.9	47.3	1,300	4%
		24-hr - state std [C]	0.121	3.93	4.05	105	4%
		Annual - federal std	0.006	0.94	0.95	80	1%
	PM_{10}	24-hr - federal std [C]	1.245	68.2	69.4	150	46%
		24-hr - state std [C]	1.245	96.0	97.2	50	194%
		Annual - state std	0.070	34.4	34.5	20	172%
	$PM_{2.5}$	24-hr - federal std [D]	1.204	30.5	31.7	35	91%
		Annual - state std [E]	0.070	16.3	16.4	12	136%
		Annual – federal std [D]	0.068	12.6	12.7	12.0	106%
	NO_2 (ARM)	1-hr - federal std [F,G]	32.77	116.0	148.8	188	79%
	NO_2 as NO_X	1-hr - state std [C]	39.54	151.5	191.1	339	56%
		Annual - state std	0.115	37.6	37.7	57	66%
		Annual – federal std	0.115	37.6	37.7	100	38%
	CO	1-hr - state std [C]	46.95	2,174	2,221	23,000	10%
		8-hr - state std [C]	32.69	1,830	1,863	10,000	19%

[A] The modeling was conducted using EPA's AERMOD dispersion model (version 19191). The modeling is based on the same methodology described in Sections 3 and 4 of Appendix D of the PTC Application, submitted May 19, 2020.

[B] See Table 3-3 in Appendix D of the PTC Application, submitted May 19, 2020, for the background concentrations. The 1-hour SO_2 state background is conservatively used for the 3-hour background.

[C] The listed modeled concentrations are the maximum highest first-high (H1H) concentrations.

[D] The listed 24-hour modeled concentration is the overall highest 24-hr concentration, averaged over 5 years. The listed annual modeled concentration is the overall highest annual concentration, averaged over 5 years. Both listed modeled concentrations Include secondary $PM_{2.5}$, based on EPA's worst-case MERPs for the climate zone. See Table 4-3 in Appendix D of the PTC Application, submitted May 19, 2020, for the MERP calculations.

[E] The listed modeled concentration is the maximum annual concentration across 5-years and does not include secondary $PM_{2.5}$.

[F] Per EPA's March 1, 2011 memorandum, the listed modeled concentration is the highest 98th percentile maximum daily 1-hr concentration averaged over 5 years.

[G] The NO_X to NO_2 conversion is based in EPA's ARM2 with the default minimum ambient NO_2/NO_X ratio of 0.5 and maximum ambient ratio of 0.9.

4.1. ALTERNATIVE 6

Table 4-1 below summarizes the health risk impacts at the relevant receptors.

Table 4-1. HRA Results Summary (Alternative 6)

Receptor Type	Cancer Risk			Chronic			Acute			Chronic 8-hr		
	Receptor ID	Risk in one million	Rule 1401 Significance Threshold (in a million)	Receptor ID	Hazard Index	Rule 1401 Significance Threshold	Receptor ID	Hazard Index	Rule 1401 Significance Threshold	Receptor ID	Hazard Index	Rule 1401 Significance Threshold
Maximum Exposed Individual Resident (MEIR)	600	1.52	≥ 10	600	<0.01	≥ 1	744	0.044	≥ 1	N/A	N/A	N/A
Maximum Exposed Individual Worker (MEIW)	599	0.97	≥ 10	599	<0.01	≥ 1	743	0.046	≥ 1	599	0.021	≥ 1

The coordinates for each of the receptors in Table 4-1 are listed in Table 4-2 below. Figure 4-1 contains a plot of the relevant receptors.

Table 4-2. Maximum Receptor Locations (Alternative 6)

Receptor ID	UTM Coordinates - Zone 11	
	X (m)	Y (m)
600	382,150	3,780,500
744	382,350	3,780,200
599	382,150	3,780,450
743	382,350	3,780,150

As shown in Table 4-1, all points of maximum impact are below the Rule 1401 limits. Additionally, the Chronic, Acute, and Chronic 8-hr impacts are all below relevant thresholds for the generation of isopleths (0.5). Figures 4-2 and 4-3 shows the area with cancer risks above one in a million for the resident and worker, scenarios.

Figure 4-1. Maximum HRA Locations (Alternative 6)

Figure 4-2. Resident Cancer Risk (Alternative 6)

Figure 4-3. Worker Cancer Risk (Alternative 6)

The resident cancer risk isopleth has the largest extent for the purposes of determining the zone of impact (ZOI), at approximately 500 meters from the center of the facility. Table 4-3 summarizes the population-wide cancer risk at each receptor within the ZOI and sums the products of the populations and cancer risks to determine the cancer burden. Table 4-3 shows that a total population of 770 individuals is exposed to a cancer risk greater than one in a million, and no individuals are exposed to a hazard index above 0.5, as no hazard indices are above 0.5 in the analysis.

Table 4-3. Cancer Burden Results (Alternative 6)

Tract No.	Block No.	UTM Coordinates - Zone 11 X (m)	UTM Coordinates - Zone 11 Y (m)	Population	Excess Cancer Risk	Cancer Burden
301601	2025	381,655	3,780,287	46	4.99E-07	2.29E-05
301701	2011	382,156	3,780,704	134	1.17E-06	1.56E-04
301701	2015	382,147	3,780,576	34	1.56E-06	5.31E-05
301701	2016	382,237	3,780,634	24	1.02E-06	2.45E-05
301701	2017	382,270	3,780,474	69	9.81E-07	6.77E-05
301701	2018	382,325	3,780,541	54	6.69E-07	3.61E-05
301701	2019	382,390	3,780,634	44	4.53E-07	1.99E-05
301701	2022	382,503	3,780,463	81	2.71E-07	2.19E-05
301701	2023	382,471	3,780,380	82	3.18E-07	2.61E-05
301701	2024	382,490	3,780,233	61	3.66E-07	2.23E-05
301701	2025	382,407	3,780,310	68	4.17E-07	2.84E-05
301701	2026	382,264	3,780,388	17	9.86E-07	1.68E-05
301701	2027	382,175	3,780,492	8	1.69E-06	1.35E-05
301701	2032	382,032	3,780,595	12	1.57E-06	1.88E-05
301701	2034	382,350	3,780,240	36	5.44E-07	1.96E-05
			Total:	**770**		**0.001**

The sum product of the population and excess cancer risk is below the Rule 1401 limit of 0.5.

No impacts are above relevant Rule 1401 thresholds, and Appendix Tables B-1 through B-6 outline the results and specific pollutant impacts at each receptor.

4.2. ALTERNATIVE 7

Table 4-4 below summarizes the health risk impacts at the relevant receptors.

Table 4-4. HRA Results Summary (Alternative 7)

Receptor Type	Cancer Risk			Chronic			Acute			Chronic 8-hr		
	Receptor ID	Risk in one million	Rule 1401 Significance Threshold (in a million)	Receptor ID	Hazard Index	Rule 1401 Significance Threshold	Receptor ID	Hazard Index	Rule 1401 Significance Threshold	Receptor ID	Hazard Index	Rule 1401 Significance Threshold
Maximum Exposed Individual Resident (MEIR)	600	1.71	≥ 10	600	<0.01	≥ 1	744	0.047	≥ 1	N/A	N/A	N/A
Maximum Exposed Individual Worker (MEIW)	566	1.09	≥ 10	566	<0.01	≥ 1	743	0.049	≥ 1	566	0.024	≥ 1

The coordinates for each of the receptors in Table 4-4 are listed in below. Figure 4-4 contains a plot of the relevant receptors.

Table 4-5. Maximum Receptor Locations (Alternative 7)

Receptor ID	UTM Coordinates - Zone 11	
	X (m)	Y (m)
501	382,000	3,780,200
600	382,150	3,780,500
744	382,350	3,780,200
566	382,100	3,780,500
743	382,350	3,780,150

As shown in Table 4-4, all points of maximum impact are below the Rule 1401 limits. Additionally, the Chronic, Acute, and Chronic 8-hr impacts are all below relevant thresholds for the generation of isopleths (0.5). Figures 4-5 and 4-6 shows the area with cancer risks above one in a million for the resident and worker, scenarios.

Figure 4-4. Maximum HRA Locations (Alternative 7)

Figure 4-5. Resident Cancer Risk (Alternative 7)

Figure 4-6. Worker Cancer Risk (Alternative 7)

The resident cancer risk isopleth has the largest extent for the purposes of determining the ZOI, at approximately 600 meters from the center of the facility. Table 4-6 summarizes the population-wide cancer risk at each receptor within the ZOI and sums the products of the populations and cancer risks to determine the cancer burden. Table 4-6 shows that a total population of 940 individuals is exposed to a cancer risk greater than one in a million, and no individuals are exposed to a hazard index above 0.5, as no hazard indices are above 0.5 in the analysis.

Table 4-6. Cancer Burden Results (Alternative 7)

Tract No.	Block No.	UTM Coordinates - Zone 11 X (m)	 Y (m)	Population	Excess Cancer Risk	Cancer Burden
301601	2025	381,655	3,780,287	46	4.32E-07	1.99E-05
301701	2011	382,156	3,780,704	134	1.32E-06	1.77E-04
301701	2015	382,147	3,780,576	34	1.78E-06	6.05E-05
301701	2016	382,237	3,780,634	24	1.12E-06	2.68E-05
301701	2017	382,270	3,780,474	69	9.73E-07	6.71E-05
301701	2018	382,325	3,780,541	54	6.65E-07	3.59E-05
301701	2019	382,390	3,780,634	44	4.54E-07	2.00E-05
301701	2022	382,503	3,780,463	81	2.84E-07	2.30E-05
301701	2023	382,471	3,780,380	82	3.41E-07	2.79E-05
301701	2024	382,490	3,780,233	61	3.93E-07	2.40E-05
301701	2025	382,407	3,780,310	68	4.51E-07	3.07E-05
301701	2026	382,264	3,780,388	17	9.00E-07	1.53E-05
301701	2027	382,175	3,780,492	8	1.86E-06	1.49E-05
301701	2032	382,032	3,780,595	12	1.76E-06	2.11E-05
301701	2034	382,350	3,780,240	36	5.91E-07	2.13E-05
301701	2006	381,933	3,780,764	72	1.06E-06	7.64E-05
301701	2008	382,098	3,780,786	75	1.21E-06	9.04E-05
301701	2012	382,315	3,780,698	23	6.88E-07	1.58E-05
			Total:	**940**		**0.001**

The sum product of the population and excess cancer risk is below the Rule 1401 limit of 0.5.

No impacts are above relevant Rule 1401 thresholds, and Appendix Tables B-7 through B-12 outline the results and specific pollutant impacts at each receptor.

Appendix A: MODELING RUN LOGS

Appendix Table A-1. BPIPPRM Run Log

Filename	File Type	Description
Alternative 6		
BPIP_Alt6.INP	Input	Input BPIPPRM file containing the project and existing sources
BPIP_Alt6.OUT	Output	BPIPPRM output information (the output is input directly into AERMOD)
BPIP_Alt6.SUM	Output	BPIPPRM summary file
Alternative 7		
BPIP_Alt7a.INP	Input	Input BPIPPRM file containing the project and existing sources
BPIP_Alt7a.OUT	Output	BPIPPRM output information (the output is input directly into AERMOD)
BPIP_Alt7a.SUM	Output	BPIPPRM summary file

Appendix Table A-2. AERMOD Run Log (Alternative 6)

Pollutant	Averaging Period	Scenario	Run ID	Comments
		Project Impact Modeling		
Unit	1-hr, 3-hr, 8-hr, and 24-hr	Full/Startup and Min. Loads	UER1216HTED07	Maximum short-term modeled impacts for 100% and minimum loads, across 5 years.
Unit	24-hr and Annual	Full/Startup and Min. Loads	UER1216DA07	Maximum 24-hr and annual modeled impacts for 100% and minimum loads, averaged over 5 years.
Unit	Annual	Full/Startup and Min. Loads	UER12A07 UER13A07 UER14A07 UER15A07 UER16A07	Maximum annual modeled impacts for 100% and minimum loads, across 5 years.
NO_2	1-hr	Full/Startup (Worst-Case)	NS1216H07a	Maximum and 98th percentile (H8H) 1-hour modeled impacts for the startup scenario, averaged over 5 years.
	1-hr	Full Load	NS1216H07c	Maximum and 98th percentile (H8H) 1-hour modeled impacts for the full load scenario, averaged over 5 years.
	1-hr	Min. Load	NS1216H07b	Maximum and 98th percentile (H8H) 1-hour modeled impacts for the minimum load scenario, averaged over 5 years.

Appendix Table A-3. AERMOD Run Log (Alternative 7)

Pollutant	Averaging Period	Scenario	Run ID	Comments
Project Impact Modeling				
Unit	1-hr, 3-hr, 8-hr, and 24-hr	Full/Startup and Min. Loads	UER1216HTED12	Maximum short-term modeled impacts for 100% and minimum loads, across 5 years.
Unit	24-hr and Annual	Full/Startup and Min. Loads	UER1216DA12	Maximum 24-hr and annual modeled impacts for 100% and minimum loads, averaged over 5 years.
Unit	Annual	Full/Startup and Min. Loads	UER12A12 UER13A12 UER14A12 UER15A12 UER16A12	Maximum annual modeled impacts for 100% and minimum loads, across 5 years.
NO_2	1-hr	Full/Startup (Worst-Case)	NS1216H12a	Maximum and 98th percentile (H8H) 1-hour modeled impacts for the startup scenario, averaged over 5 years.
	1-hr	Full Load	NS1216H12c	Maximum and 98th percentile (H8H) 1-hour modeled impacts for the full load scenario, averaged over 5 years.
	1-hr	Min. Load	NS1216H12b	Maximum and 98th percentile (H8H) 1-hour modeled impacts for the minimum load scenario, averaged over 5 years.

Appendix B: HRA TABLES

Appendix Table B-1. Summary of Maximum Cancer Health Risk Impacts (Alternative 6)

Receptor Type	Cancer Risk (in a million)	Significance Threshold (in a million)	Receptor Number	UTM Coordinates - Zone 11	
				Easting (m)	Northing (m)
MEIR	1.52	≥ 10	600	382,150	3,780,500
MEIW	0.97	≥ 10	599	382,150	3,780,450

Appendix Table B-2. Summary of Maximum Chronic Non-Cancer Health Risk Impacts (Alternative 6)

Receptor Type	Chronic Non-Cancer HI	Significance Threshold	Receptor Number	UTM Coordinates - Zone 11	
				Easting (m)	Northing (m)
MEIR	<0.01	≥ 1	600	382,150	3,780,500
MEIW	<0.01	≥ 1	599	382,150	3,780,450

Appendix Table B-3. Summary of Maximum Acute Non-Cancer Health Risk Impacts (Alternative 6)

Receptor Type	Acute Non-Cancer HI	Significance Threshold	Receptor Number	UTM Coordinates - Zone 11	
				Easting (m)	Northing (m)
MEIR	0.044	≥ 1	744	382,350	3,780,200
MEIW	0.046	≥ 1	743	382,350	3,780,150

Appendix Table B-4. Summary of Maximum Acute Non-Cancer Health Risk Impacts (Alternative 6)

Receptor Type	Worker 8-Hr Non-Cancer HI	Significance Threshold	Receptor Number	UTM Coordinates - Zone 11	
				Easting (m)	Northing (m)
MEIW	0.021	≥ 1	599	382,150	3,780,450

Appendix Table B-5. MEIR Risk Drivers (Alternative 6)

Receptor Type	MEIR - Cancer	MEIR - NC Chronic	MEIR- NC Acute
Total Impact	1.52E-06	3.43E-03	4.43E-02
Receptor Number	600	600	744
UTME (m)	382,150	382,150	382,350
UTMN (m)	3,780,500	3,780,500	3,780,200
Driving Pollutant	1,3-Butadiene	Formaldehyde	Formaldehyde
Impact Breakdown			
B[k]fluoranthen	3.49E-10	0	0
Chrysene	6.37E-11	0	0
D[a,h]anthracen	4.38E-10	0	0
Ethyl Benzene	3.06E-09	0	0
Fluoranthene	0	0	0
Fluorene	0	0	0
Formaldehyde	2.71E-07	2.12E-03	2.91E-02
In[1,2,3-cd]pyr	3.20E-10	0	0
Naphthalene	1.49E-08	2.04E-05	0
Phenanthrene	0	0	0
Propylene	0	1.31E-05	0
Pyrene	0	0	0
Toluene	0	5.82E-06	3.95E-06
Xylenes	0	6.75E-06	1.80E-05
1,3-Butadiene	1.09E-06	0	0
Acenaphthene	0	0	0
Acenaphthylene	0	0	0
Acetaldehyde	2.61E-08	2.76E-05	6.90E-04
Acrolein	0	1.23E-03	1.44E-02
Anthracene	0	0	0
Benzene	1.08E-07	0	0
B[a]anthracene	2.62E-09	0	0
B[a]P	1.21E-09	0	0
B[b]fluoranthen	1.82E-09	0	0
B[g,h,i]perylen	0	0	0

Appendix Table B-6. MEIW Risk Drivers (Alternative 6)

Receptor Type	MEIW - Cancer	MEIW - NC Chronic	MEIW - NC Acute	MEIW - 8Hr Chronic
Total Impact	9.68E-07	3.77E-03	4.62E-02	2.12E-02
Receptor Number	599	599	743	599
UTME (m)	382,150	382,150	382,350	382,150
UTMN (m)	3,780,450	3,780,450	3,780,150	3,780,450
Driving Pollutant	1,3-Butadiene	Formaldehyde	Formaldehyde	Formaldehyde
Impact Breakdown				
B[k]fluoranthen	1.60E-11	0	0	0
Chrysene	2.92E-12	0	0	0
D[a,h]anthracen	4.26E-11	0	0	0
Ethyl Benzene	1.96E-09	0	0	0
Fluoranthene	0	0	0	0
Fluorene	0	0	0	0
Formaldehyde	1.74E-07	2.33E-03	3.04E-02	1.63E-02
In[1,2,3-cd]pyr	1.46E-11	0	0	0
Naphthalene	9.55E-09	2.24E-05	0	0
Phenanthrene	0	0	0	0
Propylene	0	1.44E-05	0	0
Pyrene	0	0	0	0
Toluene	0	6.41E-06	4.12E-06	0
Xylenes	0	7.42E-06	1.88E-05	0
1,3-Butadiene	6.97E-07	0	0	0
Acenaphthene	0	0	0	0
Acenaphthylene	0	0	0	0
Acetaldehyde	1.67E-08	3.04E-05	7.20E-04	9.92E-05
Acrolein	0	1.36E-03	1.51E-02	4.75E-03
Anthracene	0	0	0	0
Benzene	6.90E-08	0	0	0
B[a]anthracene	1.20E-10	0	0	0
B[a]P	5.52E-11	0	0	0
B[b]fluoranthen	8.35E-11	0	0	0
B[g,h,i]perylen	0	0	0	0

Appendix Table B-7. Summary of Maximum Cancer Health Risk Impacts (Alternative 7)

Receptor Type	Cancer Risk (in a million)	Significance Threshold (in a million)	Receptor Number	UTM Coordinates - Zone 11	
				Easting (m)	Northing (m)
MEIR	1.71	≥ 10	600	382,150	3,780,500
MEIW	1.09	≥ 10	566	382,100	3,780,500

Appendix Table B-8. Summary of Maximum Chronic Non-Cancer Health Risk Impacts (Alternative 7)

Receptor Type	Chronic Non-Cancer HI	Significance Threshold	Receptor Number	UTM Coordinates - Zone 11	
				Easting (m)	Northing (m)
MEIR	<0.01	≥ 1	600	382,150	3,780,500
MEIW	<0.01	≥ 1	566	382,100	3,780,500

Appendix Table B-9. Summary of Maximum Acute Non-Cancer Health Risk Impacts (Alternative 7)

Receptor Type	Acute Non-Cancer HI	Significance Threshold	Receptor Number	UTM Coordinates - Zone 11	
				Easting (m)	Northing (m)
MEIR	0.047	≥ 1	744	382,350	3,780,200
MEIW	0.049	≥ 1	743	382,350	3,780,150

Appendix Table B-10. Summary of Maximum Acute Non-Cancer Health Risk Impacts (Alternative 7)

Receptor Type	Worker 8-Hr Non-Cancer HI	Significance Threshold	Receptor Number	UTM Coordinates - Zone 11	
				Easting (m)	Northing (m)
MEIW	0.024	≥ 1	566	382,100	3,780,500

Appendix Table B-11. MEIR Risk Drivers (Alternative 7)

Receptor Type	MEIR - Cancer	MEIR - NC Chronic	MEIR- NC Acute
Total Impact	1.71E-06	3.85E-03	4.69E-02
Receptor Number	600	600	744
UTME (m)	382,150	382,150	382,350
UTMN (m)	3,780,500	3,780,500	3,780,200
Driving Pollutant	1,3-Butadiene	Formaldehyde	Formaldehyde
Impact Breakdown			
B[k]fluoranthen	3.92E-10	0	0
Chrysene	7.16E-11	0	0
D[a,h]anthracen	4.92E-10	0	0
Ethyl Benzene	3.44E-09	0	0
Fluoranthene	0	0	0
Fluorene	0	0	0
Formaldehyde	3.05E-07	2.39E-03	3.08E-02
In[1,2,3-cd]pyr	3.59E-10	0	0
Naphthalene	1.68E-08	2.29E-05	0
Phenanthrene	0	0	0
Propylene	0	1.47E-05	0
Pyrene	0	0	0
Toluene	0	6.55E-06	4.18E-06
Xylenes	0	7.58E-06	1.90E-05
1,3-Butadiene	1.22E-06	0	0
Acenaphthene	0	0	0
Acenaphthylene	0	0	0
Acetaldehyde	2.94E-08	3.10E-05	7.31E-04
Acrolein	0	1.39E-03	1.53E-02
Anthracene	0	0	0
Benzene	1.21E-07	0	0
B[a]anthracene	2.95E-09	0	0
B[a]P	1.36E-09	0	0
B[b]fluoranthen	2.05E-09	0	0
B[g,h,i]perylen	0	0	0

Appendix Table B-12. MEIW Risk Drivers (Alternative 7)

Receptor Type	**MEIW - Cancer**	**MEIW - NC Chronic**	**MEIW - NC Acute**	**MEIW - 8Hr Chronic**
Total Impact	1.09E-06	4.24E-03	4.87E-02	2.38E-02
Receptor Number	566	566	743	566
UTME (m)	382,100	382,100	382,350	382,100
UTMN (m)	3,780,500	3,780,500	3,780,150	3,780,500
Driving Pollutant	1,3-Butadiene	Formaldehyde	Formaldehyde	Formaldehyde
Impact Breakdown				
B[k]fluoranthen	1.80E-11	0	0	0
Chrysene	3.28E-12	0	0	0
D[a,h]anthracen	4.78E-11	0	0	0
Ethyl Benzene	2.20E-09	0	0	0
Fluoranthene	0	0	0	0
Fluorene	0	0	0	0
Formaldehyde	1.95E-07	2.62E-03	3.20E-02	1.84E-02
In[1,2,3-cd]pyr	1.65E-11	0	0	0
Naphthalene	1.07E-08	2.52E-05	0	0
Phenanthrene	0	0	0	0
Propylene	0	1.62E-05	0	0
Pyrene	0	0	0	0
Toluene	0	7.20E-06	4.34E-06	0
Xylenes	0	8.34E-06	1.98E-05	0
1,3-Butadiene	7.83E-07	0	0	0
Acenaphthene	0	0	0	0
Acenaphthylene	0	0	0	0
Acetaldehyde	1.88E-08	3.41E-05	7.58E-04	1.11E-04
Acrolein	0	1.52E-03	1.59E-02	5.34E-03
Anthracene	0	0	0	0
Benzene	7.75E-08	0	0	0
B[a]anthracene	1.35E-10	0	0	0
B[a]P	6.20E-11	0	0	0
B[b]fluoranthen	9.39E-11	0	0	0
B[g,h,i]perylen	0	0	0	0

Appendix E

Emissions from the Existing Grayson Units to be Replaced

Appendix Table E-1

Grayson Repowering Project: BACT-Adjusted Emission Factors for Existing Units

		BACT Emission Rate, ppmc			BACT-Adjusted Emission Factor, lb/MMscf				
Unit	Fuel	NOx	CO	VOC	NOx	CO	VOC	SO2	PM10/PM2.5
Boilers 3, 4 and 5	Natural Gas	5	100	--	6.36	77.39	5.50	0.60	7.60
Boilers 3, 4 and 5	Landfill Gas	9	--	--	3.84	7.10	4.00	1.45	8.00
Gas Turbines 8A, 8B/C	Natural Gas	2.0	4	2	7.71	9.39	2.69	0.60	14.30

Notes:

Boiler BACT emission rates corrected to 3% O2
- Natural gas NOx and CO EFs from SCAQMD BACT guidance; VOC, PM and SO2 from 2016/2017 AERs
- LFG NOx EF from SJVAPCD Rule 4307; CO, VOC, PM, SO2 from 2016/2017 AERs

Gas Turbine BACT emission rates corrected to 15% O2
- NOx, CO and VOC EFs from SCAQMD BACT guidance (City of Los Angeles Bureau of Sanitation, 2/1/19)
- SO2 and PM10 EFs from 2016/2017 AERs

Conversion:

EF (lb/MMscf) = ppmvd x MW x HHV x F-factor/379.48 ft3/lb-mol x (20.9/(20.9-%O2))
MW NOx (as NO2) 46.01 lb/lb-mol
MW CO 28.01 lb/lb-mol
MW VOC (as methane) 16.04 lb/lb-mol

Natural gas conversion
Heating value: 1031 Btu/scf (HHV) (from Stantec EIR, App. D2-2)
F-factor: 8710 dscf/MMBtu

Landfill gas conversion
Heating value: 310 Btu/scf (HHV) (from Stantec EIR, App. D2-2)
F-factor: 9713 dscf/MMBtu (from Stantec EIR, App. D2-2)

Table E-2

Grayson Repowering Project 2016/17 Baseline Operations -- Calculation of Creditable Emissions Reductions from the Existing Grayson Units to be Shut Down

Year	SCAQMD ID	Device Description	Fuel	Fuel Usage, MMCF	Operating Hours	Reported Emissions, lbs/year					BACT-Adjusted Emissions, lb/year					Generation, MWh
						NOx	CO	VOC	SOx	PM10	NOx	CO	VOC	SOx	PM10	
2016	n/a	ST Unit 1	n/a	n/a	n/a	--	--	--	--	--	--	--	--	--	--	2,182
2016	n/a	ST Unit 2	n/a	n/a	n/a	--	--	--	--	--	--	--	--	--	--	3,683
2016	D2	Boiler Unit 3	NG	119.41	2015	3,886.67	10,030.10	656.73	71.64	907.49	758.98	9,241.03	656.73	71.64	907.49	15,512
2016		Boiler Unit 3	LFG	421.87		3,434.05	2,995.30	1,687.49	611.72	3,374.98	1,618.44	2,995.30	1,687.49	611.72	3,374.98	
2016	D1	Boiler Unit 4	NG	304.06	2766	9,805.81	25,540.70	1,672.31	182.43	2,310.83	1,932.67	23,531.41	1,672.31	182.43	2,310.83	41,645
2016		Boiler Unit 4	LFG	904.81		8,668.05	6,424.13	3,619.23	1,311.97	7,238.46	3,471.12	6,424.13	3,619.23	1,311.97	7,238.46	
2016	D3	Boiler Unit 5	NG	449.93	3826	13,902.80	37,794.00	2,474.60	269.96	3,419.45	2,859.87	34,820.69	2,474.60	269.96	3,419.45	62,753
2016		Boiler Unit 5	LFG	1368.83		12,292.00	9,718.66	5,475.30	1,984.80	10,950.60	5,251.24	9,718.66	5,475.30	1,984.80	10,950.60	
2016	D4	Turbine Unit 8A	NG	43.77	175	1,502.96	5,026.20	1,825.96	26.26	625.87	337.61	411.06	117.70	26.26	625.87	3,088
2016	D5/D6	Turbine Unit 8BC	NG	38.69	79	2,024.16	10,754.10	1,614.06	23.22	553.24	298.43	363.36	104.04	23.21	553.24	2,378
2016	n/a	ST Unit 1	n/a	n/a	n/a	--	--	--	--	--	--	--	--	--	--	1,251
2016	n/a	ST Unit 2	n/a	n/a	n/a	--	--	--	--	--	--	--	--	--	--	3,645
2017	D2	Boiler Unit 3	NG	3.34	27	106.01	280.56	18.37	2	25.38	21.23	258.49	18.37	2.00	25.38	284
2017		Boiler Unit 3	LFG	1.508		78.79	10.71	6.03	2.19	12.06	5.79	10.71	6.03	2.19	12.06	
2017	D1	Boiler Unit 4	NG	228.19	2117	9,672.97	19,168.00	1,255.05	136.91	1,734.24	1,450.44	17,660.01	1,255.05	136.91	1,734.24	37,797
2017		Boiler Unit 4	LFG	630.911		7,192.39	4,479.47	2,523.64	914.82	5,047.29	2,420.37	4,479.47	2,523.64	914.82	5,047.29	
2017	D3	Boiler Unit 5	NG	689.355	5387	21,597.50	57,905.80	3,791.45	413.61	5,239.10	4,381.74	53,350.34	3,791.45	413.61	5,239.10	93,396
2017		Boiler Unit 5	LFG	1,424.83		16,057.80	10,116.30	5,699.32	2,066.00	11,398.60	5,466.10	10,116.29	5,699.32	2,066.00	11,398.64	
2017	D4	Turbine Unit 8A	NG	0.264	3	46.5	193	11.01	0.16	3.78	2.04	2.48	0.71	0.16	3.78	4
2017	D5/D6	Turbine Unit 8BC	NG	62.291	115	3,019.24	20,667.00	2,598.78	37.38	890.76	480.50	585.03	167.51	37.37	890.76	3,975
Two-Year Average Emissions Baseline, tons per year						**28.3**	**55.3**	**8.7**	**2.0**	**13.4**						

Year	SCAQMD ID	Device Description	Fuel	Operating Days	BACT-Adjusted Emissions, lb/day					Adjustment Factor	Adjusted Emissions, lb/day				
					NOx	CO	VOC	SOx	PM10		NOx	CO	VOC	SOx	PM10
2016	D2	Boiler Unit 3	NG	97	7.82	95.27	6.77	0.74	9.36	0.5	3.91	47.63	3.39	0.37	4.68
2016		Boiler Unit 3	LFG		16.68	30.88	17.40	6.31	34.79		8.34	15.44	8.70	3.15	17.40
2016	D1	Boiler Unit 4	NG	118	16.38	199.42	14.17	1.55	19.58	0.5	8.19	99.71	7.09	0.77	9.79
2016		Boiler Unit 4	LFG		29.42	54.44	30.67	11.12	61.34		14.71	27.22	15.34	5.56	30.67
2016	D3	Boiler Unit 5	NG	134	21.34	259.86	18.47	2.01	25.52	0.5	10.67	129.93	9.23	1.01	12.76
2016		Boiler Unit 5	LFG		39.19	72.53	40.86	14.81	81.72		19.59	36.26	20.43	7.41	40.86
2016	D4	Turbine Unit 8A	NG	29	11.64	14.17	4.06	0.91	21.58	0.0	0.00	0.00	0.00	0.00	0.00
2016	D5/D6	Turbine Unit 8BC	NG	28	10.66	12.98	3.72	0.83	19.76	0.0	0.00	0.00	0.00	0.00	0.00
2017	D2	Boiler Unit 3	NG	1	21.23	258.49	18.37	2.00	25.38	0	0.00	0.00	0.00	0.00	0.00
2017		Boiler Unit 3	LFG		5.79	10.71	6.03	2.19	12.06		0.00	0.00	0.00	0.00	0.00
2017	D1	Boiler Unit 4	NG	91	15.94	194.07	13.79	1.50	19.06	0.5	7.97	97.03	6.90	0.75	9.53
2017		Boiler Unit 4	LFG		26.60	49.22	27.73	10.05	55.46		13.30	24.61	13.87	5.03	27.73
2017	D3	Boiler Unit 5	NG	228	19.22	233.99	16.63	1.81	22.98	1.0	19.22	233.99	16.63	1.81	22.98
2017		Boiler Unit 5	LFG		23.97	44.37	25.00	9.06	49.99		23.97	44.37	25.00	9.06	49.99
2017	D4	Turbine Unit 8A	NG	0	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
2017	D5/D6	Turbine Unit 8BC	NG	10	48.05	58.50	16.75	3.74	89.08	0	0.00	0.00	0.00	0.00	0.00

Device Description	2-Year Average Adjusted Emissions, lb/day				
	NOx	CO	VOC	SOx	PM10
Boiler Unit 3	6.13	31.54	6.04	1.76	11.04
Boiler Unit 4	12.25	106.09	11.34	2.34	34.10
Boiler Unit 5	22.08	124.29	21.59	6.06	63.30
Turbine Unit 8A	0.00	0.00	0.00	0.00	0.00
Turbine Unit 8BC	0.00	0.00	0.00	0.00	0.00
Total	**40.46**	261.92	**38.97**	10.16	**108.43**

Appendix F

Top-Down BACT Analysis

Evaluation of Best Available Control Technology

The Grayson Repowering Project (Project) is required to use best available control technology (BACT) on the reciprocating IC engine generators for regulated pollutants, in accordance with the requirements of South Coast Air Quality Management District (SCAQMD, or District) rules.

BACT for nonattainment pollutants is defined in SCAQMD Rule 1302(h):

> *(h) BEST AVAILABLE CONTROL TECHNOLOGY (BACT) means the most stringent emission limitation or control technique which:*
>
> *a) has been achieved in practice for such category or class of source; or*
>
> *b) is contained in any state implementation plan (SIP) approved by the United States Environmental Protection Agency (EPA) for such category or class of source. A specific limitation or control technique shall not apply if the owner or operator of the proposed source demonstrates to the satisfaction of the Executive Officer or designee that such limitation or control technique is not presently achievable; or*
>
> *c) is any other emission limitation or control technique, found by the Executive Officer or designee to be technologically feasible for such class or category of sources or for a specific source, and cost-effective as compared to measures as listed in the Air Quality Management Plan (AQMP) or rules adopted by the District Governing Board.*

The District NSR rules require BACT for NOx; sulfur dioxide (SO_2); volatile organic compounds (VOC); particulate (PM_{10} and $PM_{2.5}$); and ammonia. The emission rates and control technologies determined to be BACT for this project are discussed in detail in the following sections.

Steps in a Top-Down BACT Analysis

Step 1 – Identify All Possible Control Technologies

The first step in a top-down analysis is to identify, for the emissions unit and pollutant in question, all available control options. Available control options are those air pollution control technologies or techniques, including alternate basic equipment or processes, with a practical potential for application to the emissions unit in question. The control alternatives should include not only existing controls for the source category in question, but also, through technology transfer, controls applied to similar source categories and gas streams.

BACT must be at least as stringent as what has been achieved in practice (AIP) for a category or class of source. Additionally, SCAQMD guidelines require that a technology that is determined to be AIP for one category of source be considered for transfer to other source categories. There are two types of potentially transferable control technologies: exhaust stream controls, and (2) process controls and modifications. For the first type, technology transfer must be considered between source categories that produce similar exhaust streams. For the second type, technology transfer must be considered between source categories with similar processes.

Potential control technologies were identified by searching the following sources for determinations pertaining to large natural gas-fueled IC engines:

- SCAQMD BACT Guidelines;
- San Joaquin Valley Air Pollution Control District (SJVAPCD) BACT Clearinghouse;
- Bay Area Air Quality Management District (BAAQMD) BACT Guidelines;
- EPA Reasonably Available Control Technology/BACT/ Lowest Achievable Emission Rate Clearinghouse (RBLC);
- Other district and state BACT Guidelines; and
- BACT/LAER requirements in New Source Review permits issued by a local air district[1] or other air pollution control agency.

Candidate control options that do not meet basic project requirements (i.e., alternative basic designs that "redefine the source") are eliminated at this step.

The applicant's objective for the Grayson Repowering Project is to replace the existing Grayson Power Plant with more reliable, efficient, flexible, and cleaner units and related facilities and infrastructure. As part of the 2019 Integrated Resource Planning process, the City evaluated a variety of options and selected a portfolio of generation, transmission and distributed generation assets that would support a more responsive and sustainable resource portfolio for power production. The City's Repowering Project includes up to 75 MW of battery storage; the proposed engine generator portion of the Project is intended to help the City manage the intermittency and variability of energy generated by the renewable resources that will make up an ever larger fraction of the City's power resource portfolio. The proposed RICE units will provide capacity and will mitigate fluctuations in both supply and demand.

The City had previously selected a combination of simple cycle and combined cycle turbine generation for its repowering project. However, a subsequent reevaluation determined that a combination of a smaller gas plant, comprised of IC engine generators, plus battery storage would achieve the goals of the repowering project while also having the following benefits:

- ICEs are more flexible, faster responding, and more efficient than either simple cycle or combined cycle gas turbines; and

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[1] Any Air Quality Management District or Air Pollution Control District in California.

- Utility-scale batteries technology will allow the City to better integrate renewable energy into the system by making energy produced during peak sun and wind hours available in peak load hours when it is needed.

Because project alternatives have been thoroughly evaluated in other documents, these alternatives are not discussed further here. The other documents are incorporated by reference.[2,3]

Step 2 – Eliminate Technologically Infeasible Options

To be considered, the candidate control option must be technologically feasible for the application being reviewed.

Step 3 – Rank Remaining Control Options by Control Effectiveness

All feasible options are ranked in the order of decreasing control effectiveness for the pollutant under consideration. In some cases, a given control technology may be listed more than once, representing different levels of control (e.g., the use of SCR for control of NOx may be evaluated at different controlled emission rates). Any control option less stringent than what has been already achieved in practice for the category of source under review must also be eliminated at this step.

Step 4 – Evaluate Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts

To be required as BACT, the candidate control option must be cost effective, considering energy, environmental, economic, and other costs. The most stringent control technology for control of one pollutant may have other undesirable environmental or economic impacts. The purpose of Step 4 is to either validate the suitability of the top control option or provide a clear justification as to why that option should not be selected as BACT.

Once all of the candidate control technologies have been ranked, and other impacts have been evaluated, the most stringent candidate control technology is deemed to be BACT, unless the other impacts are unacceptable.

Step 5 – Determine BACT/Present Conclusions

BACT is determined to be the most effective control technology subject to evaluation, and not rejected as infeasible or having unacceptable energy, environmental, or cost impacts.

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[2] Glendale Water and Power (GWP), 2019 Integrated Resource Plan, 7/23/19. Available at https://www.glendaleca.gov/home/showdocument?id=51814

[3] GWP, Proposed Grayson Reporting Project, 2/6/18 Presentation to City Council. Available at http://graysonrepowering.com/#2-slash-6-slash-18-pres-to-city-council

BACT for the Reciprocating IC Engine Generators: Normal Operations

NOx EMISSIONS

Step 1 – Identify All Possible Control Technologies

The emissions units for which BACT is being considered are nominal 18.8 MW natural gas-fired reciprocating IC engine generators.

Outlined below are the technologies for control of NOx that were identified.

- Selective Catalytic Reduction (SCR) – SCR is a post-combustion NO_X control technology (i.e., it treats the exhaust gas downstream of the combustion source). SCR controls NO_X emissions by injecting ammonia (NH_3) into the exhaust gas upstream of a catalyst bed. On the catalyst surface, the NH_3 reacts with NO_X to form molecular nitrogen and water vapor. The general chemical reactions are:

$$4NO + 4NH_3 + O_2 \rightarrow 4N_2 + 6H_2O$$

$$2NO_2 + 4NH_3 + O_2 \rightarrow 3N_2 + 6H_2O$$

$$NO + NO_2 + 2NH_3 \rightarrow 2N_2 + 3H_2O$$

- Selective Non-Catalytic Reduction (SNCR) - SNCR is a post-combustion control technology that involves injecting ammonia or urea into regions of the exhaust with temperatures greater than 1400 – 1500 degrees Fahrenheit. The nitrogen oxides in the exhaust are reduced to nitrogen and water vapor. Additional fuel is required to heat the engine exhaust to the correct operating temperature. Heat recovery from the engine exhaust can limit the additional fuel requirement and concurrent additional emissions from heating exhaust gases. Temperature is the operational parameter affecting the reaction - as well as degree of contaminant mixing with reagent and residence time.
- Engine Design – Engine manufactures have developed various methods to minimize the formation of NO_X through the use of:
    - Fuel injection timing retard (FITR),
    - Turbocharging combined with intake air aftercooling, and
    - Computerized fuel and combustion air management.
- Alternative Basic Equipment:
    - Renewable energy source (e.g., solar, wind, etc.)
    - Combined-cycle turbine
    - Simple cycle turbine

As discussed above, because these alternative basic equipment technologies have already been considered as project alternatives, they are eliminated in this step of the analysis.

Step 2 – Eliminate Technologically Infeasible Options

Exhaust Stream Controls

The BAAQMD BACT guideline for spark ignition, natural gas fired lean burn IC engines ≥ 50 HP indicates that 6 ppmvd @ 15% O_2 (ppmc) is technologically feasible and 12 ppmc is achieved in practice.[4] The SJVAPCD BACT guideline for this source type has been rescinded, but Rule 4702 requires spark-ignited lean burn engines rated at > 50 hp to meet a NOx limit of 11 ppmc. The Santa Barbara County APCD considers a NOx limit of 5 ppmc to be achieved in practice BACT.[5] All of these BACT limits are based on SCR control. The applicable NSPS limit is 1.0 g/bhp-hr or 82 ppmc. The proposed limit of 2.4 ppmc is well below these District BACT and regulatory limits.

The most recent NOx BACT listings for natural gas-fired reciprocating IC engine generators in this size range are summarized in Table F-1. The most stringent NOx limit in these recent BACT determinations is a 1.33 lb/hr limit averaged over a 1-hour averaging period, excluding startups, for the same Wärtsilä 18V50SG engines installed at Denton Energy Center in Texas. This level is equivalent to 2.4 ppmvd @ 15% O_2 and is achieved using combustion controls and SCR.

The SCR system uses ammonia injection to reduce NOx emissions. SCR systems have been widely used in reciprocating IC engine applications of all sizes. The SCR process involves the injection of ammonia into the flue gas stream via an ammonia injection grid upstream of a reducing catalyst. The ammonia reacts with the NOx in the exhaust stream to form N_2 and water vapor. The catalyst does not require regeneration but must be replaced periodically; typical SCR catalyst lifetimes are in excess of three years.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

SCR technology, in combination with combustion controls, is capable of achieving a NOx emission level of 2.4 ppmvd @ 15% O_2 proposed for this project.

Step 4 – Evaluate the Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts

The use of SCR will result in ammonia emissions subject to a proposed ammonia slip limit of 5 ppmvd @ 15% O_2. A health risk screening analysis of the proposed project using air dispersion modeling demonstrates the acute health hazard index and the chronic health hazard index each to be much less than 1, based on an ammonia slip limit of 5 ppmv @ 15% O_2. In accordance with the District's Toxics program and currently accepted practice, a hazard index below 1.0 is not considered significant. Therefore, the

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[4] BAAQMD, BACT Guideline for IC Engine – Spark Ignition, Natural Gas Fired Lean Burn Engine, 5/7/03. Available at www.baaqmd.gov/~/media/files/engineering/bact-tbact-workshop/combustion/96-3-3.pdf?la=en

[5] Santa Barbara County APCD, BACT Guideline 3.3, June 14, 2017. Available at https://www.ourair.org/wp-content/uploads/BACT-Guideline-3.3.pdf.

Table F-1. Recent NOx BACT Determinations for Large Natural Gas-Fired IC Engines

Jurisdiction	RBLC ID	Permit Date	Facility	Unit Description	NOx Control(s)	NOx BACT Limit	Equivalent NOx Limit[a]
Michigan DEQ	MI-0440	10/19	Michigan State University	4 NG-fueled RICE, 16,500 HP each for electricity generation	SCR	0.5 g/bhp-hr except during SU/SD	No adjustment
Pima County DEQ	n/a	8/18	Tucson Electric Power – Irvington Generating Station	NG-fired Wärtsilä 18V50SG ICE, each 19 MW Net and 154.5 MMBtu/hr heat input	SCR	NOx cap of 170.0 tpy for 10 units 0.032 g/kWh	No adjustment
Texas CEQ	n/a	3/18	Denton Energy Center	NG-fired Wärtsilä 18V50SG ICE	SCR	1.33 lb/hr	No adjustment
Kansas Dept of Health & Envt	KS-0030	3/16	Mid-Kansas Electric Company – Rubart Station	10 MW SI NG-fueled 4SLB RICE	SCR	2.13 lb/hr, 1-hr avg, except during SU	~4.00 lb/hr
Kansas Dept of Health & Envt	KS-0035	1/14	Tradewind Energy, Inc – Lacy Randall Generation Facility	4SLB NG-fueled Wartsila model 20V34SG engines, rated at 9.34 MW (12,526 BHP)	SCR	1.45 lb/hr, 1-hr avg, except during SU	~2.90 lb/hr
Texas CEQ	TX-0692	12/13	South Texas Electric Cooperative – Red Gate Power Plant	4SLB NG-fueled Wartsila model 18V50SG, 18 MW	SCR	0.084 g/hp-hr, 1-hr avg	n/a

Note:

a. Permit limit(s) adjusted for engine size/output to be comparable to 18V50SG units.

air quality impact of the ammonia slip resulting from the use of SCR is deemed to be not significant and is not a sufficient reason to eliminate SCR as a control alternative.

A second potential environmental impact that may result from the use of SCR involves the storage and transport of aqueous or anhydrous ammonia.[6] Although ammonia is toxic if swallowed or inhaled and can irritate or burn the skin, eyes, nose, or throat, it is a commonly used material that is typically handled safely and without incident. The project operator is required to develop and maintain a Risk Management Plan (RMP) and to implement a Risk Management Program to prevent accidental releases of ammonia. The RMP provides information on the hazards of the substance handled at the facility and the programs in place to prevent and respond to accidental releases. In addition, aqueous ammonia is already used at the existing Grayson Power Plant and a hazard assessment performed for the Environmental Impact Report[7] determined that the use of aqueous additional ammonia at the facility would have a less than significant impact with proposed mitigation.

"Achieved in Practice" Criteria

SCAQMD has established formal criteria for determining when emission control technologies should be considered achieved in practice (AIP) for the purposes of BACT determinations. The criteria include the elements outlined below.

- Commercial Availability: At least one vendor must offer this equipment for regular or full-scale operation in the United States. A performance warranty or guarantee must be available with the purchase of the control technology, as well as parts and service.
- Reliability: All control technologies must have been installed and operated reliably for at least six months. If the operator did not require the basic equipment to operate daily, then the equipment must have at least 183 cumulative days of operation. During this period, the basic equipment must have operated (1) at a minimum of 50% design capacity; or (2) in a manner that is typical of the equipment in order to provide an expectation of continued reliability of the control technology.
- Effectiveness: The control technology must be verified to perform effectively over the range of operation expected for that type of equipment. If the control technology will be allowed to operate at lesser effectiveness during certain modes of operation, then those modes of operation must be identified. The verification shall be based on a performance test or tests, when possible, or other performance data.

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[6] The project will use the less concentrated, safer aqueous form of ammonia. Accident prevention and emergency response requirements reflect existing safety regulations and proven industry safety codes and standards. Thus, the potential environmental impact due to aqueous ammonia use at the Project is minimal and does not justify the elimination of SCR as a control alternative.

[7] Available at http://graysonrepowering.com/#final-eir .

SCR Technology – SCR has been achieved in practice at numerous RICE installations throughout the world. There is at least one large natural gas-fired RICE project that limits NOx emissions to the equivalent of 2.4 ppm, as shown in Table F-1. An evaluation of the proposed AIP criteria as applied to the achievement of 2.4 ppm, and to extremely low NOx levels (below 2.4 ppm) using SCR technology, is summarized below.

- Commercial Availability: Engine-out NOx from reciprocating IC engines is generally significantly higher than uncontrolled NOx from combustion turbines. Achieving a controlled NOx limit below 2.4 ppm would require SCR technology to achieve reductions that have not yet been demonstrated in practice. The proposed NOx limit of 2.4 ppm is significantly lower than most recently permitted large natural gas-fueled RICE, as shown in Table F-1. Consequently, this criterion is not satisfied for limits below 2.4 ppm for this type of generating unit. As shown in Table F-1 above, this criterion is satisfied for large natural gas-fueled RICE at a 2.4 ppm permit level.
- Reliability: SCR technology has been shown to be capable of achieving NOx levels consistent with a 2.4 ppm permit limit during extended, routine operations at one commercial power plant, with a second plant under construction. There are no reported adverse effects of operation of the SCR system at these levels on overall plant operation or reliability. There has been no demonstration of operation at levels below 2.4 ppm during extended, routine operation of large reciprocating IC engines; consequently, this criterion is not satisfied for NOx limits below 2.4 ppm.
- Effectiveness: SCR technology has been demonstrated to achieve NOx levels of 2.4 ppm with large reciprocating IC engines, but not at lower limits for this generating technology. Consequently, this criterion is satisfied at a NOx limit of 2.4 ppm, but not at lower NOx limits.
- Conclusion: SCR technology capable of achieving NOx levels of 2.4 ppm is considered to be achieved in practice. The permit limits for the proposed project include a NOx limit of 2.4 ppm. This proposed limit is consistent with the available data. The AIP criteria are not met for SCR on large reciprocating IC engines at NOx limits lower than 2.4 ppm.

Summary of Achieved in Practice Evaluation

SCR's capability to consistently achieve 2.4 ppmvd NOx (1-hour average) in large reciprocating IC engines has been demonstrated in at least one installation, with a second installation under construction. An emission level of 2.4 ppm NOx has therefore been achieved in practice, and any BACT determination must be at least as stringent as that.

Technologically Feasible/Cost Effective Criterion

No candidate technology with lower emission levels than those achieved in practice has been identified.

Step 5 – Determine BACT/Present Conclusions

BACT must be at least as stringent as the most stringent level achieved in practice, federal NSPS, or district prohibitory rule. Based upon the results of this analysis, the proposed NOx limit of 2.4 ppmvd @ 15% O_2 on a 1-hour average basis reflects the most stringent NOx emission limit that has been achieved in practice[8] and goes beyond current BACT in California. The most recent BACT determination for a large reciprocating engine project in California was made in 2008 for the Eastshore Energy Project, a 115.5 MW electric generating facility consisting of 14 8 MW natural gas-fired engine generators. For this project, the BAAQMD BACT determination for NOx was 5 ppmvd @ 15% O_2.[9] No more stringent level has been suggested as being technologically feasible. Therefore, BACT for NOx for this application is SCR capable of achieving 2.4 ppmvd @ 15% O_2 on a 1-hour average basis.

The Project will be designed to meet a NOx level of 2.4 ppmvd @ 15% O_2 on a 1-hour average basis using SCR and combustion controls.

CO EMISSIONS

Step 1 – Identify All Possible Control Technologies

CO emitted from natural gas-fired large reciprocating IC engines is the result of incomplete combustion of fuel. Use of an oxidation catalyst is generally considered BACT for CO. Alternative basic equipment—including renewable energy sources, such as solar and wind—was already discussed above (Step 1 for NOx BACT). For the same reasons, solar, wind and other renewable energy sources are rejected as CO BACT for this application.

Step 2 – Eliminate Technologically Infeasible Options

The only technology under consideration is use of an oxidation catalyst in combination with combustion controls. This combination of technologies has been demonstrated to be feasible in many applications. No other technologies have been identified that are capable of achieving the same level of control. As a result, the goal of the rest of this

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[8] Although the Denton Energy Center reciprocating engines have a permitted limit of 1.33 lb/hr that is equivalent to 2.4 ppm, the Denton project limited annual emissions to below 50 tons per year to avoid the need to undergo nonattainment review. As a result, this limit was not the result of a BACT determination and cannot be considered to have established BACT for this type of source.

[9] As cited in the California Energy Commission's Final Commission Decision for the Eastshore Energy Center (06-AFC-6), October 2008. Available at *https://ww2.energy.ca.gov/2008publications/CEC-800-2008-004/CEC-800-2008-004-CMF.PDF*.

analysis is to determine the appropriate emission limit that constitutes BACT for this application.

The BAAQMD's BACT guidelines specify that, for natural gas-fired lean-burn RICE larger than 50 HP, a CO limit of 74 ppmc has been "achieved in practice," while a limit of 12 ppmc is considered "technologically feasible." The Santa Barbara County APCD's BACT guidelines contain a determination for prime lean burn spark ignition engines. The SBCAPCD concluded that a CO exhaust concentration of 12 ppmc constitutes BACT that is considered technologically feasible. The applicable NSPS limit is 2.0 g/hp-hr or 270 ppmvd. The proposed CO limit of 11.2 ppmc (0.066 g/bhp-hr) is below these District BACT and regulatory limits.

A summary of recent CO BACT determinations is shown in Table F-2. The proposed CO limit of 3.76 lb/hr is also well below these recent BACT limits for similar engines.

Table F-2. Recent CO BACT Determinations for Large Natural Gas-Fired IC Engines

Jurisdiction	RBLC ID	Permit Date	Facility	Unit Description	CO Control(s)	CO BACT Limit	Equivalent CO Limit[a]
Michigan DEQ	MI-0440	10/19	Michigan State University	4SLB NG-fueled RICE, 16,500 HP each for electricity generation	Oxidation catalyst	0.3 g/bhp-hr except during SU/SD	n/a
Pima County DEQ	n/a	8/18	Tucson Electric Power – Irvington Generating Station	4SLB NG- fueled Wärtsilä 18V50SG ICE, each rated at 19 MW Net and 154.5 MMBtu/hr heat input	Oxidation catalyst	4.43 lb/hr, except during SU	No adjustment
Texas CEQ	n/a	3/18	Denton Energy Center	4SLB NG-fired Wärtsilä 18V50SG ICE	Oxidation catalyst	4.96 lb/hr 0.12 g/kWh	No adjustment
Kansas Dept of Health & Envt	KS-0030	3/16	Mid-Kansas Electric Company – Rubart Station	4SLB NG-fueled Caterpillar G20CM34 RICE, each rated at 10 MW	none	3.86 lb/hr, 1-hr avg, except during SU	~7.26 lb/hr
Kansas Dept of Health & Envt	KS-0035	1/14	Tradewind Energy, Inc – Lacy Randall Generation Facility	4SLB NG-fueled Wartsila model 20V34SG RICE, each rated at 9.34 MW (12,526 BHP)	Oxidation catalyst	2.67 lb/hr, 1-hr avg, except during SU	~5.37 lb/hr
Texas CEQ	TX-0692	12/13	South Texas Electric Cooperative – Red Gate Power Plant	4SLB NG-fueled Wartsila model 18V50SG RICE, each rated at 18 MW	Oxidation catalyst	0.3 g/hp-hr, 1-hr avg	n/a

Note:

a. Permit limit(s) adjusted for engine size/output to be comparable to 18V50SG units.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The control technologies under consideration are ranked as follows:

- Oxidation catalyst unit capable of achieving 11.2 ppmvd @ 15% O_2
- Oxidation catalyst unit capable of achieving ≥ 12 ppmvd @ 15% O_2

Step 4 – Evaluate the Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts

This step evaluates any source-specific environmental, energy, or economic impacts that demonstrate that the top alternative listed in the previous step is inappropriate as BACT.

The applicant has proposed to meet 11.2 ppmc limit on a 1-hour average basis. Because the applicant has proposed to use the highest ranked technology under consideration, the analysis ends at this step.

Step 5 – Determine BACT/Present Conclusions

BACT must be at least as stringent as the most stringent achieved in practice, required in a federal NSPS or district prohibitory rule, or considered technologically feasible. Based upon the results of this analysis, the CO emission limit of 11.2 ppmvd @ 15% O_2 is considered to be BACT for the proposed project.

VOC EMISSIONS

Step 1 – Identify All Possible Control Technologies

Most VOCs emitted from natural gas-fired reciprocating engines are the result of incomplete combustion of fuel. Therefore, most of the VOCs are methane and ethane, which are not effectively controlled by an oxidation catalyst. However, oxidation catalyst technology designed to control CO can also provide some degree of control of VOC emissions, especially the more complex compounds formed in the combustion process. Therefore, use of an oxidation catalyst is generally considered BACT for VOC.

Alternative basic equipment—including renewable energy sources, such as solar and wind—was already discussed above (Step 1 for NOx BACT). For the same reasons, solar, wind and other renewable energy sources are rejected as VOC BACT for this application.

Step 2 – Eliminate Technologically Infeasible Options

The only technology under consideration is use of an oxidation catalyst in combination with combustion controls. This combination of technologies has been demonstrated to be feasible in many applications. No other technologies have been identified that are capable of achieving the same level of control. As a result, the goal of the rest of this analysis is to determine the appropriate emission limit that constitutes BACT for this application.

The BAAQMD's BACT guidelines include an achieved in practice BACT determination for natural gas-fired lean burn engines greater than 50 HP of 32 ppmc using an oxidation catalyst. The SBCAPCD's BACT guidelines contain a determination for prime lean burn spark ignition engines. The SBCAPCD concluded that a VOC exhaust concentration of 25 ppmc constitutes BACT that has been achieved in practice. The applicable NSPS (40 CFR 60 Subpart JJJJ) limit for VOC is 0.7 g/hp-hr or 60 ppmc. The proposed limits of 9.8 ppmc (0.033 g/hp-hr) is well below these District and regulatory limits.

A summary of recent VOC BACT determinations is shown in Table F-3. The proposed VOC limit of 1.89 lb/hr is also well below these recent BACT limits for similar engines.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

- Oxidation catalyst unit capable of achieving 9.8 ppmvd VOC (as methane) @ 15% O_2
- Oxidation catalyst unit capable of achieving ≥ 9.8 ppmvd VOC (as methane) @ 15% O_2

Step 4 – Evaluate the Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts

This step evaluates any source-specific environmental, energy, or economic impacts that demonstrate that the top alternative listed in the previous step is inappropriate as BACT.

The applicant has proposed to meet a 9.8 ppmvd limit on a 1-hour average basis. This level is comparable to or lower than those achieved in practice for comparable sources and therefore meets BACT.

Step 5 – Determine BACT/Present Conclusions

BACT must be at least as stringent as the most stringent achieved in practice, required in a federal NSPS or district prohibitory rule, or considered technologically feasible. Based upon the results of this analysis, the VOC emission limit of 9.8 ppmvd @ 15% O_2 is considered to be BACT for the proposed project.

SULFUR OXIDE EMISSIONS

Step 1 – Identify All Possible Control Technologies

Natural gas fired engines have inherently low SOx emissions due to the small amount of sulfur present in the fuel. Typical pipeline quality natural gas sulfur content is well below 1 grain/100 scf. Firing by natural gas, and the resulting control of SOx emissions, has been used by numerous IC engines throughout the world. Due to the prevalence of

Table F-3. Recent VOC BACT Determinations for Large Natural Gas-Fired IC Engines

Jurisdiction	RBLC ID	Permit Date	Facility	Unit Description	VOC Control(s)	VOC BACT Limit	Equivalent VOC Limit[a]
Michigan DEQ	MI-0440	10/19	Michigan State University	4SLB NG-fueled RICE, 16,500 HP each for electricity generation	Good combustion practices	1.6 lb/hr	2.45 lb/hr
Pima County DEQ	n/a	8/18	Tucson Electric Power – Irvington Generating Station	4SLB NG- fueled Wärtsilä 18V50SG ICE, each rated at 19 MW Net and 154.5 MMBtu/hr heat input	Oxidation catalyst	4.49 lb/hr, except during SU	No adjustment
Texas CEQ	n/a	3/18	Denton Energy Center	4SLB NG-fired Wärtsilä 18V50SG ICE	Oxidation catalyst	2.07 lb/hr 0.05 g/kWh	No adjustment
Kansas Dept of Health & Envt	KS-0030	3/16	Mid-Kansas Electric Company – Rubart Station	4SLB NG-fueled Caterpillar G20CM34 RICE, each rated at 10 MW	none	5.82 lb/hr, 1-hr avg, except during SU	~10.9 lb/hr
Kansas Dept of Health & Envt	KS-0035	1/14	Tradewind Energy, Inc – Lacy Randall Generation Facility	4SLB NG-fueled Wartsila model 20V34SG RICE, each rated at 9.34 MW (12,526 BHP)	Oxidation catalyst	2.67 lb/hr, 1-hr avg, except during SU	~5.37 lb/hr
Texas CEQ	TX-0692	12/13	South Texas Electric Cooperative – Red Gate Power Plant	4SLB NG-fueled Wartsila model 18V50SG RICE, each rated at 18 MW	Oxidation catalyst	0.3 g/hp-hr, 1-hr avg	n/a

Note:

a. Permit limit(s) adjusted for engine size/output to be comparable to 18V50SG units.

the use of natural gas to control SOx emissions from IC engines, only an abbreviated discussion of post-combustion controls will be addressed in this section.

Post-combustion SOx control systems include dry and wet scrubber systems. These types of systems are typically installed on high SOx emitting sources such as coal-fired power plants.

Step 2 – Eliminate Technically Infeasible Options

All of the control options discussed above are technically feasible.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The typical SOx control level for a well-designed wet or dry scrubber installed on a coal fired boiler ranges from approximately 70% to 90%,[10] with some installations achieving even higher control levels.

Step 4 – Evaluate Most Effective Controls and Document Results

The use of low sulfur content pipeline natural gas has been achieved in practice at numerous IC engine installations throughout the world, and the use of this fuel minimizes SOx emissions. While it would be theoretically feasible to install some type of post-combustion control such as a dry/wet scrubber system, due to the inherently low SOx emissions associated with the use of natural gas, these systems are not cost effective and regulatory agencies do not require them. Consequently, no further discussion of post-combustion SOx control is necessary.

Step 5 – Determine BACT/Present Conclusions

The SOx control method for the proposed Project is the use of pipeline-quality natural gas. Consequently, the proposed project is consistent with BACT requirements.

PM/PM_{10}/$PM_{2.5}$ EMISSIONS

Step 1 – Identify All Possible Control Technologies

Alternative basic equipment—including renewable energy sources, such as solar and wind—has also been identified as a technology for the control of PM/PM_{10}/$PM_{2.5}$ emissions. Such alternative basic equipment was already discussed above (Step 1 for NOx BACT on the CTGs/HRSGs). For the same reasons, solar, wind and other renewable energy sources are rejected as PM_{10}/$PM_{2.5}$ BACT for this application.

Achievable Controlled Levels and Available Control Options

PM emissions from natural gas-fired engines primarily result from carryover of noncombustible trace constituents in the fuel. PM emissions are minimized by using clean-burning pipeline quality natural gas with low sulfur content. Other technologies in

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[10] Air Pollution Control Manual, Air and Waste Management Association, Second Edition, page 206.

use for control of PM emissions such as filters or electrostatic precipitators have not been applied to and are not potentially applicable to natural gas fired RICE units due to the low concentration of filterable PM in the exhaust stream.

The BAAQMD and SBCAPCD BACT guidelines identifies the use of natural gas as the primary fuel as "achieved in practice" for the control of PM_{10} for natural gas-fired lean-burn IC engines.

Title 40 CFR Part 60 Subpart JJJJ contains the applicable NSPS for stationary spark-ignited IC engines. Subpart JJJJ does not regulate PM_{10} emissions.

Published prohibitory rules from the SCAQMD, SJVAPCD, SMAQMD, and SDCAPCD were reviewed to identify the PM_{10} standards that govern natural gas-fired reciprocating engines. These prohibitory rules do not regulate PM_{10} emissions.

Step 2 – Eliminate Technologically Infeasible Options

As discussed above, solar, wind and other renewable energy alternatives, as well as add-on PM controls, are not considered technologically feasible for this application.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

No control technology other than use of clean natural gas fuel has been identified for this application.

Step 4 – Evaluate the Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts

No control technology other than use of clean natural gas fuel has been identified for this application.

Step 5 – Determine BACT/Present Conclusions

Based upon the results of this analysis, the use of natural gas as the primary fuel source constitutes BACT for PM_{10} emissions from the proposed Project. Through the use of natural gas, the engines are expected to be able to meet the proposed emission limit of 1.32 lbs/hr.

AMMONIA EMISSIONS

Step 1 – Identify All Possible Control Technologies

Alternative basic equipment—including renewable energy sources, such as solar and wind—has also been identified as a technology for the control of ammonia emissions. Such alternative basic equipment was already discussed above (Step 1 for NOx BACT on the CTGs/HRSGs). For the same reasons, solar, wind and other renewable energy sources are rejected as ammonia BACT for this application.

Achievable Controlled Levels and Available Control Options

Ammonia emissions from natural gas-fired engines primarily result from carryover of excess ammonia that passes unreacted through the SCR system. Ammonia emissions are minimized by monitoring and controlling NOx emissions and ammonia injection rates to optimize injection rates and avoid the use of excess ammonia. Other technologies used for control of NOx emissions without the use of SCR and ammonia injection are not capable of reducing engine-out NOx to the levels required to achieve BACT NOx emission rates, so alternative NOx control technologies that do not utilize ammonia are not technologically feasible for this application.

The BAAQMD and SBCAPCD BACT guidelines do not address ammonia emissions from IC engines. In these districts, ammonia emissions are regulated for potential health impacts.

Title 40 CFR Part 60 Subpart JJJJ contains the applicable NSPS for stationary spark-ignited IC engines. Subpart JJJJ does not regulate ammonia emissions.

Published prohibitory rules from the SCAQMD, SJVAPCD, SMAQMD, and SDCAPCD were reviewed to identify the PM_{10} standards that govern natural gas-fired reciprocating engines. These prohibitory rules do not regulate ammonia emissions.

Permitted ammonia slip limits for SCR-equipped IC engines range from 5 to 10 ppmc, as shown in Table F-4. The SCAQMD has determined that 5 ppmc is BACT for ammonia slip from SCR-equipped gas turbines.

Step 2 – Eliminate Technologically Infeasible Options

As discussed above, solar, wind and other renewable energy alternatives, as well as alternative NOx controls, are not considered technologically feasible for this application.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The most stringent ammonia emission limit identified for this type of source and/or emission control system is 5 ppmc.

Step 4 – Evaluate the Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts

No lower ammonia slip emission rate has been identified that would be applicable for this application.

Step 5 – Determine BACT/Present Conclusions

Based upon the results of this analysis, the proposed 5 ppmc ammonia slip limit constitutes BACT for the proposed Project. Through the use of process monitors and controls, the engines are expected to be able to meet the proposed emission limit of 5 ppmc.

Table F-4. Recent Ammonia Slip Limits for Large Natural Gas-Fired IC Engines

Jurisdiction	RBLC ID	Permit Date	Facility	Unit Description	Ammonia Slip Limit
Michigan DEQ	MI-0440	10/19	Michigan State University	4SLB NG-fueled RICE, 16,500 HP each for electricity generation	None reported
Pima County DEQ	n/a	8/18	Tucson Electric Power – Irvington Generating Station	4SLB NG- fueled Wärtsilä 18V50SG ICE, each rated at 19 MW Net and 154.5 MMBtu/hr heat input	None
Texas CEQ	n/a	3/18	Denton Energy Center	4SLB NG-fired Wärtsilä 18V50SG ICE	2.07 lb/hr (equivalent to 10 ppmc)
Santa Barbara County APCD	CA-1240	3/17	Gold Coast Packing	4SLB NG-fired 881 bhp ICE	5 ppmc
Kansas Dept of Health & Envt	KS-0030	3/16	Mid-Kansas Electric Company – Rubart Station	4SLB NG-fueled Caterpillar G20CM34 RICE, each rated at 10 MW	None reported
Kansas Dept of Health & Envt	KS-0035	1/14	Tradewind Energy, Inc – Lacy Randall Generation Facility	4SLB NG-fueled Wartsila model 20V34SG RICE, each rated at 9.34 MW (12,526 BHP)	None reported
Texas CEQ	TX-0692	12/13	South Texas Electric Cooperative – Red Gate Power Plant	4SLB NG-fueled Wartsila model 18V50SG RICE, each rated at 18 MW	10 ppmc

C.2 Alternative 8

ALTERNATE 8
ATTACHMENTS

EMISSION INVENTORY
(CRITERIA POLLUTANTS AND TOXICS)

CRITERIA POLLUTANTS EMISSION INVENTORY

ALTERNATIVE 8 EMISSION INVENTORY
CRITERIA POLLUTANTS EMISSION FACTORS

	POLLUTANT CONCENTRATION (CONTROLLED)										POLLUTANT EMISSION FACTOR (CONTROLLED)				
Equipment Type	NO_X		CO		VOC		PM10/2.5		SO_X		NO_X, LBS/HR	CO, LBS/HR	VOC, LBS/HR	PM10/2.5, LBS/HR	SO_X, LBS/HR
Turbine 8A (Simple cycle)	2.5	PPMV	20.6	PPMV	6.97	LBS/MMCF	3.15	LBS/MMCF	0.714	LBS/MMCF	3.27	16.41	2.32	1.05	0.24
Turbine 8B or 8C (Combined Cycle)	2	PPMV	20.6	PPMV	14.65	LBS/MMCF	3.15	LBS/MMCF	0.714	LBS/MMCF	2.62	16.41	4.88	1.05	0.24

	POLLUTANT CONCENTRATION (UNCONTROLLED)										POLLUTANT EMISSION FACTOR (UNCONTROLLED)				
Equipment Type	NO_X		CO		VOC		PM10/2.5		SO_X		NO_X, LBS/HR	CO, LBS/HR	VOC, LBS/HR	PM10/2.5, LBS/HR	SO_X, LBS/HR
Turbine 8A (Simple cycle)	23.5	PPMV	206.1	PPMV	6.97	LBS/MMCF	3.15	LBS/MMCF	0.714	LBS/MMCF	30.76	164.21	2.32	1.05	0.24
Turbine 8B or 8C (Combined Cycle)	23.5	PPMV	206.1	PPMV	14.65	LBS/MMCF	3.15	LBS/MMCF	0.714	LBS/MMCF	30.76	164.21	4.88	1.05	0.24

	STARTUP EMISSION RATE (LBS/EVENT)					SHUTDOWN EMISSION RATE (LBS/EVENT)				
STARTUP/SHUTDOWN RATE	NO_X	CO	VOC	PM10/2.5	SO_X	NO_X	CO	VOC	PM10/2.5	SO_X
Turbine 8A (Simple cycle) Startup: 60 minutes; Shutdown 15 minutes	15.60	82.79	2.32	1.05	0.24	3.85	2.05	0.58	0.26	0.06
Turbine 8B or 8C (Combined Cycle) Startup: 60 minutes; Shutdown 15 minutes	15.30	82.79	4.88	1.05	0.24	3.85	2.05	1.22	0.26	0.06

	Ammonia (NH3) Slip			
Turbine 8A (Simple cycle)	5	PPMV	7.26	LBS/MMCF
Turbine 8B or 8C (Combined Cycle)	5	PPMV	7.26	LBS/MMCF

Natural Gas Information

Combined gas turbines 8ABC daily consumption:	8.6	MMCF/DAY
Each gas turbine daily consumption:	2.866667	MMCF/DAY
Each turbine rating:	350	MMBTU/HR
Each gas turbine hourly consumption:	0.333333	MMCF/HR
Natural Gas Higher Heating Value (HHV):	1050	BTU/SCF
Dry fuel factor (Fd):	8710	DSCF/MMBTU

Startup/Shutdown Schedule	Daily	Monthly	Annual
Turbine 8A (number of events)	2	25	125
Turbine 8B or 8C (number of events)	2	40	200

Turbine 8A, 8B, 8C startup schedule:	60	minutes/event
Turbine 8A, 8B, 8C shutdown schedule:	15	minutes/event

Operating Schedule	Daily	Monthly	Annual
Turbine 8A (Simple cycle)	8.60	250	1,200
Turbine 8B or 8C (Combined Cycle)	8.60	250	1,200

ALTERNATIVE 8 EMISSION INVENTORY
CRITERIA POLLUTANTS EMISSIONS

Simple Cycle Turbine 8A

Pollutant	No. of Normal Operating Hours per Day	Normal Operating Hour Emission Rate	No. of Startups Per Day	lb / Startup	No. of shutdowns per Day	Lb / Shutdown	No. of Maintenance Operating Hours per Day	Maintenance Operating Hour Emission Rate	Number of Normal Operating Hours Per Month	Number of Normal Operating Hours Per Year	Daily Maximum Emissions (Lbs)	Monthly Maximum Emissions (Lbs)	30-Day Average Emissions (lbs)	Annual PTE (Lbs)	Annual PTE (Tons)
NOx	0.00	3.27	0	15.60	0	3.85	8.60	30.76	210.40	1035.40	264.54	1,555	51.85	6,684	3.34
CO	0.00	16.41	0	82.79	0	2.05	8.60	164.21	210.40	1035.40	1412.21	7,495	249.83	31,638	15.82
VOC	0.00	2.32	0	2.32	0	0.58	8.60	2.32	210.40	1035.40	19.95	598	19.93	2,874	1.44
PM10/2.5	0.00	1.05	0	1.05	0	0.26	8.60	1.05	210.40	1035.40	9.03	271	9.02	1,301	0.65
SOx	0.00	0.24	0	0.24	0	0.06	8.60	0.24	210.40	1035.40	2.05	61	2.04	295	0.15

Monthly Op. hours:	250
Annual Op. hours:	1,200
Monthly Operating Load	100%
Annual Operating Load	100%

Max. number of Startups/Shudtown per Day:	2
Max. hours of Startups/Shudtown per Day:	2.50
Max. number of Startups/Shutdowns per Month:	25
Max. hours of Startups/Shutdowns per Month:	31
Number of Startups/Shutdowns per Year:	125
Hours of Startups/Shutdowns per Year:	156
Hours of Maintenance (Daily, Monthly, Annually):	8.6

Combined Cycle Turbine 8B or 8C

Pollutant	No. of Normal Operating Hours per Day	Normal Operating Hour Emission Rate	No. of Startups Per Day	lb / Startup	No. of shutdowns per Day	Lb / Shutdown	No. of Maintenance Operating Hours per Day	Maintenance Operating Hour Emission Rate	Number of Normal Operating Hours Per Month	Number of Normal Operating Hours Per Year	Daily Maximum Emissions (Lbs)	Monthly Maximum Emissions (Lbs)	30-Day Average Emissions (lbs)	Annual PTE (Lbs)	Annual PTE (Tons)
NOx	0.00	2.62	0	15.30	0	3.85	8.60	30.76	191.40	941.40	264.54	1,724	57.45	7,519	3.76
CO	0.00	16.41	0	82.79	0	2.05	8.60	164.21	191.40	941.40	1412.21	8,795	293.17	38,071	19.04
VOC	0.00	4.88	0	4.88	0	1.22	8.60	4.88	191.40	941.40	41.97	1,281	42.70	6,161	3.08
PM10/2.5	0.00	1.05	0	1.05	0	0.26	8.60	1.05	191.40	941.40	9.03	276	9.19	1,326	0.66
SOx	0.00	0.24	0	0.24	0	0.06	8.60	0.24	191.40	941.40	2.05	62	2.08	300	0.15

Monthly Op. hours:	250
Annual Op. hours:	1,200
Monthly Operating Load	100%
Annual Operating Load	100%

Max. number of Startups/Shudtown per Day:	2
Max. hours of Startups/Shudtown per Day:	2.50
Number of Startups/Shutdowns per Month:	40
Hours of Startups/Shutdowns per Month:	50
Number of Startups/Shutdowns per Year:	200
Hours of Startups/Shutdowns per Year:	250
Hours of Maintenance (Daily, Monthly, Annually):	8.6

Summary - Annual PTE (tons)

Pollutant	Turbine 8A	Turbien 8B	Turbine 8C	Total
NOx	3.34	3.76	3.76	10.86
CO	15.82	19.04	19.04	53.89
VOC	1.44	3.08	3.08	7.60
PM10/2.5	0.65	0.66	0.66	1.98
SOx	0.15	0.15	0.15	0.45

ALTERNATIVE 8
BASELINE EMISSION INVENTORY

Baseline Emissions Based on SCAQMD AER 2015 and 2016.

Tons/year	**NOX**	**CO**	**VOC**	**PM**	**SOX**
Boiler 3 (NG)	1.95	4.21	0.28	0.38	0.03
Boiler 3 (LFG)	1.66	1.32	0.74	1.49	0.27
Boiler 4 (NG)	3.63	10.01	0.66	0.91	0.07
Boiler 4 (LFG)	3.13	2.76	1.55	3.11	0.56
Boiler 5 (NG)	8.62	23.99	1.57	2.17	0.17
Boiler 5 (LFG)	7.30	5.21	2.93	5.87	1.06
Gas Turbine 8A	2.13	9.07	2.84	0.97	0.04
Gas Turbine 8BC	1.46	10.42	1.47	0.50	0.02
Total	**29.88**	**66.99**	**12.04**	**15.40**	**2.23**

Baseline Emissions Based on SCAQMD AER 2018.

Tons/year	**NOX**	**CO**	**VOC**	**PM**	**SOX**
Boiler 3 (NG)	0.00	0.00	0.00	0.00	0.00
Boiler 3 (LFG)	0.00	0.00	0.00	0.00	0.00
Boiler 4 (NG)	13.79	29.39	1.92	2.66	0.21
Boiler 4 (LFG)	2.77	0.54	1.49	2.98	0.54
Boiler 5 (NG)	9.19	26.64	1.74	2.41	0.19
Boiler 5 (LFG)	1.85	0.25	0.14	0.28	0.05
Gas Turbine 8A	0.00	0.00	0.00	0.00	0.00
Gas Turbine 8BC	0.86	0.06	0.77	0.27	0.01
Total	**28.47**	**56.88**	**6.07**	**8.60**	**1.00**

TOXICS EMISSION INVENTORY

ALTERNATIVE 8 EMISSION INVENTORY
TOXIC AIR CONTAMINANTS EMISSIONS

Turbine Model	**Heat Input, MMBtu/hr**	**Heat Input, MMCF/hr**	**Max Annual Hours, hrs/yr**
Gas Turbine 8A (Simple Cycle)	350	0.333	1200
Gas Turbine 8B (Combined Cycle)	350	0.333	1200
Gas Turbine 8C (Combined Cycle)	350	0.333	1200
Operating Load	100%		

			Gas Turbine 8A (Simple Cycle)		Gas Turbine 8B (Combined Cycle)		Gas Turbine 8C (Combined Cycle)	
Compound	CAS	Emission Factor[2], lbs/MMCF	Maximum Hourly Emissions, lbs/hr[4]	Maximum Annual, lbs/yr[4]	Maximum Hourly Emissions, lbs/hr[4]	Maximum Annual, lbs/yr[4]	Maximum Hourly Emissions, lbs/hr[4]	Maximum Annual, lbs/yr[4]
Ammonia[1]	766417	7.26	2.42E+00	2.90E+03	2.42E+00	2.90E+03	2.42E+00	2.90E+03
Acetaldehyde	75070	4.08E-02	3.13E-04	3.75E-01	3.13E-04	3.75E-01	3.13E-04	3.75E-01
Acrolein	107028	6.53E-03	5.01E-05	6.01E-02	5.01E-05	6.01E-02	5.01E-05	6.01E-02
Benzene	71432	1.22E-02	9.35E-05	1.12E-01	9.35E-05	1.12E-01	9.35E-05	1.12E-01
Butadiene, 1,3-	106990	4.39E-04	3.37E-06	4.04E-03	3.37E-06	4.04E-03	3.37E-06	4.04E-03
Ethylbenzene	100414	3.26E-02	2.50E-04	3.00E-01	2.50E-04	3.00E-01	2.50E-04	3.00E-01
Formaldehyde	50000	7.24E-01	5.55E-03	6.66E+00	5.55E-03	6.66E+00	5.55E-03	6.66E+00
Naphthalene	91203	1.33E-03	1.02E-05	1.22E-02	1.02E-05	1.22E-02	1.02E-05	1.22E-02
PAHS (excluding naphthalene)[3]	1151	9.18E-04	7.04E-06	8.45E-03	7.04E-06	8.45E-03	7.04E-06	8.45E-03
Propylene Oxide	75569	2.96E-02	2.27E-04	2.72E-01	2.27E-04	2.72E-01	2.27E-04	2.72E-01
Toluene	108883	1.33E-01	1.02E-03	1.22E+00	1.02E-03	1.22E+00	1.02E-03	1.22E+00
Xylenes	1330207	6.53E-02	5.01E-04	6.01E-01	5.01E-04	6.01E-01	5.01E-04	6.01E-01

Note:

[1] Ammonia hourly emission factor is estimated based on concentration limit of 5 ppmv at 15%O2.

[2] Emission factors are based on the SCAQMD Supplemental Instruction for AB2588 Facilities for Reporting Quadrennial Air Toxics Emission Inventory, dated June 2020.

[3] Emission factors for PAHS excluding naphthalene are based on the SCAQMD Supplemental Instruction for AB2588 Facilities for Reporting Quadrennial Air Toxics Emission Inventory, dated

[4] Turbine 8A, 8B, and 8C will be equipped with oxidation catalyst. The control efficinecy of oxidation catalyst for organic TACs is 97.7% based on Rule 1401 calculator. Therefore, this control efficiency is applied to all TACs, except ammonia.

ALTERNATIVE 8 EMISSION INVENTORY
TOXIC AIR CONTAMINANTS EMISSIONS

Turbines 9

Turbine Model	**Heat Input, MMBtu/hr**	**Heat Input, MMCF/hr**	**Max Annual Hours, hrs/yr**
Gas Turbine 9 (Simple Cycle)	470	0.448	8760
Operating Load	100%		

			Gas Turbine 9 (Simple Cycle)	
Compound	CAS	Emission Factor[2], lbs/MMCF	Maximum Hourly Emissions, lbs/hr[4]	Maximum Annual, lbs/yr[4]
Ammonia[1]	766417	7.26	3.25E+00	2.85E+04
Acetaldehyde	75070	4.08E-02	4.20E-04	3.68E+00
Acrolein	107028	6.53E-03	6.72E-05	5.89E-01
Benzene	71432	1.22E-02	1.26E-04	1.10E+00
Butadiene, 1,3-	106990	4.39E-04	4.52E-06	3.96E-02
Ethylbenzene	100414	3.26E-02	3.36E-04	2.94E+00
Formaldehyde	50000	7.24E-01	7.45E-03	6.53E+01
Naphthalene	91203	1.33E-03	1.37E-05	1.20E-01
PAHS (excluding naphthalene)[3]	1151	9.18E-04	9.45E-06	8.28E-02
Propylene Oxide	75569	2.96E-02	3.05E-04	2.67E+00
Toluene	108883	1.33E-01	1.37E-03	1.20E+01
Xylenes	1330207	6.53E-02	6.72E-04	5.89E+00

Note:

[1] Ammonia hourly emission factor is estimated based on concentration limit of 5 ppmv at 15%O2.

[2] Emission factors are based on the SCAQMD Supplemental Instruction for AB2588 Facilities for Reporting Quadrennial Air Toxics Emission Inventory, dated June 2020.

[3] Emission factors for PAHS excluding naphthalene are based on the SCAQMD Supplemental Instruction for AB2588 Facilities for Reporting Quadrennial Air Toxics Emission Inventory, dated

[4] Turbine 8A, 8B, and 8C will be equipped with oxidation catalyst. The control efficinecy of oxidation catalyst for organic TACs is 97.7% based on Rule 1401 calculator. Therefore, this control efficiency is applied to all TACs, except ammonia.

ALTERNATE 8
ATTACHMENTS

HEALTH RISK ASSESSMENTS (HRA)

HRA RESULTS
(THE HIGHEST VALUES)

ALTERNATIVE 8
CANCER RISK OUTPUT - RESIDENTIAL
(POINT MAXIMUM IMPACT)

*HARP - HRACalc v21081 6/28/2021 11:31:55 AM - Cancer Risk - Input File: C:\Work\Bee\Glendale CA\Grayson 2021\HRA\GRAYSON2021\hra\rec_cancerHRAInput.hra

REC	GRP	NETID	X	Y	RISK_SUM	SCENARIO	INH_RISK	SOIL_RISK	DERMAL_R	MMILK_RI	WATER_RI	FISH_RISK	CROP_RISK	BEEF_RISK	DAIRY_RIS	PIG_RISK	CHICKEN_F	EGG_RISK
878	ALL		382180	3780440	1.42E-08	30YrCance	2.89E-09	1.33E-09	3.31E-10	3.16E-09	0.00E+00	0.00E+00	6.51E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
907	ALL		382180	3780460	1.42E-08	30YrCance	2.88E-09	1.33E-09	3.30E-10	3.15E-09	0.00E+00	0.00E+00	6.50E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
906	ALL		382160	3780460	1.42E-08	30YrCance	2.88E-09	1.33E-09	3.30E-10	3.15E-09	0.00E+00	0.00E+00	6.50E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
877	ALL		382160	3780440	1.42E-08	30YrCance	2.88E-09	1.33E-09	3.30E-10	3.15E-09	0.00E+00	0.00E+00	6.50E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
850	ALL		382180	3780420	1.42E-08	30YrCance	2.88E-09	1.32E-09	3.30E-10	3.15E-09	0.00E+00	0.00E+00	6.49E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
935	ALL		382160	3780480	1.41E-08	30YrCance	2.87E-09	1.32E-09	3.29E-10	3.14E-09	0.00E+00	0.00E+00	6.48E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
849	ALL		382160	3780420	1.41E-08	30YrCance	2.87E-09	1.32E-09	3.29E-10	3.14E-09	0.00E+00	0.00E+00	6.47E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
936	ALL		382180	3780480	1.41E-08	30YrCance	2.87E-09	1.32E-09	3.29E-10	3.14E-09	0.00E+00	0.00E+00	6.47E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
822	ALL		382180	3780400	1.41E-08	30YrCance	2.86E-09	1.32E-09	3.28E-10	3.13E-09	0.00E+00	0.00E+00	6.45E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
964	ALL		382160	3780500	1.41E-08	30YrCance	2.85E-09	1.31E-09	3.27E-10	3.12E-09	0.00E+00	0.00E+00	6.44E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
965	ALL		382180	3780500	1.40E-08	30YrCance	2.85E-09	1.31E-09	3.26E-10	3.12E-09	0.00E+00	0.00E+00	6.42E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
821	ALL		382160	3780400	1.40E-08	30YrCance	2.85E-09	1.31E-09	3.26E-10	3.11E-09	0.00E+00	0.00E+00	6.42E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
879	ALL		382200	3780440	1.40E-08	30YrCance	2.84E-09	1.31E-09	3.26E-10	3.11E-09	0.00E+00	0.00E+00	6.41E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
905	ALL		382140	3780460	1.40E-08	30YrCance	2.84E-09	1.31E-09	3.26E-10	3.11E-09	0.00E+00	0.00E+00	6.41E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
851	ALL		382200	3780420	1.40E-08	30YrCance	2.84E-09	1.31E-09	3.26E-10	3.11E-09	0.00E+00	0.00E+00	6.40E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
934	ALL		382140	3780480	1.40E-08	30YrCance	2.84E-09	1.31E-09	3.25E-10	3.11E-09	0.00E+00	0.00E+00	6.40E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
908	ALL		382200	3780460	1.40E-08	30YrCance	2.84E-09	1.31E-09	3.25E-10	3.11E-09	0.00E+00	0.00E+00	6.40E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
876	ALL		382140	3780440	1.39E-08	30YrCance	2.83E-09	1.30E-09	3.25E-10	3.10E-09	0.00E+00	0.00E+00	6.38E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
991	ALL		382160	3780520	1.39E-08	30YrCance	2.83E-09	1.30E-09	3.25E-10	3.10E-09	0.00E+00	0.00E+00	6.38E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
796	ALL		382180	3780380	1.39E-08	30YrCance	2.83E-09	1.30E-09	3.24E-10	3.10E-09	0.00E+00	0.00E+00	6.38E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
823	ALL		382200	3780400	1.39E-08	30YrCance	2.83E-09	1.30E-09	3.24E-10	3.09E-09	0.00E+00	0.00E+00	6.37E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
963	ALL		382140	3780500	1.39E-08	30YrCance	2.83E-09	1.30E-09	3.24E-10	3.09E-09	0.00E+00	0.00E+00	6.37E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
937	ALL		382200	3780480	1.39E-08	30YrCance	2.82E-09	1.30E-09	3.24E-10	3.09E-09	0.00E+00	0.00E+00	6.37E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
992	ALL		382180	3780520	1.39E-08	30YrCance	2.82E-09	1.30E-09	3.23E-10	3.09E-09	0.00E+00	0.00E+00	6.36E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
848	ALL		382140	3780420	1.39E-08	30YrCance	2.82E-09	1.30E-09	3.23E-10	3.08E-09	0.00E+00	0.00E+00	6.35E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
795	ALL		382160	3780380	1.38E-08	30YrCance	2.81E-09	1.29E-09	3.22E-10	3.07E-09	0.00E+00	0.00E+00	6.33E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
990	ALL		382140	3780520	1.38E-08	30YrCance	2.81E-09	1.29E-09	3.22E-10	3.07E-09	0.00E+00	0.00E+00	6.33E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
966	ALL		382200	3780500	1.38E-08	30YrCance	2.80E-09	1.29E-09	3.21E-10	3.07E-09	0.00E+00	0.00E+00	6.32E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1017	ALL		382160	3780540	1.38E-08	30YrCance	2.80E-09	1.29E-09	3.21E-10	3.06E-09	0.00E+00	0.00E+00	6.31E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
797	ALL		382200	3780380	1.38E-08	30YrCance	2.80E-09	1.29E-09	3.21E-10	3.06E-09	0.00E+00	0.00E+00	6.31E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
820	ALL		382140	3780400	1.37E-08	30YrCance	2.79E-09	1.28E-09	3.20E-10	3.05E-09	0.00E+00	0.00E+00	6.29E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1018	ALL		382180	3780540	1.37E-08	30YrCance	2.79E-09	1.28E-09	3.20E-10	3.05E-09	0.00E+00	0.00E+00	6.29E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
771	ALL		382180	3780360	1.37E-08	30YrCance	2.78E-09	1.28E-09	3.19E-10	3.05E-09	0.00E+00	0.00E+00	6.28E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1016	ALL		382140	3780540	1.37E-08	30YrCance	2.78E-09	1.28E-09	3.19E-10	3.04E-09	0.00E+00	0.00E+00	6.27E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
993	ALL		382200	3780520	1.37E-08	30YrCance	2.77E-09	1.28E-09	3.18E-10	3.04E-09	0.00E+00	0.00E+00	6.26E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
933	ALL		382120	3780480	1.36E-08	30YrCance	2.77E-09	1.27E-09	3.17E-10	3.03E-09	0.00E+00	0.00E+00	6.24E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
962	ALL		382120	3780500	1.36E-08	30YrCance	2.77E-09	1.27E-09	3.17E-10	3.03E-09	0.00E+00	0.00E+00	6.24E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1041	ALL		382160	3780560	1.36E-08	30YrCance	2.76E-09	1.27E-09	3.17E-10	3.03E-09	0.00E+00	0.00E+00	6.24E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
904	ALL		382120	3780460	1.36E-08	30YrCance	2.76E-09	1.27E-09	3.17E-10	3.02E-09	0.00E+00	0.00E+00	6.23E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
772	ALL		382200	3780360	1.36E-08	30YrCance	2.76E-09	1.27E-09	3.16E-10	3.02E-09	0.00E+00	0.00E+00	6.22E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
770	ALL		382160	3780360	1.36E-08	30YrCance	2.76E-09	1.27E-09	3.16E-10	3.02E-09	0.00E+00	0.00E+00	6.21E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
880	ALL		382220	3780440	1.36E-08	30YrCance	2.75E-09	1.27E-09	3.16E-10	3.01E-09	0.00E+00	0.00E+00	6.21E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
875	ALL		382120	3780440	1.36E-08	30YrCance	2.75E-09	1.27E-09	3.16E-10	3.01E-09	0.00E+00	0.00E+00	6.21E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
989	ALL		382120	3780520	1.36E-08	30YrCance	2.75E-09	1.27E-09	3.16E-10	3.01E-09	0.00E+00	0.00E+00	6.20E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1042	ALL		382180	3780560	1.35E-08	30YrCance	2.75E-09	1.27E-09	3.15E-10	3.01E-09	0.00E+00	0.00E+00	6.20E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
852	ALL		382220	3780420	1.35E-08	30YrCance	2.75E-09	1.27E-09	3.15E-10	3.01E-09	0.00E+00	0.00E+00	6.20E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
909	ALL		382220	3780460	1.35E-08	30YrCance	2.75E-09	1.27E-09	3.15E-10	3.01E-09	0.00E+00	0.00E+00	6.20E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

ALTERNATIVE 8
CANCER OUTPUT - WORKER
(POINT MAXIMUM IMPACT)

*HARP - HRACalc v21081 6/28/2021 12:05:53 PM - Cancer Risk - Input File: C:\Work\Bee\Glendale CA\Grayson 2021\HRA\GRAYSON2021\hra\work_cancerHRAInput.hra

REC	GRP	NETID	X	Y	RISK_SUM	SCENARIO	INH_RISK	SOIL_RISK	DERMAL_R	MMILK_RIS	WATER_RIS	FISH_RISK	CROP_RISK	BEEF_RISK	DAIRY_RISI	PIG_RISK	CHICKEN_F	EGG_RISK
878	ALL		382180	3780440	4.88E-10	25YrCance	2.41E-10	1.32E-10	1.15E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
907	ALL		382180	3780460	4.88E-10	25YrCance	2.41E-10	1.32E-10	1.15E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
906	ALL		382160	3780460	4.88E-10	25YrCance	2.41E-10	1.32E-10	1.15E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
877	ALL		382160	3780440	4.87E-10	25YrCance	2.41E-10	1.32E-10	1.14E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
850	ALL		382180	3780420	4.87E-10	25YrCance	2.41E-10	1.32E-10	1.14E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
935	ALL		382160	3780480	4.86E-10	25YrCance	2.40E-10	1.32E-10	1.14E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
849	ALL		382160	3780420	4.86E-10	25YrCance	2.40E-10	1.32E-10	1.14E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
936	ALL		382180	3780480	4.85E-10	25YrCance	2.40E-10	1.32E-10	1.14E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
822	ALL		382180	3780400	4.84E-10	25YrCance	2.39E-10	1.31E-10	1.14E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
964	ALL		382160	3780500	4.83E-10	25YrCance	2.39E-10	1.31E-10	1.13E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
965	ALL		382180	3780500	4.82E-10	25YrCance	2.38E-10	1.31E-10	1.13E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
821	ALL		382160	3780400	4.82E-10	25YrCance	2.38E-10	1.31E-10	1.13E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
879	ALL		382200	3780440	4.81E-10	25YrCance	2.38E-10	1.30E-10	1.13E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
905	ALL		382140	3780460	4.81E-10	25YrCance	2.38E-10	1.30E-10	1.13E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
851	ALL		382200	3780420	4.81E-10	25YrCance	2.38E-10	1.30E-10	1.13E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
934	ALL		382140	3780480	4.80E-10	25YrCance	2.37E-10	1.30E-10	1.13E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
908	ALL		382200	3780460	4.80E-10	25YrCance	2.37E-10	1.30E-10	1.13E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
876	ALL		382140	3780440	4.79E-10	25YrCance	2.37E-10	1.30E-10	1.13E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
991	ALL		382160	3780520	4.79E-10	25YrCance	2.37E-10	1.30E-10	1.13E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
796	ALL		382180	3780380	4.79E-10	25YrCance	2.37E-10	1.30E-10	1.12E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
823	ALL		382200	3780400	4.78E-10	25YrCance	2.36E-10	1.30E-10	1.12E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
963	ALL		382140	3780500	4.78E-10	25YrCance	2.36E-10	1.30E-10	1.12E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
937	ALL		382200	3780480	4.78E-10	25YrCance	2.36E-10	1.29E-10	1.12E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
992	ALL		382180	3780520	4.77E-10	25YrCance	2.36E-10	1.29E-10	1.12E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
848	ALL		382140	3780420	4.77E-10	25YrCance	2.36E-10	1.29E-10	1.12E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
795	ALL		382160	3780380	4.75E-10	25YrCance	2.35E-10	1.29E-10	1.12E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
990	ALL		382140	3780520	4.75E-10	25YrCance	2.35E-10	1.29E-10	1.12E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
966	ALL		382200	3780500	4.74E-10	25YrCance	2.34E-10	1.29E-10	1.11E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1017	ALL		382160	3780540	4.74E-10	25YrCance	2.34E-10	1.28E-10	1.11E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
797	ALL		382200	3780380	4.74E-10	25YrCance	2.34E-10	1.28E-10	1.11E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
820	ALL		382140	3780400	4.72E-10	25YrCance	2.33E-10	1.28E-10	1.11E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1018	ALL		382180	3780540	4.72E-10	25YrCance	2.33E-10	1.28E-10	1.11E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
771	ALL		382180	3780360	4.71E-10	25YrCance	2.33E-10	1.28E-10	1.11E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1016	ALL		382140	3780540	4.70E-10	25YrCance	2.32E-10	1.27E-10	1.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
993	ALL		382200	3780520	4.70E-10	25YrCance	2.32E-10	1.27E-10	1.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
933	ALL		382120	3780480	4.68E-10	25YrCance	2.31E-10	1.27E-10	1.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
962	ALL		382120	3780500	4.68E-10	25YrCance	2.31E-10	1.27E-10	1.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1041	ALL		382160	3780560	4.68E-10	25YrCance	2.31E-10	1.27E-10	1.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
904	ALL		382120	3780460	4.68E-10	25YrCance	2.31E-10	1.27E-10	1.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
772	ALL		382200	3780360	4.67E-10	25YrCance	2.31E-10	1.26E-10	1.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
770	ALL		382160	3780360	4.66E-10	25YrCance	2.30E-10	1.26E-10	1.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
880	ALL		382220	3780440	4.66E-10	25YrCance	2.30E-10	1.26E-10	1.09E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
875	ALL		382120	3780440	4.66E-10	25YrCance	2.30E-10	1.26E-10	1.09E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
989	ALL		382120	3780520	4.66E-10	25YrCance	2.30E-10	1.26E-10	1.09E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1042	ALL		382180	3780560	4.66E-10	25YrCance	2.30E-10	1.26E-10	1.09E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
852	ALL		382220	3780420	4.65E-10	25YrCance	2.30E-10	1.26E-10	1.09E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
909	ALL		382220	3780460	4.65E-10	25YrCance	2.30E-10	1.26E-10	1.09E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

ALTERNATIVE 8
CHRONIC OUTPUT - RESIDENTIAL
(POINT MAXIMUM IMPACT)

*HARP - HRACalc v21081 6/28/2021 11:48:00 AM - Chronic Risk - Input File: C:\Work\Bee\Glendale CA\Grayson 2021\HRA\GRAYSON2021\hra\rec_chronicHRAInput.hra

REC	GRP	NETID	X	Y	SCENARIO	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DE	RESP	SKIN	EYE	BONE/TEE	ENDO	BLOOD	ODOR	GENERAL	MAXHI
878	ALL		382180	3780440	NonCancer	0.00E+00	1.95E-08	0.00E+00	3.40E-09	3.40E-09	4.92E-08	3.50E-04	0.00E+00	8.55E-08	0.00E+00	3.40E-09	8.47E-07	0.00E+00	0.00E+00	3.50E-04
907	ALL		382180	3780460	NonCancer	0.00E+00	1.94E-08	0.00E+00	3.39E-09	3.39E-09	4.91E-08	3.50E-04	0.00E+00	8.54E-08	0.00E+00	3.39E-09	8.46E-07	0.00E+00	0.00E+00	3.50E-04
906	ALL		382160	3780460	NonCancer	0.00E+00	1.94E-08	0.00E+00	3.39E-09	3.39E-09	4.91E-08	3.50E-04	0.00E+00	8.54E-08	0.00E+00	3.39E-09	8.46E-07	0.00E+00	0.00E+00	3.50E-04
877	ALL		382160	3780440	NonCancer	0.00E+00	1.94E-08	0.00E+00	3.39E-09	3.39E-09	4.91E-08	3.50E-04	0.00E+00	8.54E-08	0.00E+00	3.39E-09	8.46E-07	0.00E+00	0.00E+00	3.50E-04
850	ALL		382180	3780420	NonCancer	0.00E+00	1.94E-08	0.00E+00	3.39E-09	3.39E-09	4.91E-08	3.50E-04	0.00E+00	8.53E-08	0.00E+00	3.39E-09	8.46E-07	0.00E+00	0.00E+00	3.50E-04
935	ALL		382160	3780480	NonCancer	0.00E+00	1.94E-08	0.00E+00	3.38E-09	3.38E-09	4.89E-08	3.49E-04	0.00E+00	8.51E-08	0.00E+00	3.38E-09	8.43E-07	0.00E+00	0.00E+00	3.49E-04
849	ALL		382160	3780420	NonCancer	0.00E+00	1.93E-08	0.00E+00	3.38E-09	3.38E-09	4.89E-08	3.48E-04	0.00E+00	8.50E-08	0.00E+00	3.38E-09	8.43E-07	0.00E+00	0.00E+00	3.48E-04
936	ALL		382180	3780480	NonCancer	0.00E+00	1.93E-08	0.00E+00	3.38E-09	3.38E-09	4.89E-08	3.48E-04	0.00E+00	8.50E-08	0.00E+00	3.38E-09	8.42E-07	0.00E+00	0.00E+00	3.48E-04
822	ALL		382180	3780400	NonCancer	0.00E+00	1.93E-08	0.00E+00	3.37E-09	3.37E-09	4.88E-08	3.47E-04	0.00E+00	8.48E-08	0.00E+00	3.37E-09	8.40E-07	0.00E+00	0.00E+00	3.47E-04
964	ALL		382160	3780500	NonCancer	0.00E+00	1.92E-08	0.00E+00	3.36E-09	3.36E-09	4.86E-08	3.47E-04	0.00E+00	8.46E-08	0.00E+00	3.36E-09	8.38E-07	0.00E+00	0.00E+00	3.47E-04
965	ALL		382180	3780500	NonCancer	0.00E+00	1.92E-08	0.00E+00	3.35E-09	3.35E-09	4.85E-08	3.46E-04	0.00E+00	8.44E-08	0.00E+00	3.35E-09	8.36E-07	0.00E+00	0.00E+00	3.46E-04
821	ALL		382160	3780400	NonCancer	0.00E+00	1.92E-08	0.00E+00	3.35E-09	3.35E-09	4.85E-08	3.46E-04	0.00E+00	8.43E-08	0.00E+00	3.35E-09	8.36E-07	0.00E+00	0.00E+00	3.46E-04
879	ALL		382200	3780440	NonCancer	0.00E+00	1.92E-08	0.00E+00	3.35E-09	3.35E-09	4.85E-08	3.45E-04	0.00E+00	8.43E-08	0.00E+00	3.35E-09	8.35E-07	0.00E+00	0.00E+00	3.45E-04
905	ALL		382140	3780460	NonCancer	0.00E+00	1.92E-08	0.00E+00	3.35E-09	3.35E-09	4.84E-08	3.45E-04	0.00E+00	8.42E-08	0.00E+00	3.35E-09	8.35E-07	0.00E+00	0.00E+00	3.45E-04
851	ALL		382200	3780420	NonCancer	0.00E+00	1.91E-08	0.00E+00	3.35E-09	3.35E-09	4.84E-08	3.45E-04	0.00E+00	8.42E-08	0.00E+00	3.35E-09	8.34E-07	0.00E+00	0.00E+00	3.45E-04
908	ALL		382200	3780460	NonCancer	0.00E+00	1.91E-08	0.00E+00	3.34E-09	3.34E-09	4.84E-08	3.45E-04	0.00E+00	8.41E-08	0.00E+00	3.34E-09	8.34E-07	0.00E+00	0.00E+00	3.45E-04
934	ALL		382140	3780480	NonCancer	0.00E+00	1.91E-08	0.00E+00	3.34E-09	3.34E-09	4.84E-08	3.45E-04	0.00E+00	8.41E-08	0.00E+00	3.34E-09	8.34E-07	0.00E+00	0.00E+00	3.45E-04
876	ALL		382140	3780440	NonCancer	0.00E+00	1.91E-08	0.00E+00	3.34E-09	3.34E-09	4.83E-08	3.44E-04	0.00E+00	8.39E-08	0.00E+00	3.34E-09	8.32E-07	0.00E+00	0.00E+00	3.44E-04
991	ALL		382160	3780520	NonCancer	0.00E+00	1.91E-08	0.00E+00	3.33E-09	3.33E-09	4.82E-08	3.44E-04	0.00E+00	8.39E-08	0.00E+00	3.33E-09	8.31E-07	0.00E+00	0.00E+00	3.44E-04
796	ALL		382180	3780380	NonCancer	0.00E+00	1.91E-08	0.00E+00	3.33E-09	3.33E-09	4.82E-08	3.44E-04	0.00E+00	8.38E-08	0.00E+00	3.33E-09	8.31E-07	0.00E+00	0.00E+00	3.44E-04
823	ALL		382200	3780400	NonCancer	0.00E+00	1.91E-08	0.00E+00	3.33E-09	3.33E-09	4.82E-08	3.43E-04	0.00E+00	8.37E-08	0.00E+00	3.33E-09	8.30E-07	0.00E+00	0.00E+00	3.43E-04
963	ALL		382140	3780500	NonCancer	0.00E+00	1.90E-08	0.00E+00	3.33E-09	3.33E-09	4.82E-08	3.43E-04	0.00E+00	8.37E-08	0.00E+00	3.33E-09	8.30E-07	0.00E+00	0.00E+00	3.43E-04
937	ALL		382200	3780480	NonCancer	0.00E+00	1.90E-08	0.00E+00	3.33E-09	3.33E-09	4.81E-08	3.43E-04	0.00E+00	8.37E-08	0.00E+00	3.33E-09	8.29E-07	0.00E+00	0.00E+00	3.43E-04
992	ALL		382180	3780520	NonCancer	0.00E+00	1.90E-08	0.00E+00	3.32E-09	3.32E-09	4.81E-08	3.43E-04	0.00E+00	8.36E-08	0.00E+00	3.32E-09	8.29E-07	0.00E+00	0.00E+00	3.43E-04
848	ALL		382140	3780420	NonCancer	0.00E+00	1.90E-08	0.00E+00	3.32E-09	3.32E-09	4.80E-08	3.42E-04	0.00E+00	8.35E-08	0.00E+00	3.32E-09	8.28E-07	0.00E+00	0.00E+00	3.42E-04
795	ALL		382160	3780380	NonCancer	0.00E+00	1.89E-08	0.00E+00	3.31E-09	3.31E-09	4.79E-08	3.41E-04	0.00E+00	8.32E-08	0.00E+00	3.31E-09	8.25E-07	0.00E+00	0.00E+00	3.41E-04
990	ALL		382140	3780520	NonCancer	0.00E+00	1.89E-08	0.00E+00	3.31E-09	3.31E-09	4.78E-08	3.41E-04	0.00E+00	8.31E-08	0.00E+00	3.31E-09	8.24E-07	0.00E+00	0.00E+00	3.41E-04
966	ALL		382200	3780500	NonCancer	0.00E+00	1.89E-08	0.00E+00	3.30E-09	3.30E-09	4.78E-08	3.40E-04	0.00E+00	8.30E-08	0.00E+00	3.30E-09	8.23E-07	0.00E+00	0.00E+00	3.40E-04
1017	ALL		382160	3780540	NonCancer	0.00E+00	1.89E-08	0.00E+00	3.30E-09	3.30E-09	4.77E-08	3.40E-04	0.00E+00	8.30E-08	0.00E+00	3.30E-09	8.22E-07	0.00E+00	0.00E+00	3.40E-04
797	ALL		382200	3780380	NonCancer	0.00E+00	1.89E-08	0.00E+00	3.30E-09	3.30E-09	4.77E-08	3.40E-04	0.00E+00	8.29E-08	0.00E+00	3.30E-09	8.22E-07	0.00E+00	0.00E+00	3.40E-04
820	ALL		382140	3780400	NonCancer	0.00E+00	1.88E-08	0.00E+00	3.29E-09	3.29E-09	4.76E-08	3.39E-04	0.00E+00	8.27E-08	0.00E+00	3.29E-09	8.19E-07	0.00E+00	0.00E+00	3.39E-04
1018	ALL		382180	3780540	NonCancer	0.00E+00	1.88E-08	0.00E+00	3.28E-09	3.28E-09	4.75E-08	3.39E-04	0.00E+00	8.26E-08	0.00E+00	3.28E-09	8.19E-07	0.00E+00	0.00E+00	3.39E-04
771	ALL		382180	3780360	NonCancer	0.00E+00	1.88E-08	0.00E+00	3.28E-09	3.28E-09	4.74E-08	3.38E-04	0.00E+00	8.25E-08	0.00E+00	3.28E-09	8.17E-07	0.00E+00	0.00E+00	3.38E-04
1016	ALL		382140	3780540	NonCancer	0.00E+00	1.87E-08	0.00E+00	3.27E-09	3.27E-09	4.74E-08	3.38E-04	0.00E+00	8.24E-08	0.00E+00	3.27E-09	8.16E-07	0.00E+00	0.00E+00	3.38E-04
993	ALL		382200	3780520	NonCancer	0.00E+00	1.87E-08	0.00E+00	3.27E-09	3.27E-09	4.73E-08	3.37E-04	0.00E+00	8.22E-08	0.00E+00	3.27E-09	8.15E-07	0.00E+00	0.00E+00	3.37E-04
933	ALL		382120	3780480	NonCancer	0.00E+00	1.87E-08	0.00E+00	3.26E-09	3.26E-09	4.72E-08	3.36E-04	0.00E+00	8.20E-08	0.00E+00	3.26E-09	8.13E-07	0.00E+00	0.00E+00	3.36E-04
962	ALL		382120	3780500	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.26E-09	3.26E-09	4.71E-08	3.36E-04	0.00E+00	8.20E-08	0.00E+00	3.26E-09	8.12E-07	0.00E+00	0.00E+00	3.36E-04
1041	ALL		382160	3780560	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.26E-09	3.26E-09	4.71E-08	3.36E-04	0.00E+00	8.19E-08	0.00E+00	3.26E-09	8.12E-07	0.00E+00	0.00E+00	3.36E-04
904	ALL		382120	3780460	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.26E-09	3.26E-09	4.71E-08	3.36E-04	0.00E+00	8.19E-08	0.00E+00	3.26E-09	8.12E-07	0.00E+00	0.00E+00	3.36E-04
772	ALL		382200	3780360	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.25E-09	3.25E-09	4.70E-08	3.35E-04	0.00E+00	8.17E-08	0.00E+00	3.25E-09	8.10E-07	0.00E+00	0.00E+00	3.35E-04
770	ALL		382160	3780360	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.25E-09	3.25E-09	4.70E-08	3.35E-04	0.00E+00	8.17E-08	0.00E+00	3.25E-09	8.09E-07	0.00E+00	0.00E+00	3.35E-04
880	ALL		382220	3780440	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.24E-09	3.24E-09	4.69E-08	3.34E-04	0.00E+00	8.16E-08	0.00E+00	3.24E-09	8.09E-07	0.00E+00	0.00E+00	3.34E-04
875	ALL		382120	3780440	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.24E-09	3.24E-09	4.69E-08	3.34E-04	0.00E+00	8.16E-08	0.00E+00	3.24E-09	8.08E-07	0.00E+00	0.00E+00	3.34E-04
989	ALL		382120	3780520	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.24E-09	3.24E-09	4.69E-08	3.34E-04	0.00E+00	8.15E-08	0.00E+00	3.24E-09	8.08E-07	0.00E+00	0.00E+00	3.34E-04
1042	ALL		382180	3780560	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.24E-09	3.24E-09	4.69E-08	3.34E-04	0.00E+00	8.15E-08	0.00E+00	3.24E-09	8.08E-07	0.00E+00	0.00E+00	3.34E-04
852	ALL		382220	3780420	NonCancer	0.00E+00	1.85E-08	0.00E+00	3.24E-09	3.24E-09	4.69E-08	3.34E-04	0.00E+00	8.15E-08	0.00E+00	3.24E-09	8.08E-07	0.00E+00	0.00E+00	3.34E-04
909	ALL		382220	3780460	NonCancer	0.00E+00	1.85E-08	0.00E+00	3.24E-09	3.24E-09	4.69E-08	3.34E-04	0.00E+00	8.15E-08	0.00E+00	3.24E-09	8.08E-07	0.00E+00	0.00E+00	3.34E-04
1040	ALL		382140	3780560	NonCancer	0.00E+00	1.85E-08	0.00E+00	3.24E-09	3.24E-09	4.68E-08	3.34E-04	0.00E+00	8.14E-08	0.00E+00	3.24E-09	8.07E-07	0.00E+00	0.00E+00	3.34E-04
794	ALL		382140	3780380	NonCancer	0.00E+00	1.85E-08	0.00E+00	3.24E-09	3.24E-09	4.68E-08	3.34E-04	0.00E+00	8.14E-08	0.00E+00	3.24E-09	8.07E-07	0.00E+00	0.00E+00	3.34E-04
1019	ALL		382200	3780540	NonCancer	0.00E+00	1.85E-08	0.00E+00	3.23E-09	3.23E-09	4.67E-08	3.33E-04	0.00E+00	8.13E-08	0.00E+00	3.23E-09	8.05E-07	0.00E+00	0.00E+00	3.33E-04
938	ALL		382220	3780480	NonCancer	0.00E+00	1.85E-08	0.00E+00	3.22E-09	3.22E-09	4.67E-08	3.32E-04	0.00E+00	8.11E-08	0.00E+00	3.22E-09	8.04E-07	0.00E+00	0.00E+00	3.32E-04
847	ALL		382120	3780420	NonCancer	0.00E+00	1.85E-08	0.00E+00	3.22E-09	3.22E-09	4.67E-08	3.32E-04	0.00E+00	8.11E-08	0.00E+00	3.22E-09	8.04E-07	0.00E+00	0.00E+00	3.32E-04

ALTERNATIVE 8
CHRONIC OUTPUT - WORKER
(POINT MAXIMUM IMPACT)

*HARP - HRACalc v21081 6/28/2021 12:13:56 PM - Chronic Risk - Input File: C:\Work\Bee\Glendale CA\Grayson 2021\HRA\GRAYSON2021\hra\work_chronicHRAInput.hra

REC	GRP	NETID	X	Y	SCENARIO	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DE	RESP	SKIN	EYE	BONE/TEE	ENDO	BLOOD	ODOR	GENERAL	MAXHI
878	ALL		382180	3780440	NonCancer	0.00E+00	1.95E-08	0.00E+00	3.40E-09	3.40E-09	4.92E-08	3.50E-04	0.00E+00	8.55E-08	0.00E+00	3.40E-09	8.47E-07	0.00E+00	0.00E+00	3.50E-04
907	ALL		382180	3780460	NonCancer	0.00E+00	1.94E-08	0.00E+00	3.39E-09	3.39E-09	4.91E-08	3.50E-04	0.00E+00	8.54E-08	0.00E+00	3.39E-09	8.46E-07	0.00E+00	0.00E+00	3.50E-04
906	ALL		382160	3780460	NonCancer	0.00E+00	1.94E-08	0.00E+00	3.39E-09	3.39E-09	4.91E-08	3.50E-04	0.00E+00	8.54E-08	0.00E+00	3.39E-09	8.46E-07	0.00E+00	0.00E+00	3.50E-04
877	ALL		382160	3780440	NonCancer	0.00E+00	1.94E-08	0.00E+00	3.39E-09	3.39E-09	4.91E-08	3.50E-04	0.00E+00	8.54E-08	0.00E+00	3.39E-09	8.46E-07	0.00E+00	0.00E+00	3.50E-04
850	ALL		382180	3780420	NonCancer	0.00E+00	1.94E-08	0.00E+00	3.39E-09	3.39E-09	4.91E-08	3.50E-04	0.00E+00	8.53E-08	0.00E+00	3.39E-09	8.46E-07	0.00E+00	0.00E+00	3.50E-04
935	ALL		382160	3780480	NonCancer	0.00E+00	1.94E-08	0.00E+00	3.38E-09	3.38E-09	4.89E-08	3.49E-04	0.00E+00	8.51E-08	0.00E+00	3.38E-09	8.43E-07	0.00E+00	0.00E+00	3.49E-04
849	ALL		382160	3780420	NonCancer	0.00E+00	1.93E-08	0.00E+00	3.38E-09	3.38E-09	4.89E-08	3.48E-04	0.00E+00	8.50E-08	0.00E+00	3.38E-09	8.43E-07	0.00E+00	0.00E+00	3.48E-04
936	ALL		382180	3780480	NonCancer	0.00E+00	1.93E-08	0.00E+00	3.38E-09	3.38E-09	4.89E-08	3.48E-04	0.00E+00	8.50E-08	0.00E+00	3.38E-09	8.42E-07	0.00E+00	0.00E+00	3.48E-04
822	ALL		382180	3780400	NonCancer	0.00E+00	1.93E-08	0.00E+00	3.37E-09	3.37E-09	4.88E-08	3.47E-04	0.00E+00	8.48E-08	0.00E+00	3.37E-09	8.40E-07	0.00E+00	0.00E+00	3.47E-04
964	ALL		382160	3780500	NonCancer	0.00E+00	1.92E-08	0.00E+00	3.36E-09	3.36E-09	4.86E-08	3.47E-04	0.00E+00	8.46E-08	0.00E+00	3.36E-09	8.38E-07	0.00E+00	0.00E+00	3.47E-04
965	ALL		382180	3780500	NonCancer	0.00E+00	1.92E-08	0.00E+00	3.35E-09	3.35E-09	4.85E-08	3.46E-04	0.00E+00	8.44E-08	0.00E+00	3.35E-09	8.36E-07	0.00E+00	0.00E+00	3.46E-04
821	ALL		382160	3780400	NonCancer	0.00E+00	1.92E-08	0.00E+00	3.35E-09	3.35E-09	4.85E-08	3.46E-04	0.00E+00	8.43E-08	0.00E+00	3.35E-09	8.36E-07	0.00E+00	0.00E+00	3.46E-04
879	ALL		382200	3780440	NonCancer	0.00E+00	1.92E-08	0.00E+00	3.35E-09	3.35E-09	4.85E-08	3.45E-04	0.00E+00	8.43E-08	0.00E+00	3.35E-09	8.35E-07	0.00E+00	0.00E+00	3.45E-04
905	ALL		382140	3780460	NonCancer	0.00E+00	1.92E-08	0.00E+00	3.35E-09	3.35E-09	4.84E-08	3.45E-04	0.00E+00	8.42E-08	0.00E+00	3.35E-09	8.35E-07	0.00E+00	0.00E+00	3.45E-04
851	ALL		382200	3780420	NonCancer	0.00E+00	1.91E-08	0.00E+00	3.35E-09	3.35E-09	4.84E-08	3.45E-04	0.00E+00	8.42E-08	0.00E+00	3.35E-09	8.34E-07	0.00E+00	0.00E+00	3.45E-04
908	ALL		382200	3780460	NonCancer	0.00E+00	1.91E-08	0.00E+00	3.34E-09	3.34E-09	4.84E-08	3.45E-04	0.00E+00	8.41E-08	0.00E+00	3.34E-09	8.34E-07	0.00E+00	0.00E+00	3.45E-04
934	ALL		382140	3780480	NonCancer	0.00E+00	1.91E-08	0.00E+00	3.34E-09	3.34E-09	4.84E-08	3.45E-04	0.00E+00	8.41E-08	0.00E+00	3.34E-09	8.34E-07	0.00E+00	0.00E+00	3.45E-04
876	ALL		382140	3780440	NonCancer	0.00E+00	1.91E-08	0.00E+00	3.34E-09	3.34E-09	4.83E-08	3.44E-04	0.00E+00	8.39E-08	0.00E+00	3.34E-09	8.32E-07	0.00E+00	0.00E+00	3.44E-04
991	ALL		382160	3780520	NonCancer	0.00E+00	1.91E-08	0.00E+00	3.33E-09	3.33E-09	4.82E-08	3.44E-04	0.00E+00	8.39E-08	0.00E+00	3.33E-09	8.31E-07	0.00E+00	0.00E+00	3.44E-04
796	ALL		382180	3780380	NonCancer	0.00E+00	1.91E-08	0.00E+00	3.33E-09	3.33E-09	4.82E-08	3.44E-04	0.00E+00	8.38E-08	0.00E+00	3.33E-09	8.31E-07	0.00E+00	0.00E+00	3.44E-04
823	ALL		382200	3780400	NonCancer	0.00E+00	1.91E-08	0.00E+00	3.33E-09	3.33E-09	4.82E-08	3.43E-04	0.00E+00	8.37E-08	0.00E+00	3.33E-09	8.30E-07	0.00E+00	0.00E+00	3.43E-04
963	ALL		382140	3780500	NonCancer	0.00E+00	1.90E-08	0.00E+00	3.33E-09	3.33E-09	4.82E-08	3.43E-04	0.00E+00	8.37E-08	0.00E+00	3.33E-09	8.30E-07	0.00E+00	0.00E+00	3.43E-04
937	ALL		382200	3780480	NonCancer	0.00E+00	1.90E-08	0.00E+00	3.33E-09	3.33E-09	4.81E-08	3.43E-04	0.00E+00	8.37E-08	0.00E+00	3.33E-09	8.29E-07	0.00E+00	0.00E+00	3.43E-04
992	ALL		382180	3780520	NonCancer	0.00E+00	1.90E-08	0.00E+00	3.32E-09	3.32E-09	4.81E-08	3.43E-04	0.00E+00	8.36E-08	0.00E+00	3.32E-09	8.29E-07	0.00E+00	0.00E+00	3.43E-04
848	ALL		382140	3780420	NonCancer	0.00E+00	1.90E-08	0.00E+00	3.32E-09	3.32E-09	4.80E-08	3.42E-04	0.00E+00	8.35E-08	0.00E+00	3.32E-09	8.28E-07	0.00E+00	0.00E+00	3.42E-04
795	ALL		382160	3780380	NonCancer	0.00E+00	1.89E-08	0.00E+00	3.31E-09	3.31E-09	4.79E-08	3.41E-04	0.00E+00	8.32E-08	0.00E+00	3.31E-09	8.25E-07	0.00E+00	0.00E+00	3.41E-04
990	ALL		382140	3780520	NonCancer	0.00E+00	1.89E-08	0.00E+00	3.31E-09	3.31E-09	4.78E-08	3.41E-04	0.00E+00	8.31E-08	0.00E+00	3.31E-09	8.24E-07	0.00E+00	0.00E+00	3.41E-04
966	ALL		382200	3780500	NonCancer	0.00E+00	1.89E-08	0.00E+00	3.30E-09	3.30E-09	4.78E-08	3.40E-04	0.00E+00	8.30E-08	0.00E+00	3.30E-09	8.23E-07	0.00E+00	0.00E+00	3.40E-04
1017	ALL		382160	3780540	NonCancer	0.00E+00	1.89E-08	0.00E+00	3.30E-09	3.30E-09	4.77E-08	3.40E-04	0.00E+00	8.30E-08	0.00E+00	3.30E-09	8.22E-07	0.00E+00	0.00E+00	3.40E-04
797	ALL		382200	3780380	NonCancer	0.00E+00	1.89E-08	0.00E+00	3.30E-09	3.30E-09	4.77E-08	3.40E-04	0.00E+00	8.29E-08	0.00E+00	3.30E-09	8.22E-07	0.00E+00	0.00E+00	3.40E-04
820	ALL		382140	3780400	NonCancer	0.00E+00	1.88E-08	0.00E+00	3.29E-09	3.29E-09	4.76E-08	3.39E-04	0.00E+00	8.27E-08	0.00E+00	3.29E-09	8.19E-07	0.00E+00	0.00E+00	3.39E-04
1018	ALL		382180	3780540	NonCancer	0.00E+00	1.88E-08	0.00E+00	3.28E-09	3.28E-09	4.75E-08	3.39E-04	0.00E+00	8.26E-08	0.00E+00	3.28E-09	8.19E-07	0.00E+00	0.00E+00	3.39E-04
771	ALL		382180	3780360	NonCancer	0.00E+00	1.88E-08	0.00E+00	3.28E-09	3.28E-09	4.74E-08	3.38E-04	0.00E+00	8.25E-08	0.00E+00	3.28E-09	8.17E-07	0.00E+00	0.00E+00	3.38E-04
1016	ALL		382140	3780540	NonCancer	0.00E+00	1.87E-08	0.00E+00	3.27E-09	3.27E-09	4.74E-08	3.38E-04	0.00E+00	8.24E-08	0.00E+00	3.27E-09	8.16E-07	0.00E+00	0.00E+00	3.38E-04
993	ALL		382200	3780520	NonCancer	0.00E+00	1.87E-08	0.00E+00	3.27E-09	3.27E-09	4.73E-08	3.37E-04	0.00E+00	8.22E-08	0.00E+00	3.27E-09	8.15E-07	0.00E+00	0.00E+00	3.37E-04
933	ALL		382120	3780480	NonCancer	0.00E+00	1.87E-08	0.00E+00	3.26E-09	3.26E-09	4.72E-08	3.36E-04	0.00E+00	8.20E-08	0.00E+00	3.26E-09	8.13E-07	0.00E+00	0.00E+00	3.36E-04
962	ALL		382120	3780500	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.26E-09	3.26E-09	4.71E-08	3.36E-04	0.00E+00	8.20E-08	0.00E+00	3.26E-09	8.12E-07	0.00E+00	0.00E+00	3.36E-04
1041	ALL		382160	3780560	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.26E-09	3.26E-09	4.71E-08	3.36E-04	0.00E+00	8.19E-08	0.00E+00	3.26E-09	8.12E-07	0.00E+00	0.00E+00	3.36E-04
904	ALL		382120	3780460	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.26E-09	3.26E-09	4.71E-08	3.36E-04	0.00E+00	8.19E-08	0.00E+00	3.26E-09	8.12E-07	0.00E+00	0.00E+00	3.36E-04
772	ALL		382200	3780360	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.25E-09	3.25E-09	4.70E-08	3.35E-04	0.00E+00	8.17E-08	0.00E+00	3.25E-09	8.10E-07	0.00E+00	0.00E+00	3.35E-04
770	ALL		382160	3780360	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.25E-09	3.25E-09	4.70E-08	3.35E-04	0.00E+00	8.17E-08	0.00E+00	3.25E-09	8.09E-07	0.00E+00	0.00E+00	3.35E-04
880	ALL		382220	3780440	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.24E-09	3.24E-09	4.69E-08	3.34E-04	0.00E+00	8.16E-08	0.00E+00	3.24E-09	8.09E-07	0.00E+00	0.00E+00	3.34E-04
875	ALL		382120	3780440	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.24E-09	3.24E-09	4.69E-08	3.34E-04	0.00E+00	8.16E-08	0.00E+00	3.24E-09	8.08E-07	0.00E+00	0.00E+00	3.34E-04
989	ALL		382120	3780520	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.24E-09	3.24E-09	4.69E-08	3.34E-04	0.00E+00	8.15E-08	0.00E+00	3.24E-09	8.08E-07	0.00E+00	0.00E+00	3.34E-04
1042	ALL		382180	3780560	NonCancer	0.00E+00	1.86E-08	0.00E+00	3.24E-09	3.24E-09	4.69E-08	3.34E-04	0.00E+00	8.15E-08	0.00E+00	3.24E-09	8.08E-07	0.00E+00	0.00E+00	3.34E-04
852	ALL		382220	3780420	NonCancer	0.00E+00	1.85E-08	0.00E+00	3.24E-09	3.24E-09	4.69E-08	3.34E-04	0.00E+00	8.15E-08	0.00E+00	3.24E-09	8.08E-07	0.00E+00	0.00E+00	3.34E-04
909	ALL		382220	3780460	NonCancer	0.00E+00	1.85E-08	0.00E+00	3.24E-09	3.24E-09	4.69E-08	3.34E-04	0.00E+00	8.15E-08	0.00E+00	3.24E-09	8.08E-07	0.00E+00	0.00E+00	3.34E-04
1040	ALL		382140	3780560	NonCancer	0.00E+00	1.85E-08	0.00E+00	3.24E-09	3.24E-09	4.68E-08	3.34E-04	0.00E+00	8.14E-08	0.00E+00	3.24E-09	8.07E-07	0.00E+00	0.00E+00	3.34E-04
794	ALL		382140	3780380	NonCancer	0.00E+00	1.85E-08	0.00E+00	3.24E-09	3.24E-09	4.68E-08	3.34E-04	0.00E+00	8.14E-08	0.00E+00	3.24E-09	8.07E-07	0.00E+00	0.00E+00	3.34E-04
1019	ALL		382200	3780540	NonCancer	0.00E+00	1.85E-08	0.00E+00	3.23E-09	3.23E-09	4.67E-08	3.33E-04	0.00E+00	8.13E-08	0.00E+00	3.23E-09	8.05E-07	0.00E+00	0.00E+00	3.33E-04
938	ALL		382220	3780480	NonCancer	0.00E+00	1.85E-08	0.00E+00	3.22E-09	3.22E-09	4.67E-08	3.32E-04	0.00E+00	8.11E-08	0.00E+00	3.22E-09	8.04E-07	0.00E+00	0.00E+00	3.32E-04
847	ALL		382120	3780420	NonCancer	0.00E+00	1.85E-08	0.00E+00	3.22E-09	3.22E-09	4.67E-08	3.32E-04	0.00E+00	8.11E-08	0.00E+00	3.22E-09	8.04E-07	0.00E+00	0.00E+00	3.32E-04

ALTERNATIVE 8
CHRONIC-8 HOUR OUTPUT - RESIDENTIAL
(POINT MAXIMUM IMPACT)

*HARP - HRACalc v21081 6/28/2021 11:54:09 AM - Chronic 8Hr Risk - Input File: C:\Work\Bee\Glendale CA\Grayson 2021\HRA\GRAYSON2021\hra\rec_chronic8HRAInput.hra

REC	GRP	NETID	X	Y	SCENARIO	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DE	RESP	SKIN	EYE	BONE/TEE	ENDO	BLOOD	ODOR	GENERAL	MAXHI
878	ALL		382180	3780440	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-08	1.87E-05	0.00E+00	3.34E-08	0.00E+00	0.00E+00	8.47E-07	0.00E+00	0.00E+00	1.87E-05
907	ALL		382180	3780460	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-08	1.87E-05	0.00E+00	3.34E-08	0.00E+00	0.00E+00	8.46E-07	0.00E+00	0.00E+00	1.87E-05
906	ALL		382160	3780460	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-08	1.87E-05	0.00E+00	3.34E-08	0.00E+00	0.00E+00	8.46E-07	0.00E+00	0.00E+00	1.87E-05
877	ALL		382160	3780440	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-08	1.87E-05	0.00E+00	3.34E-08	0.00E+00	0.00E+00	8.46E-07	0.00E+00	0.00E+00	1.87E-05
850	ALL		382180	3780420	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-08	1.87E-05	0.00E+00	3.33E-08	0.00E+00	0.00E+00	8.46E-07	0.00E+00	0.00E+00	1.87E-05
935	ALL		382160	3780480	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-08	1.87E-05	0.00E+00	3.33E-08	0.00E+00	0.00E+00	8.43E-07	0.00E+00	0.00E+00	1.87E-05
849	ALL		382160	3780420	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-08	1.86E-05	0.00E+00	3.32E-08	0.00E+00	0.00E+00	8.43E-07	0.00E+00	0.00E+00	1.86E-05
936	ALL		382180	3780480	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-08	1.86E-05	0.00E+00	3.32E-08	0.00E+00	0.00E+00	8.42E-07	0.00E+00	0.00E+00	1.86E-05
822	ALL		382180	3780400	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-08	1.86E-05	0.00E+00	3.31E-08	0.00E+00	0.00E+00	8.40E-07	0.00E+00	0.00E+00	1.86E-05
964	ALL		382160	3780500	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-08	1.85E-05	0.00E+00	3.31E-08	0.00E+00	0.00E+00	8.38E-07	0.00E+00	0.00E+00	1.85E-05
965	ALL		382180	3780500	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-08	1.85E-05	0.00E+00	3.30E-08	0.00E+00	0.00E+00	8.36E-07	0.00E+00	0.00E+00	1.85E-05
821	ALL		382160	3780400	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-08	1.85E-05	0.00E+00	3.30E-08	0.00E+00	0.00E+00	8.36E-07	0.00E+00	0.00E+00	1.85E-05
879	ALL		382200	3780440	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-08	1.85E-05	0.00E+00	3.29E-08	0.00E+00	0.00E+00	8.35E-07	0.00E+00	0.00E+00	1.85E-05
905	ALL		382140	3780460	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-08	1.85E-05	0.00E+00	3.29E-08	0.00E+00	0.00E+00	8.35E-07	0.00E+00	0.00E+00	1.85E-05
851	ALL		382200	3780420	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-08	1.85E-05	0.00E+00	3.29E-08	0.00E+00	0.00E+00	8.34E-07	0.00E+00	0.00E+00	1.85E-05
908	ALL		382200	3780460	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-08	1.84E-05	0.00E+00	3.29E-08	0.00E+00	0.00E+00	8.34E-07	0.00E+00	0.00E+00	1.84E-05
934	ALL		382140	3780480	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-08	1.84E-05	0.00E+00	3.29E-08	0.00E+00	0.00E+00	8.34E-07	0.00E+00	0.00E+00	1.84E-05
876	ALL		382140	3780440	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.98E-09	1.84E-05	0.00E+00	3.28E-08	0.00E+00	0.00E+00	8.32E-07	0.00E+00	0.00E+00	1.84E-05
991	ALL		382160	3780520	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.98E-09	1.84E-05	0.00E+00	3.28E-08	0.00E+00	0.00E+00	8.31E-07	0.00E+00	0.00E+00	1.84E-05
796	ALL		382180	3780380	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.98E-09	1.84E-05	0.00E+00	3.28E-08	0.00E+00	0.00E+00	8.31E-07	0.00E+00	0.00E+00	1.84E-05
823	ALL		382200	3780400	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.96E-09	1.84E-05	0.00E+00	3.27E-08	0.00E+00	0.00E+00	8.30E-07	0.00E+00	0.00E+00	1.84E-05
963	ALL		382140	3780500	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.96E-09	1.84E-05	0.00E+00	3.27E-08	0.00E+00	0.00E+00	8.30E-07	0.00E+00	0.00E+00	1.84E-05
937	ALL		382200	3780480	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.96E-09	1.83E-05	0.00E+00	3.27E-08	0.00E+00	0.00E+00	8.29E-07	0.00E+00	0.00E+00	1.83E-05
992	ALL		382180	3780520	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.95E-09	1.83E-05	0.00E+00	3.27E-08	0.00E+00	0.00E+00	8.29E-07	0.00E+00	0.00E+00	1.83E-05
848	ALL		382140	3780420	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.94E-09	1.83E-05	0.00E+00	3.26E-08	0.00E+00	0.00E+00	8.28E-07	0.00E+00	0.00E+00	1.83E-05
795	ALL		382160	3780380	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.90E-09	1.82E-05	0.00E+00	3.25E-08	0.00E+00	0.00E+00	8.25E-07	0.00E+00	0.00E+00	1.82E-05
990	ALL		382140	3780520	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.89E-09	1.82E-05	0.00E+00	3.25E-08	0.00E+00	0.00E+00	8.24E-07	0.00E+00	0.00E+00	1.82E-05
966	ALL		382200	3780500	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.88E-09	1.82E-05	0.00E+00	3.25E-08	0.00E+00	0.00E+00	8.23E-07	0.00E+00	0.00E+00	1.82E-05
1017	ALL		382160	3780540	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.87E-09	1.82E-05	0.00E+00	3.24E-08	0.00E+00	0.00E+00	8.22E-07	0.00E+00	0.00E+00	1.82E-05
797	ALL		382200	3780380	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.87E-09	1.82E-05	0.00E+00	3.24E-08	0.00E+00	0.00E+00	8.22E-07	0.00E+00	0.00E+00	1.82E-05
820	ALL		382140	3780400	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.84E-09	1.81E-05	0.00E+00	3.23E-08	0.00E+00	0.00E+00	8.19E-07	0.00E+00	0.00E+00	1.81E-05
1018	ALL		382180	3780540	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.83E-09	1.81E-05	0.00E+00	3.23E-08	0.00E+00	0.00E+00	8.19E-07	0.00E+00	0.00E+00	1.81E-05
771	ALL		382180	3780360	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.81E-09	1.81E-05	0.00E+00	3.22E-08	0.00E+00	0.00E+00	8.17E-07	0.00E+00	0.00E+00	1.81E-05
1016	ALL		382140	3780540	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.80E-09	1.81E-05	0.00E+00	3.22E-08	0.00E+00	0.00E+00	8.16E-07	0.00E+00	0.00E+00	1.81E-05
993	ALL		382200	3780520	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.78E-09	1.80E-05	0.00E+00	3.21E-08	0.00E+00	0.00E+00	8.15E-07	0.00E+00	0.00E+00	1.80E-05
933	ALL		382120	3780480	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.76E-09	1.80E-05	0.00E+00	3.20E-08	0.00E+00	0.00E+00	8.13E-07	0.00E+00	0.00E+00	1.80E-05
962	ALL		382120	3780500	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.75E-09	1.80E-05	0.00E+00	3.20E-08	0.00E+00	0.00E+00	8.12E-07	0.00E+00	0.00E+00	1.80E-05
1041	ALL		382160	3780560	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.75E-09	1.80E-05	0.00E+00	3.20E-08	0.00E+00	0.00E+00	8.12E-07	0.00E+00	0.00E+00	1.80E-05
904	ALL		382120	3780460	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.74E-09	1.80E-05	0.00E+00	3.20E-08	0.00E+00	0.00E+00	8.12E-07	0.00E+00	0.00E+00	1.80E-05
772	ALL		382200	3780360	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.72E-09	1.79E-05	0.00E+00	3.19E-08	0.00E+00	0.00E+00	8.10E-07	0.00E+00	0.00E+00	1.79E-05
770	ALL		382160	3780360	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.72E-09	1.79E-05	0.00E+00	3.19E-08	0.00E+00	0.00E+00	8.09E-07	0.00E+00	0.00E+00	1.79E-05
880	ALL		382220	3780440	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.71E-09	1.79E-05	0.00E+00	3.19E-08	0.00E+00	0.00E+00	8.09E-07	0.00E+00	0.00E+00	1.79E-05
875	ALL		382120	3780440	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.71E-09	1.79E-05	0.00E+00	3.19E-08	0.00E+00	0.00E+00	8.08E-07	0.00E+00	0.00E+00	1.79E-05
989	ALL		382120	3780520	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.70E-09	1.79E-05	0.00E+00	3.19E-08	0.00E+00	0.00E+00	8.08E-07	0.00E+00	0.00E+00	1.79E-05
1042	ALL		382180	3780560	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.70E-09	1.79E-05	0.00E+00	3.19E-08	0.00E+00	0.00E+00	8.08E-07	0.00E+00	0.00E+00	1.79E-05
852	ALL		382220	3780420	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.70E-09	1.79E-05	0.00E+00	3.19E-08	0.00E+00	0.00E+00	8.08E-07	0.00E+00	0.00E+00	1.79E-05
909	ALL		382220	3780460	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.70E-09	1.79E-05	0.00E+00	3.19E-08	0.00E+00	0.00E+00	8.08E-07	0.00E+00	0.00E+00	1.79E-05
1040	ALL		382140	3780560	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.69E-09	1.79E-05	0.00E+00	3.18E-08	0.00E+00	0.00E+00	8.07E-07	0.00E+00	0.00E+00	1.79E-05
794	ALL		382140	3780380	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.68E-09	1.78E-05	0.00E+00	3.18E-08	0.00E+00	0.00E+00	8.07E-07	0.00E+00	0.00E+00	1.78E-05
1019	ALL		382200	3780540	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.67E-09	1.78E-05	0.00E+00	3.18E-08	0.00E+00	0.00E+00	8.05E-07	0.00E+00	0.00E+00	1.78E-05
938	ALL		382220	3780480	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.65E-09	1.78E-05	0.00E+00	3.17E-08	0.00E+00	0.00E+00	8.04E-07	0.00E+00	0.00E+00	1.78E-05
847	ALL		382120	3780420	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.65E-09	1.78E-05	0.00E+00	3.17E-08	0.00E+00	0.00E+00	8.04E-07	0.00E+00	0.00E+00	1.78E-05

ALTERNATIVE 8
CHRONIC-8 HOUR OUTPUT - WORKER
(POINT MAXIMUM IMPACT)

*HARP - HRACalc v21081 6/28/2021 12:19:24 PM - Chronic 8Hr Risk - Input File: C:\Work\Bee\Glendale CA\Grayson 2021\HRA\GRAYSON2021\hra\work_chronic8HRAInput.hra

REC	GRP	NETID	X	Y	SCENARIO	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DE	RESP	SKIN	EYE	BONE/TEE	ENDO	BLOOD	ODOR	GENERAL	MAXHI
878	ALL		382180	3780440	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-08	1.87E-05	0.00E+00	3.34E-08	0.00E+00	0.00E+00	8.47E-07	0.00E+00	0.00E+00	1.87E-05
907	ALL		382180	3780460	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-08	1.87E-05	0.00E+00	3.34E-08	0.00E+00	0.00E+00	8.46E-07	0.00E+00	0.00E+00	1.87E-05
906	ALL		382160	3780460	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-08	1.87E-05	0.00E+00	3.34E-08	0.00E+00	0.00E+00	8.46E-07	0.00E+00	0.00E+00	1.87E-05
877	ALL		382160	3780440	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-08	1.87E-05	0.00E+00	3.34E-08	0.00E+00	0.00E+00	8.46E-07	0.00E+00	0.00E+00	1.87E-05
850	ALL		382180	3780420	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-08	1.87E-05	0.00E+00	3.33E-08	0.00E+00	0.00E+00	8.46E-07	0.00E+00	0.00E+00	1.87E-05
935	ALL		382160	3780480	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-08	1.87E-05	0.00E+00	3.33E-08	0.00E+00	0.00E+00	8.43E-07	0.00E+00	0.00E+00	1.87E-05
849	ALL		382160	3780420	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-08	1.86E-05	0.00E+00	3.32E-08	0.00E+00	0.00E+00	8.43E-07	0.00E+00	0.00E+00	1.86E-05
936	ALL		382180	3780480	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-08	1.86E-05	0.00E+00	3.32E-08	0.00E+00	0.00E+00	8.42E-07	0.00E+00	0.00E+00	1.86E-05
822	ALL		382180	3780400	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-08	1.86E-05	0.00E+00	3.31E-08	0.00E+00	0.00E+00	8.40E-07	0.00E+00	0.00E+00	1.86E-05
964	ALL		382160	3780500	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-08	1.85E-05	0.00E+00	3.31E-08	0.00E+00	0.00E+00	8.38E-07	0.00E+00	0.00E+00	1.85E-05
965	ALL		382180	3780500	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-08	1.85E-05	0.00E+00	3.30E-08	0.00E+00	0.00E+00	8.36E-07	0.00E+00	0.00E+00	1.85E-05
821	ALL		382160	3780400	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-08	1.85E-05	0.00E+00	3.30E-08	0.00E+00	0.00E+00	8.36E-07	0.00E+00	0.00E+00	1.85E-05
879	ALL		382200	3780440	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-08	1.85E-05	0.00E+00	3.29E-08	0.00E+00	0.00E+00	8.35E-07	0.00E+00	0.00E+00	1.85E-05
905	ALL		382140	3780460	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-08	1.85E-05	0.00E+00	3.29E-08	0.00E+00	0.00E+00	8.35E-07	0.00E+00	0.00E+00	1.85E-05
851	ALL		382200	3780420	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-08	1.85E-05	0.00E+00	3.29E-08	0.00E+00	0.00E+00	8.34E-07	0.00E+00	0.00E+00	1.85E-05
908	ALL		382200	3780460	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-08	1.84E-05	0.00E+00	3.29E-08	0.00E+00	0.00E+00	8.34E-07	0.00E+00	0.00E+00	1.84E-05
934	ALL		382140	3780480	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-08	1.84E-05	0.00E+00	3.29E-08	0.00E+00	0.00E+00	8.34E-07	0.00E+00	0.00E+00	1.84E-05
876	ALL		382140	3780440	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.98E-09	1.84E-05	0.00E+00	3.28E-08	0.00E+00	0.00E+00	8.32E-07	0.00E+00	0.00E+00	1.84E-05
991	ALL		382160	3780520	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.98E-09	1.84E-05	0.00E+00	3.28E-08	0.00E+00	0.00E+00	8.31E-07	0.00E+00	0.00E+00	1.84E-05
796	ALL		382180	3780380	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.98E-09	1.84E-05	0.00E+00	3.28E-08	0.00E+00	0.00E+00	8.31E-07	0.00E+00	0.00E+00	1.84E-05
823	ALL		382200	3780400	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.96E-09	1.84E-05	0.00E+00	3.27E-08	0.00E+00	0.00E+00	8.30E-07	0.00E+00	0.00E+00	1.84E-05
963	ALL		382140	3780500	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.96E-09	1.84E-05	0.00E+00	3.27E-08	0.00E+00	0.00E+00	8.30E-07	0.00E+00	0.00E+00	1.84E-05
937	ALL		382200	3780480	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.96E-09	1.83E-05	0.00E+00	3.27E-08	0.00E+00	0.00E+00	8.29E-07	0.00E+00	0.00E+00	1.83E-05
992	ALL		382180	3780520	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.95E-09	1.83E-05	0.00E+00	3.27E-08	0.00E+00	0.00E+00	8.29E-07	0.00E+00	0.00E+00	1.83E-05
848	ALL		382140	3780420	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.94E-09	1.83E-05	0.00E+00	3.26E-08	0.00E+00	0.00E+00	8.28E-07	0.00E+00	0.00E+00	1.83E-05
795	ALL		382160	3780380	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.90E-09	1.82E-05	0.00E+00	3.25E-08	0.00E+00	0.00E+00	8.25E-07	0.00E+00	0.00E+00	1.82E-05
990	ALL		382140	3780520	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.89E-09	1.82E-05	0.00E+00	3.25E-08	0.00E+00	0.00E+00	8.24E-07	0.00E+00	0.00E+00	1.82E-05
966	ALL		382200	3780500	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.88E-09	1.82E-05	0.00E+00	3.25E-08	0.00E+00	0.00E+00	8.23E-07	0.00E+00	0.00E+00	1.82E-05
1017	ALL		382160	3780540	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.87E-09	1.82E-05	0.00E+00	3.24E-08	0.00E+00	0.00E+00	8.22E-07	0.00E+00	0.00E+00	1.82E-05
797	ALL		382200	3780380	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.87E-09	1.82E-05	0.00E+00	3.24E-08	0.00E+00	0.00E+00	8.22E-07	0.00E+00	0.00E+00	1.82E-05
820	ALL		382140	3780400	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.84E-09	1.81E-05	0.00E+00	3.23E-08	0.00E+00	0.00E+00	8.19E-07	0.00E+00	0.00E+00	1.81E-05
1018	ALL		382180	3780540	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.83E-09	1.81E-05	0.00E+00	3.23E-08	0.00E+00	0.00E+00	8.19E-07	0.00E+00	0.00E+00	1.81E-05
771	ALL		382180	3780360	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.81E-09	1.81E-05	0.00E+00	3.22E-08	0.00E+00	0.00E+00	8.17E-07	0.00E+00	0.00E+00	1.81E-05
1016	ALL		382140	3780540	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.80E-09	1.81E-05	0.00E+00	3.22E-08	0.00E+00	0.00E+00	8.16E-07	0.00E+00	0.00E+00	1.81E-05
993	ALL		382200	3780520	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.78E-09	1.80E-05	0.00E+00	3.21E-08	0.00E+00	0.00E+00	8.15E-07	0.00E+00	0.00E+00	1.80E-05
933	ALL		382120	3780480	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.76E-09	1.80E-05	0.00E+00	3.20E-08	0.00E+00	0.00E+00	8.13E-07	0.00E+00	0.00E+00	1.80E-05
962	ALL		382120	3780500	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.75E-09	1.80E-05	0.00E+00	3.20E-08	0.00E+00	0.00E+00	8.12E-07	0.00E+00	0.00E+00	1.80E-05
1041	ALL		382160	3780560	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.75E-09	1.80E-05	0.00E+00	3.20E-08	0.00E+00	0.00E+00	8.12E-07	0.00E+00	0.00E+00	1.80E-05
904	ALL		382120	3780460	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.74E-09	1.80E-05	0.00E+00	3.20E-08	0.00E+00	0.00E+00	8.12E-07	0.00E+00	0.00E+00	1.80E-05
772	ALL		382200	3780360	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.72E-09	1.79E-05	0.00E+00	3.19E-08	0.00E+00	0.00E+00	8.10E-07	0.00E+00	0.00E+00	1.79E-05
770	ALL		382160	3780360	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.72E-09	1.79E-05	0.00E+00	3.19E-08	0.00E+00	0.00E+00	8.09E-07	0.00E+00	0.00E+00	1.79E-05
880	ALL		382220	3780440	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.71E-09	1.79E-05	0.00E+00	3.19E-08	0.00E+00	0.00E+00	8.09E-07	0.00E+00	0.00E+00	1.79E-05
875	ALL		382120	3780440	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.71E-09	1.79E-05	0.00E+00	3.19E-08	0.00E+00	0.00E+00	8.08E-07	0.00E+00	0.00E+00	1.79E-05
989	ALL		382120	3780520	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.70E-09	1.79E-05	0.00E+00	3.19E-08	0.00E+00	0.00E+00	8.08E-07	0.00E+00	0.00E+00	1.79E-05
1042	ALL		382180	3780560	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.70E-09	1.79E-05	0.00E+00	3.19E-08	0.00E+00	0.00E+00	8.08E-07	0.00E+00	0.00E+00	1.79E-05
852	ALL		382220	3780420	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.70E-09	1.79E-05	0.00E+00	3.19E-08	0.00E+00	0.00E+00	8.08E-07	0.00E+00	0.00E+00	1.79E-05
909	ALL		382220	3780460	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.70E-09	1.79E-05	0.00E+00	3.19E-08	0.00E+00	0.00E+00	8.08E-07	0.00E+00	0.00E+00	1.79E-05
1040	ALL		382140	3780560	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.69E-09	1.79E-05	0.00E+00	3.18E-08	0.00E+00	0.00E+00	8.07E-07	0.00E+00	0.00E+00	1.79E-05
794	ALL		382140	3780380	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.68E-09	1.78E-05	0.00E+00	3.18E-08	0.00E+00	0.00E+00	8.07E-07	0.00E+00	0.00E+00	1.78E-05
1019	ALL		382200	3780540	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.67E-09	1.78E-05	0.00E+00	3.18E-08	0.00E+00	0.00E+00	8.05E-07	0.00E+00	0.00E+00	1.78E-05
938	ALL		382220	3780480	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.65E-09	1.78E-05	0.00E+00	3.17E-08	0.00E+00	0.00E+00	8.04E-07	0.00E+00	0.00E+00	1.78E-05
847	ALL		382120	3780420	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.65E-09	1.78E-05	0.00E+00	3.17E-08	0.00E+00	0.00E+00	8.04E-07	0.00E+00	0.00E+00	1.78E-05

ALTERNATIVE 8
ACUTE OUTPUT - RESIDENTIAL
(POINT MAXIMUM IMPACT)

*HARP - HRACalc v21081 6/28/2021 12:00:33 PM - Acute Risk - Input File: C:\Work\Bee\Glendale CA\Grayson 2021\HRA\GRAYSON2021\hra\rec_acuteHRAInput.hra

REC	GRP	NETID	X	Y	SCENARIO	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DE	RESP	SKIN	EYE	BONE/TEE	ENDO	BLOOD	ODOR	GENERAL	MAXHI
75	ALL		381945	3780247	NonCancer	0.00E+00	1.76E-07	2.69E-06	0.00E+00	0.00E+00	2.76E-06	6.04E-04	0.00E+00	6.82E-04	0.00E+00	0.00E+00	2.69E-06	0.00E+00	0.00E+00	6.82E-04
74	ALL		381963	3780238	NonCancer	0.00E+00	1.76E-07	2.69E-06	0.00E+00	0.00E+00	2.75E-06	6.02E-04	0.00E+00	6.80E-04	0.00E+00	0.00E+00	2.69E-06	0.00E+00	0.00E+00	6.80E-04
624	ALL		381940	3780240	NonCancer	0.00E+00	1.75E-07	2.68E-06	0.00E+00	0.00E+00	2.74E-06	6.00E-04	0.00E+00	6.78E-04	0.00E+00	0.00E+00	2.68E-06	0.00E+00	0.00E+00	6.78E-04
595	ALL		381960	3780220	NonCancer	0.00E+00	1.75E-07	2.67E-06	0.00E+00	0.00E+00	2.74E-06	6.00E-04	0.00E+00	6.77E-04	0.00E+00	0.00E+00	2.67E-06	0.00E+00	0.00E+00	6.77E-04
596	ALL		381980	3780220	NonCancer	0.00E+00	1.74E-07	2.67E-06	0.00E+00	0.00E+00	2.73E-06	5.97E-04	0.00E+00	6.75E-04	0.00E+00	0.00E+00	2.67E-06	0.00E+00	0.00E+00	6.75E-04
76	ALL		381927	3780255	NonCancer	0.00E+00	1.74E-07	2.66E-06	0.00E+00	0.00E+00	2.73E-06	5.97E-04	0.00E+00	6.75E-04	0.00E+00	0.00E+00	2.66E-06	0.00E+00	0.00E+00	6.75E-04
73	ALL		381978.5	3780226	NonCancer	0.00E+00	1.74E-07	2.66E-06	0.00E+00	0.00E+00	2.72E-06	5.96E-04	0.00E+00	6.74E-04	0.00E+00	0.00E+00	2.66E-06	0.00E+00	0.00E+00	6.74E-04
29	ALL		382153.1	3780332	NonCancer	0.00E+00	1.74E-07	2.66E-06	0.00E+00	0.00E+00	2.72E-06	5.95E-04	0.00E+00	6.73E-04	0.00E+00	0.00E+00	2.66E-06	0.00E+00	0.00E+00	6.73E-04
28	ALL		382141.4	3780347	NonCancer	0.00E+00	1.73E-07	2.65E-06	0.00E+00	0.00E+00	2.71E-06	5.93E-04	0.00E+00	6.70E-04	0.00E+00	0.00E+00	2.65E-06	0.00E+00	0.00E+00	6.70E-04
745	ALL		382160	3780340	NonCancer	0.00E+00	1.73E-07	2.65E-06	0.00E+00	0.00E+00	2.71E-06	5.93E-04	0.00E+00	6.70E-04	0.00E+00	0.00E+00	2.65E-06	0.00E+00	0.00E+00	6.70E-04
770	ALL		382160	3780360	NonCancer	0.00E+00	1.73E-07	2.64E-06	0.00E+00	0.00E+00	2.70E-06	5.92E-04	0.00E+00	6.68E-04	0.00E+00	0.00E+00	2.64E-06	0.00E+00	0.00E+00	6.68E-04
30	ALL		382164.7	3780317	NonCancer	0.00E+00	1.72E-07	2.63E-06	0.00E+00	0.00E+00	2.69E-06	5.90E-04	0.00E+00	6.66E-04	0.00E+00	0.00E+00	2.63E-06	0.00E+00	0.00E+00	6.66E-04
795	ALL		382160	3780380	NonCancer	0.00E+00	1.72E-07	2.63E-06	0.00E+00	0.00E+00	2.69E-06	5.89E-04	0.00E+00	6.65E-04	0.00E+00	0.00E+00	2.63E-06	0.00E+00	0.00E+00	6.65E-04
623	ALL		381920	3780240	NonCancer	0.00E+00	1.71E-07	2.62E-06	0.00E+00	0.00E+00	2.68E-06	5.88E-04	0.00E+00	6.64E-04	0.00E+00	0.00E+00	2.62E-06	0.00E+00	0.00E+00	6.64E-04
651	ALL		381900	3780260	NonCancer	0.00E+00	1.71E-07	2.62E-06	0.00E+00	0.00E+00	2.68E-06	5.87E-04	0.00E+00	6.63E-04	0.00E+00	0.00E+00	2.62E-06	0.00E+00	0.00E+00	6.63E-04
650	ALL		381880	3780260	NonCancer	0.00E+00	1.71E-07	2.62E-06	0.00E+00	0.00E+00	2.68E-06	5.87E-04	0.00E+00	6.63E-04	0.00E+00	0.00E+00	2.62E-06	0.00E+00	0.00E+00	6.63E-04
77	ALL		381909.7	3780265	NonCancer	0.00E+00	1.71E-07	2.61E-06	0.00E+00	0.00E+00	2.67E-06	5.86E-04	0.00E+00	6.62E-04	0.00E+00	0.00E+00	2.61E-06	0.00E+00	0.00E+00	6.62E-04
769	ALL		382140	3780360	NonCancer	0.00E+00	1.71E-07	2.61E-06	0.00E+00	0.00E+00	2.67E-06	5.85E-04	0.00E+00	6.60E-04	0.00E+00	0.00E+00	2.61E-06	0.00E+00	0.00E+00	6.60E-04
821	ALL		382160	3780400	NonCancer	0.00E+00	1.70E-07	2.59E-06	0.00E+00	0.00E+00	2.65E-06	5.81E-04	0.00E+00	6.57E-04	0.00E+00	0.00E+00	2.59E-06	0.00E+00	0.00E+00	6.57E-04
565	ALL		381980	3780200	NonCancer	0.00E+00	1.69E-07	2.59E-06	0.00E+00	0.00E+00	2.65E-06	5.81E-04	0.00E+00	6.56E-04	0.00E+00	0.00E+00	2.59E-06	0.00E+00	0.00E+00	6.56E-04
649	ALL		381860	3780260	NonCancer	0.00E+00	1.69E-07	2.59E-06	0.00E+00	0.00E+00	2.64E-06	5.80E-04	0.00E+00	6.55E-04	0.00E+00	0.00E+00	2.59E-06	0.00E+00	0.00E+00	6.55E-04
72	ALL		381994	3780214	NonCancer	0.00E+00	1.69E-07	2.59E-06	0.00E+00	0.00E+00	2.64E-06	5.80E-04	0.00E+00	6.55E-04	0.00E+00	0.00E+00	2.59E-06	0.00E+00	0.00E+00	6.55E-04
27	ALL		382129.8	3780363	NonCancer	0.00E+00	1.69E-07	2.58E-06	0.00E+00	0.00E+00	2.64E-06	5.79E-04	0.00E+00	6.54E-04	0.00E+00	0.00E+00	2.58E-06	0.00E+00	0.00E+00	6.54E-04
771	ALL		382180	3780360	NonCancer	0.00E+00	1.69E-07	2.58E-06	0.00E+00	0.00E+00	2.64E-06	5.78E-04	0.00E+00	6.53E-04	0.00E+00	0.00E+00	2.58E-06	0.00E+00	0.00E+00	6.53E-04
594	ALL		381940	3780220	NonCancer	0.00E+00	1.69E-07	2.58E-06	0.00E+00	0.00E+00	2.63E-06	5.78E-04	0.00E+00	6.53E-04	0.00E+00	0.00E+00	2.58E-06	0.00E+00	0.00E+00	6.53E-04
796	ALL		382180	3780380	NonCancer	0.00E+00	1.68E-07	2.57E-06	0.00E+00	0.00E+00	2.62E-06	5.75E-04	0.00E+00	6.50E-04	0.00E+00	0.00E+00	2.57E-06	0.00E+00	0.00E+00	6.50E-04
78	ALL		381892.3	3780274	NonCancer	0.00E+00	1.68E-07	2.56E-06	0.00E+00	0.00E+00	2.62E-06	5.75E-04	0.00E+00	6.50E-04	0.00E+00	0.00E+00	2.56E-06	0.00E+00	0.00E+00	6.50E-04
622	ALL		381900	3780240	NonCancer	0.00E+00	1.67E-07	2.56E-06	0.00E+00	0.00E+00	2.62E-06	5.73E-04	0.00E+00	6.48E-04	0.00E+00	0.00E+00	2.56E-06	0.00E+00	0.00E+00	6.48E-04
746	ALL		382180	3780340	NonCancer	0.00E+00	1.67E-07	2.55E-06	0.00E+00	0.00E+00	2.61E-06	5.73E-04	0.00E+00	6.47E-04	0.00E+00	0.00E+00	2.55E-06	0.00E+00	0.00E+00	6.47E-04
675	ALL		381860	3780280	NonCancer	0.00E+00	1.67E-07	2.55E-06	0.00E+00	0.00E+00	2.61E-06	5.72E-04	0.00E+00	6.46E-04	0.00E+00	0.00E+00	2.55E-06	0.00E+00	0.00E+00	6.46E-04
849	ALL		382160	3780420	NonCancer	0.00E+00	1.67E-07	2.55E-06	0.00E+00	0.00E+00	2.61E-06	5.71E-04	0.00E+00	6.45E-04	0.00E+00	0.00E+00	2.55E-06	0.00E+00	0.00E+00	6.45E-04
25	ALL		382106.5	3780394	NonCancer	0.00E+00	1.67E-07	2.55E-06	0.00E+00	0.00E+00	2.60E-06	5.71E-04	0.00E+00	6.45E-04	0.00E+00	0.00E+00	2.55E-06	0.00E+00	0.00E+00	6.45E-04
794	ALL		382140	3780380	NonCancer	0.00E+00	1.67E-07	2.55E-06	0.00E+00	0.00E+00	2.60E-06	5.71E-04	0.00E+00	6.45E-04	0.00E+00	0.00E+00	2.55E-06	0.00E+00	0.00E+00	6.45E-04
676	ALL		381880	3780280	NonCancer	0.00E+00	1.67E-07	2.55E-06	0.00E+00	0.00E+00	2.60E-06	5.71E-04	0.00E+00	6.45E-04	0.00E+00	0.00E+00	2.55E-06	0.00E+00	0.00E+00	6.45E-04
26	ALL		382118.1	3780378	NonCancer	0.00E+00	1.66E-07	2.54E-06	0.00E+00	0.00E+00	2.60E-06	5.70E-04	0.00E+00	6.44E-04	0.00E+00	0.00E+00	2.54E-06	0.00E+00	0.00E+00	6.44E-04
722	ALL		382180	3780320	NonCancer	0.00E+00	1.66E-07	2.54E-06	0.00E+00	0.00E+00	2.60E-06	5.69E-04	0.00E+00	6.43E-04	0.00E+00	0.00E+00	2.54E-06	0.00E+00	0.00E+00	6.43E-04
822	ALL		382180	3780400	NonCancer	0.00E+00	1.66E-07	2.54E-06	0.00E+00	0.00E+00	2.59E-06	5.68E-04	0.00E+00	6.42E-04	0.00E+00	0.00E+00	2.54E-06	0.00E+00	0.00E+00	6.42E-04
1185	ALL		382000	3779700	NonCancer	0.00E+00	1.66E-07	2.53E-06	0.00E+00	0.00E+00	2.59E-06	5.68E-04	0.00E+00	6.42E-04	0.00E+00	0.00E+00	2.53E-06	0.00E+00	0.00E+00	6.42E-04
674	ALL		381840	3780280	NonCancer	0.00E+00	1.66E-07	2.53E-06	0.00E+00	0.00E+00	2.59E-06	5.67E-04	0.00E+00	6.41E-04	0.00E+00	0.00E+00	2.53E-06	0.00E+00	0.00E+00	6.41E-04
31	ALL		382176.4	3780301	NonCancer	0.00E+00	1.65E-07	2.53E-06	0.00E+00	0.00E+00	2.59E-06	5.67E-04	0.00E+00	6.40E-04	0.00E+00	0.00E+00	2.53E-06	0.00E+00	0.00E+00	6.40E-04
79	ALL		381875	3780284	NonCancer	0.00E+00	1.65E-07	2.53E-06	0.00E+00	0.00E+00	2.58E-06	5.67E-04	0.00E+00	6.40E-04	0.00E+00	0.00E+00	2.53E-06	0.00E+00	0.00E+00	6.40E-04
793	ALL		382120	3780380	NonCancer	0.00E+00	1.65E-07	2.53E-06	0.00E+00	0.00E+00	2.58E-06	5.66E-04	0.00E+00	6.40E-04	0.00E+00	0.00E+00	2.53E-06	0.00E+00	0.00E+00	6.40E-04
820	ALL		382140	3780400	NonCancer	0.00E+00	1.65E-07	2.53E-06	0.00E+00	0.00E+00	2.58E-06	5.66E-04	0.00E+00	6.40E-04	0.00E+00	0.00E+00	2.53E-06	0.00E+00	0.00E+00	6.40E-04
566	ALL		382000	3780200	NonCancer	0.00E+00	1.65E-07	2.52E-06	0.00E+00	0.00E+00	2.57E-06	5.64E-04	0.00E+00	6.37E-04	0.00E+00	0.00E+00	2.52E-06	0.00E+00	0.00E+00	6.37E-04
24	ALL		382094.9	3780409	NonCancer	0.00E+00	1.64E-07	2.51E-06	0.00E+00	0.00E+00	2.57E-06	5.63E-04	0.00E+00	6.36E-04	0.00E+00	0.00E+00	2.51E-06	0.00E+00	0.00E+00	6.36E-04
80	ALL		381857.7	3780288	NonCancer	0.00E+00	1.64E-07	2.51E-06	0.00E+00	0.00E+00	2.57E-06	5.62E-04	0.00E+00	6.35E-04	0.00E+00	0.00E+00	2.51E-06	0.00E+00	0.00E+00	6.35E-04
1171	ALL		382200	3779650	NonCancer	0.00E+00	1.64E-07	2.51E-06	0.00E+00	0.00E+00	2.56E-06	5.62E-04	0.00E+00	6.35E-04	0.00E+00	0.00E+00	2.51E-06	0.00E+00	0.00E+00	6.35E-04
358	ALL		382480	3780040	NonCancer	0.00E+00	1.64E-07	2.51E-06	0.00E+00	0.00E+00	2.56E-06	5.62E-04	0.00E+00	6.35E-04	0.00E+00	0.00E+00	2.51E-06	0.00E+00	0.00E+00	6.35E-04
1167	ALL		382000	3779650	NonCancer	0.00E+00	1.64E-07	2.50E-06	0.00E+00	0.00E+00	2.56E-06	5.61E-04	0.00E+00	6.34E-04	0.00E+00	0.00E+00	2.50E-06	0.00E+00	0.00E+00	6.34E-04
359	ALL		382500	3780040	NonCancer	0.00E+00	1.64E-07	2.50E-06	0.00E+00	0.00E+00	2.56E-06	5.61E-04	0.00E+00	6.34E-04	0.00E+00	0.00E+00	2.50E-06	0.00E+00	0.00E+00	6.34E-04
81	ALL		381840.3	3780293	NonCancer	0.00E+00	1.63E-07	2.50E-06	0.00E+00	0.00E+00	2.55E-06	5.59E-04	0.00E+00	6.32E-04	0.00E+00	0.00E+00	2.50E-06	0.00E+00	0.00E+00	6.32E-04
848	ALL		382140	3780420	NonCancer	0.00E+00	1.63E-07	2.49E-06	0.00E+00	0.00E+00	2.55E-06	5.59E-04	0.00E+00	6.32E-04	0.00E+00	0.00E+00	2.49E-06	0.00E+00	0.00E+00	6.32E-04

ALTERNATIVE 8
ACUTE OUTPUT - WORKER
(POINT MAXIMUM IMPACT)

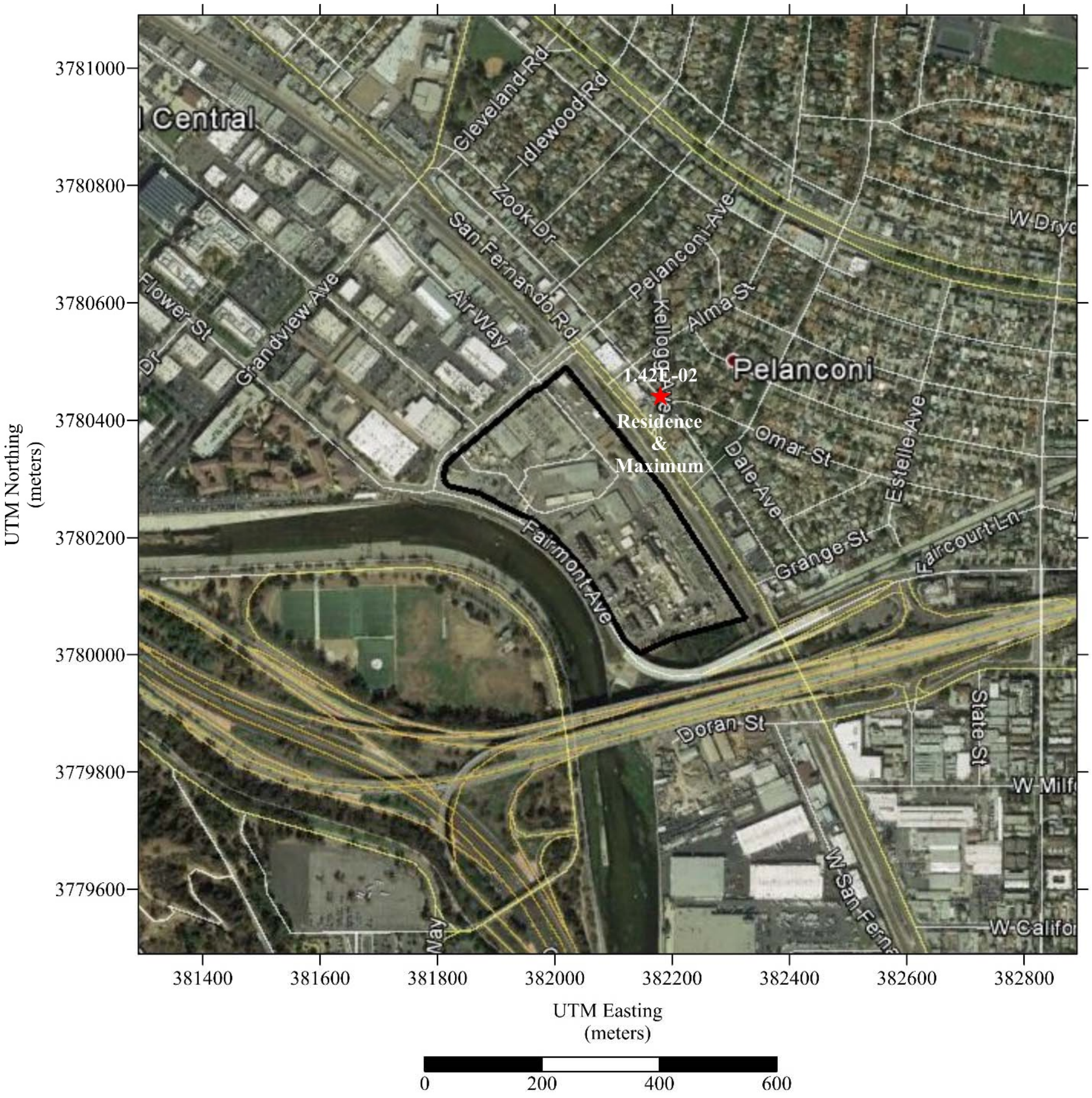
*HARP - HRACalc v21081 6/28/2021 12:42:29 PM - Acute Risk - Input File: C:\Work\Bee\Glendale CA\Grayson 2021\HRA\GRAYSON2021\hra\work_acuteHRAInput.hra

REC	GRP	NETID	X	Y	SCENARIO	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DE'	RESP	SKIN	EYE	BONE/TEE	ENDO	BLOOD	ODOR	GENERAL	MAXHI
75	ALL		381945	3780247	NonCancer	0.00E+00	1.76E-07	2.69E-06	0.00E+00	0.00E+00	2.76E-06	6.04E-04	0.00E+00	6.82E-04	0.00E+00	0.00E+00	2.69E-06	0.00E+00	0.00E+00	6.82E-04
74	ALL		381963	3780238	NonCancer	0.00E+00	1.76E-07	2.69E-06	0.00E+00	0.00E+00	2.75E-06	6.02E-04	0.00E+00	6.80E-04	0.00E+00	0.00E+00	2.69E-06	0.00E+00	0.00E+00	6.80E-04
624	ALL		381940	3780240	NonCancer	0.00E+00	1.75E-07	2.68E-06	0.00E+00	0.00E+00	2.74E-06	6.00E-04	0.00E+00	6.78E-04	0.00E+00	0.00E+00	2.68E-06	0.00E+00	0.00E+00	6.78E-04
595	ALL		381960	3780220	NonCancer	0.00E+00	1.75E-07	2.67E-06	0.00E+00	0.00E+00	2.74E-06	6.00E-04	0.00E+00	6.77E-04	0.00E+00	0.00E+00	2.67E-06	0.00E+00	0.00E+00	6.77E-04
596	ALL		381980	3780220	NonCancer	0.00E+00	1.74E-07	2.67E-06	0.00E+00	0.00E+00	2.73E-06	5.97E-04	0.00E+00	6.75E-04	0.00E+00	0.00E+00	2.67E-06	0.00E+00	0.00E+00	6.75E-04
76	ALL		381927	3780255	NonCancer	0.00E+00	1.74E-07	2.66E-06	0.00E+00	0.00E+00	2.73E-06	5.97E-04	0.00E+00	6.75E-04	0.00E+00	0.00E+00	2.66E-06	0.00E+00	0.00E+00	6.75E-04
73	ALL		381978.5	3780226	NonCancer	0.00E+00	1.74E-07	2.66E-06	0.00E+00	0.00E+00	2.72E-06	5.96E-04	0.00E+00	6.74E-04	0.00E+00	0.00E+00	2.66E-06	0.00E+00	0.00E+00	6.74E-04
29	ALL		382153.1	3780332	NonCancer	0.00E+00	1.74E-07	2.66E-06	0.00E+00	0.00E+00	2.72E-06	5.95E-04	0.00E+00	6.73E-04	0.00E+00	0.00E+00	2.66E-06	0.00E+00	0.00E+00	6.73E-04
28	ALL		382141.4	3780347	NonCancer	0.00E+00	1.73E-07	2.65E-06	0.00E+00	0.00E+00	2.71E-06	5.93E-04	0.00E+00	6.70E-04	0.00E+00	0.00E+00	2.65E-06	0.00E+00	0.00E+00	6.70E-04
745	ALL		382160	3780340	NonCancer	0.00E+00	1.73E-07	2.65E-06	0.00E+00	0.00E+00	2.71E-06	5.93E-04	0.00E+00	6.70E-04	0.00E+00	0.00E+00	2.65E-06	0.00E+00	0.00E+00	6.70E-04
770	ALL		382160	3780360	NonCancer	0.00E+00	1.73E-07	2.64E-06	0.00E+00	0.00E+00	2.70E-06	5.92E-04	0.00E+00	6.68E-04	0.00E+00	0.00E+00	2.64E-06	0.00E+00	0.00E+00	6.68E-04
30	ALL		382164.7	3780317	NonCancer	0.00E+00	1.72E-07	2.63E-06	0.00E+00	0.00E+00	2.69E-06	5.90E-04	0.00E+00	6.66E-04	0.00E+00	0.00E+00	2.63E-06	0.00E+00	0.00E+00	6.66E-04
795	ALL		382160	3780380	NonCancer	0.00E+00	1.72E-07	2.63E-06	0.00E+00	0.00E+00	2.69E-06	5.89E-04	0.00E+00	6.65E-04	0.00E+00	0.00E+00	2.63E-06	0.00E+00	0.00E+00	6.65E-04
623	ALL		381920	3780240	NonCancer	0.00E+00	1.71E-07	2.62E-06	0.00E+00	0.00E+00	2.68E-06	5.88E-04	0.00E+00	6.64E-04	0.00E+00	0.00E+00	2.62E-06	0.00E+00	0.00E+00	6.64E-04
651	ALL		381900	3780260	NonCancer	0.00E+00	1.71E-07	2.62E-06	0.00E+00	0.00E+00	2.68E-06	5.87E-04	0.00E+00	6.63E-04	0.00E+00	0.00E+00	2.62E-06	0.00E+00	0.00E+00	6.63E-04
650	ALL		381880	3780260	NonCancer	0.00E+00	1.71E-07	2.62E-06	0.00E+00	0.00E+00	2.68E-06	5.87E-04	0.00E+00	6.63E-04	0.00E+00	0.00E+00	2.62E-06	0.00E+00	0.00E+00	6.63E-04
77	ALL		381909.7	3780265	NonCancer	0.00E+00	1.71E-07	2.61E-06	0.00E+00	0.00E+00	2.67E-06	5.86E-04	0.00E+00	6.62E-04	0.00E+00	0.00E+00	2.61E-06	0.00E+00	0.00E+00	6.62E-04
769	ALL		382140	3780360	NonCancer	0.00E+00	1.71E-07	2.61E-06	0.00E+00	0.00E+00	2.67E-06	5.85E-04	0.00E+00	6.60E-04	0.00E+00	0.00E+00	2.61E-06	0.00E+00	0.00E+00	6.60E-04
821	ALL		382160	3780400	NonCancer	0.00E+00	1.70E-07	2.59E-06	0.00E+00	0.00E+00	2.65E-06	5.81E-04	0.00E+00	6.57E-04	0.00E+00	0.00E+00	2.59E-06	0.00E+00	0.00E+00	6.57E-04
565	ALL		381980	3780200	NonCancer	0.00E+00	1.69E-07	2.59E-06	0.00E+00	0.00E+00	2.65E-06	5.81E-04	0.00E+00	6.56E-04	0.00E+00	0.00E+00	2.59E-06	0.00E+00	0.00E+00	6.56E-04
649	ALL		381860	3780260	NonCancer	0.00E+00	1.69E-07	2.59E-06	0.00E+00	0.00E+00	2.64E-06	5.80E-04	0.00E+00	6.55E-04	0.00E+00	0.00E+00	2.59E-06	0.00E+00	0.00E+00	6.55E-04
72	ALL		381994	3780214	NonCancer	0.00E+00	1.69E-07	2.59E-06	0.00E+00	0.00E+00	2.64E-06	5.80E-04	0.00E+00	6.55E-04	0.00E+00	0.00E+00	2.59E-06	0.00E+00	0.00E+00	6.55E-04
27	ALL		382129.8	3780363	NonCancer	0.00E+00	1.69E-07	2.58E-06	0.00E+00	0.00E+00	2.64E-06	5.79E-04	0.00E+00	6.54E-04	0.00E+00	0.00E+00	2.58E-06	0.00E+00	0.00E+00	6.54E-04
771	ALL		382180	3780360	NonCancer	0.00E+00	1.69E-07	2.58E-06	0.00E+00	0.00E+00	2.64E-06	5.78E-04	0.00E+00	6.53E-04	0.00E+00	0.00E+00	2.58E-06	0.00E+00	0.00E+00	6.53E-04
594	ALL		381940	3780220	NonCancer	0.00E+00	1.69E-07	2.58E-06	0.00E+00	0.00E+00	2.63E-06	5.78E-04	0.00E+00	6.53E-04	0.00E+00	0.00E+00	2.58E-06	0.00E+00	0.00E+00	6.53E-04
796	ALL		382180	3780380	NonCancer	0.00E+00	1.68E-07	2.57E-06	0.00E+00	0.00E+00	2.62E-06	5.75E-04	0.00E+00	6.50E-04	0.00E+00	0.00E+00	2.57E-06	0.00E+00	0.00E+00	6.50E-04
78	ALL		381892.3	3780274	NonCancer	0.00E+00	1.68E-07	2.56E-06	0.00E+00	0.00E+00	2.62E-06	5.75E-04	0.00E+00	6.50E-04	0.00E+00	0.00E+00	2.56E-06	0.00E+00	0.00E+00	6.50E-04
622	ALL		381900	3780240	NonCancer	0.00E+00	1.67E-07	2.56E-06	0.00E+00	0.00E+00	2.62E-06	5.73E-04	0.00E+00	6.48E-04	0.00E+00	0.00E+00	2.56E-06	0.00E+00	0.00E+00	6.48E-04
746	ALL		382180	3780340	NonCancer	0.00E+00	1.67E-07	2.55E-06	0.00E+00	0.00E+00	2.61E-06	5.73E-04	0.00E+00	6.47E-04	0.00E+00	0.00E+00	2.55E-06	0.00E+00	0.00E+00	6.47E-04
675	ALL		381860	3780280	NonCancer	0.00E+00	1.67E-07	2.55E-06	0.00E+00	0.00E+00	2.61E-06	5.72E-04	0.00E+00	6.46E-04	0.00E+00	0.00E+00	2.55E-06	0.00E+00	0.00E+00	6.46E-04
849	ALL		382160	3780420	NonCancer	0.00E+00	1.67E-07	2.55E-06	0.00E+00	0.00E+00	2.61E-06	5.71E-04	0.00E+00	6.45E-04	0.00E+00	0.00E+00	2.55E-06	0.00E+00	0.00E+00	6.45E-04
25	ALL		382106.5	3780394	NonCancer	0.00E+00	1.67E-07	2.55E-06	0.00E+00	0.00E+00	2.60E-06	5.71E-04	0.00E+00	6.45E-04	0.00E+00	0.00E+00	2.55E-06	0.00E+00	0.00E+00	6.45E-04
794	ALL		382140	3780380	NonCancer	0.00E+00	1.67E-07	2.55E-06	0.00E+00	0.00E+00	2.60E-06	5.71E-04	0.00E+00	6.45E-04	0.00E+00	0.00E+00	2.55E-06	0.00E+00	0.00E+00	6.45E-04
676	ALL		381880	3780280	NonCancer	0.00E+00	1.67E-07	2.55E-06	0.00E+00	0.00E+00	2.60E-06	5.71E-04	0.00E+00	6.45E-04	0.00E+00	0.00E+00	2.55E-06	0.00E+00	0.00E+00	6.45E-04
26	ALL		382118.1	3780378	NonCancer	0.00E+00	1.66E-07	2.54E-06	0.00E+00	0.00E+00	2.60E-06	5.70E-04	0.00E+00	6.44E-04	0.00E+00	0.00E+00	2.54E-06	0.00E+00	0.00E+00	6.44E-04
722	ALL		382180	3780320	NonCancer	0.00E+00	1.66E-07	2.54E-06	0.00E+00	0.00E+00	2.60E-06	5.69E-04	0.00E+00	6.43E-04	0.00E+00	0.00E+00	2.54E-06	0.00E+00	0.00E+00	6.43E-04
822	ALL		382180	3780400	NonCancer	0.00E+00	1.66E-07	2.54E-06	0.00E+00	0.00E+00	2.59E-06	5.68E-04	0.00E+00	6.42E-04	0.00E+00	0.00E+00	2.54E-06	0.00E+00	0.00E+00	6.42E-04
1185	ALL		382000	3779700	NonCancer	0.00E+00	1.66E-07	2.53E-06	0.00E+00	0.00E+00	2.59E-06	5.68E-04	0.00E+00	6.42E-04	0.00E+00	0.00E+00	2.53E-06	0.00E+00	0.00E+00	6.42E-04
674	ALL		381840	3780280	NonCancer	0.00E+00	1.66E-07	2.53E-06	0.00E+00	0.00E+00	2.59E-06	5.67E-04	0.00E+00	6.41E-04	0.00E+00	0.00E+00	2.53E-06	0.00E+00	0.00E+00	6.41E-04
31	ALL		382176.4	3780301	NonCancer	0.00E+00	1.65E-07	2.53E-06	0.00E+00	0.00E+00	2.59E-06	5.67E-04	0.00E+00	6.40E-04	0.00E+00	0.00E+00	2.53E-06	0.00E+00	0.00E+00	6.40E-04
79	ALL		381875	3780284	NonCancer	0.00E+00	1.65E-07	2.53E-06	0.00E+00	0.00E+00	2.58E-06	5.67E-04	0.00E+00	6.40E-04	0.00E+00	0.00E+00	2.53E-06	0.00E+00	0.00E+00	6.40E-04
793	ALL		382120	3780380	NonCancer	0.00E+00	1.65E-07	2.53E-06	0.00E+00	0.00E+00	2.58E-06	5.66E-04	0.00E+00	6.40E-04	0.00E+00	0.00E+00	2.53E-06	0.00E+00	0.00E+00	6.40E-04
820	ALL		382140	3780400	NonCancer	0.00E+00	1.65E-07	2.53E-06	0.00E+00	0.00E+00	2.58E-06	5.66E-04	0.00E+00	6.40E-04	0.00E+00	0.00E+00	2.53E-06	0.00E+00	0.00E+00	6.40E-04
566	ALL		382000	3780200	NonCancer	0.00E+00	1.65E-07	2.52E-06	0.00E+00	0.00E+00	2.57E-06	5.64E-04	0.00E+00	6.37E-04	0.00E+00	0.00E+00	2.52E-06	0.00E+00	0.00E+00	6.37E-04
24	ALL		382094.9	3780409	NonCancer	0.00E+00	1.64E-07	2.51E-06	0.00E+00	0.00E+00	2.57E-06	5.63E-04	0.00E+00	6.36E-04	0.00E+00	0.00E+00	2.51E-06	0.00E+00	0.00E+00	6.36E-04
80	ALL		381857.7	3780288	NonCancer	0.00E+00	1.64E-07	2.51E-06	0.00E+00	0.00E+00	2.57E-06	5.62E-04	0.00E+00	6.35E-04	0.00E+00	0.00E+00	2.51E-06	0.00E+00	0.00E+00	6.35E-04
1171	ALL		382200	3779650	NonCancer	0.00E+00	1.64E-07	2.51E-06	0.00E+00	0.00E+00	2.56E-06	5.62E-04	0.00E+00	6.35E-04	0.00E+00	0.00E+00	2.51E-06	0.00E+00	0.00E+00	6.35E-04
358	ALL		382480	3780040	NonCancer	0.00E+00	1.64E-07	2.51E-06	0.00E+00	0.00E+00	2.56E-06	5.62E-04	0.00E+00	6.35E-04	0.00E+00	0.00E+00	2.51E-06	0.00E+00	0.00E+00	6.35E-04
1167	ALL		382000	3779650	NonCancer	0.00E+00	1.64E-07	2.50E-06	0.00E+00	0.00E+00	2.56E-06	5.61E-04	0.00E+00	6.34E-04	0.00E+00	0.00E+00	2.50E-06	0.00E+00	0.00E+00	6.34E-04
359	ALL		382500	3780040	NonCancer	0.00E+00	1.64E-07	2.50E-06	0.00E+00	0.00E+00	2.56E-06	5.61E-04	0.00E+00	6.34E-04	0.00E+00	0.00E+00	2.50E-06	0.00E+00	0.00E+00	6.34E-04
81	ALL		381840.3	3780293	NonCancer	0.00E+00	1.63E-07	2.50E-06	0.00E+00	0.00E+00	2.55E-06	5.59E-04	0.00E+00	6.32E-04	0.00E+00	0.00E+00	2.50E-06	0.00E+00	0.00E+00	6.32E-04
848	ALL		382140	3780420	NonCancer	0.00E+00	1.63E-07	2.49E-06	0.00E+00	0.00E+00	2.55E-06	5.59E-04	0.00E+00	6.32E-04	0.00E+00	0.00E+00	2.49E-06	0.00E+00	0.00E+00	6.32E-04

SITE MAPS SHOWING THE LOCATIONS OF MODELING RESULTS

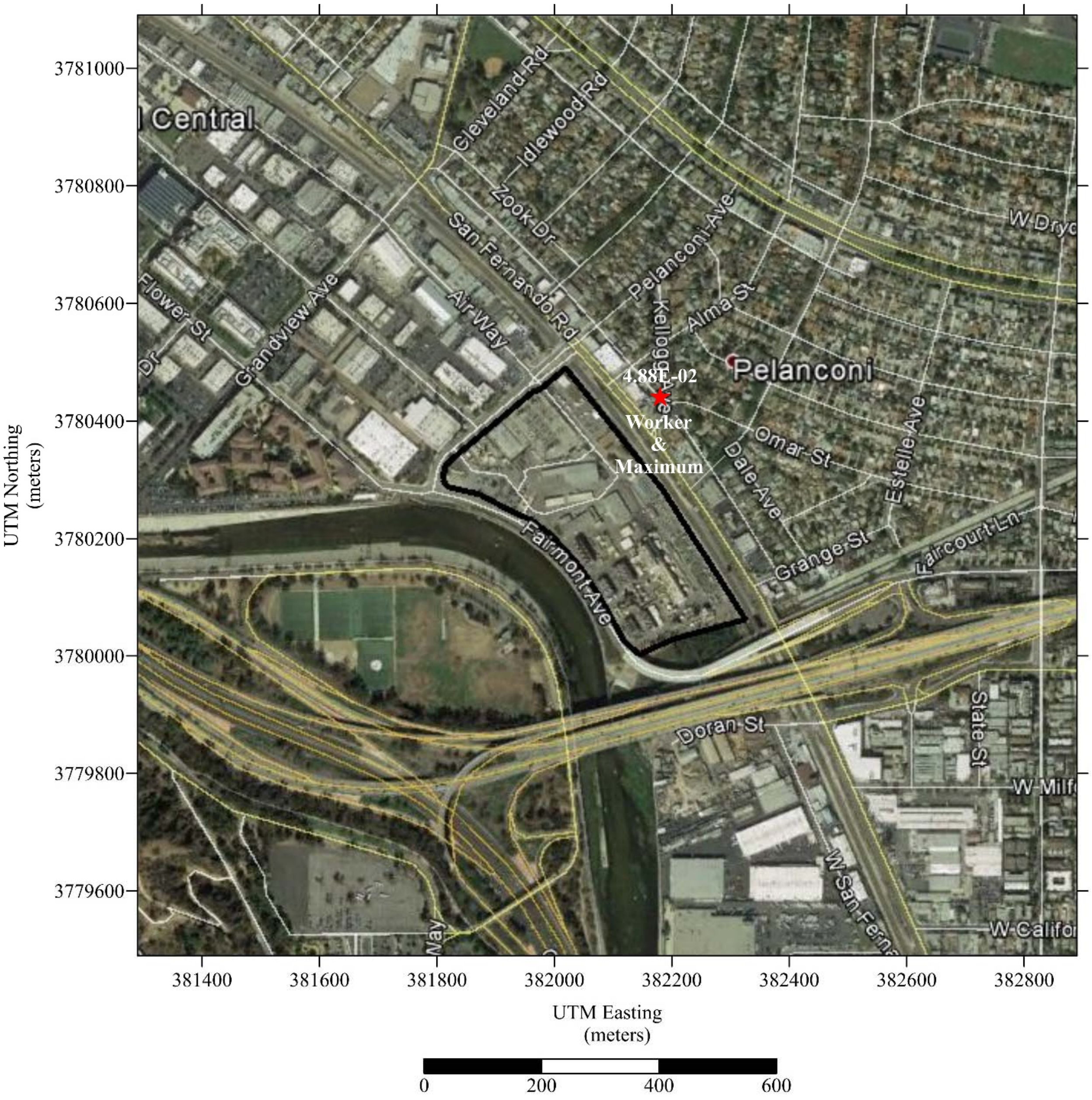
CANCER RISK OUTPUT - RESIDENTIAL

(UNIT OF MEASUREMENT: IN ONE MILLION)

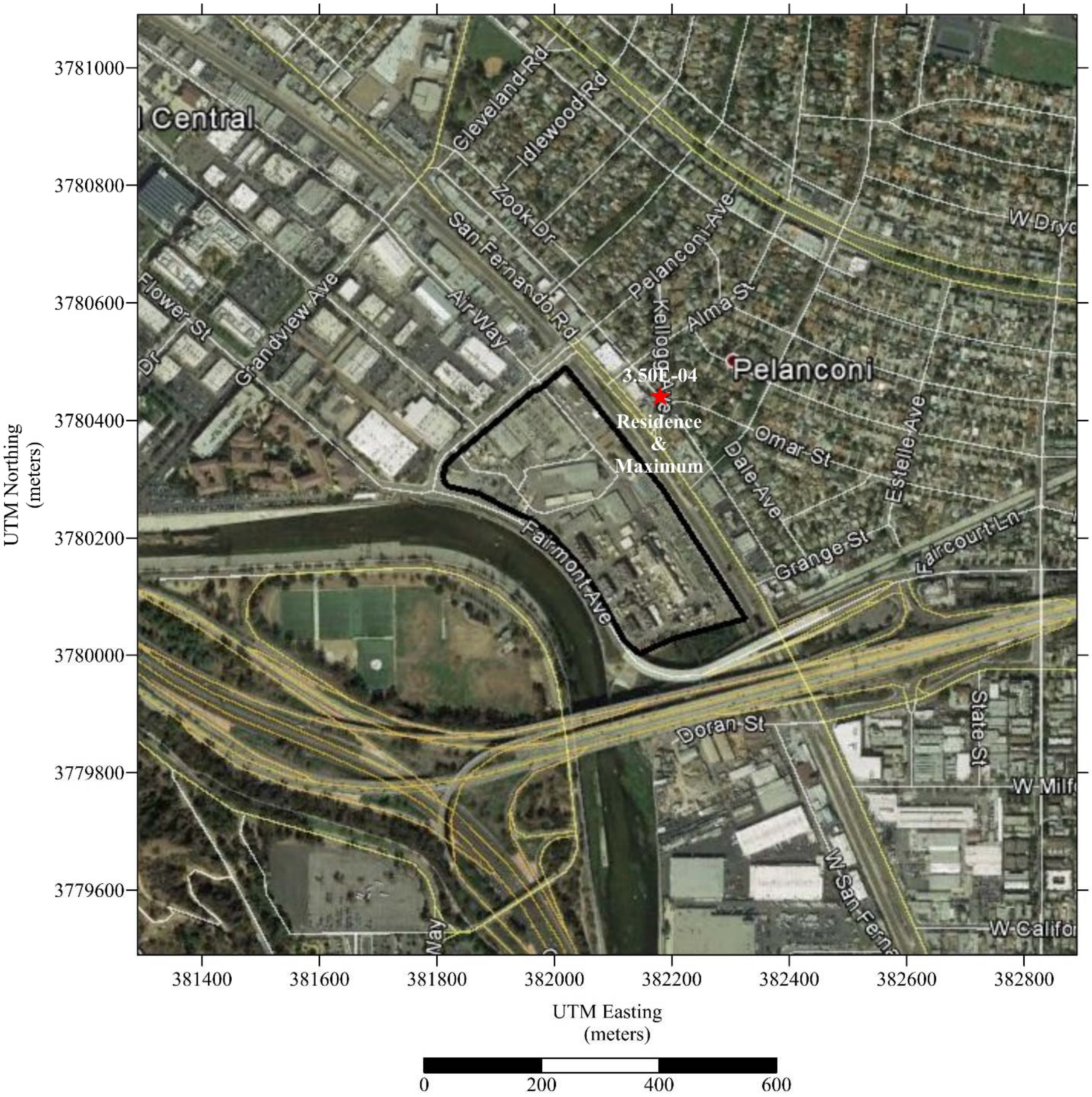


CANCER RISK OUTPUT - WORKER

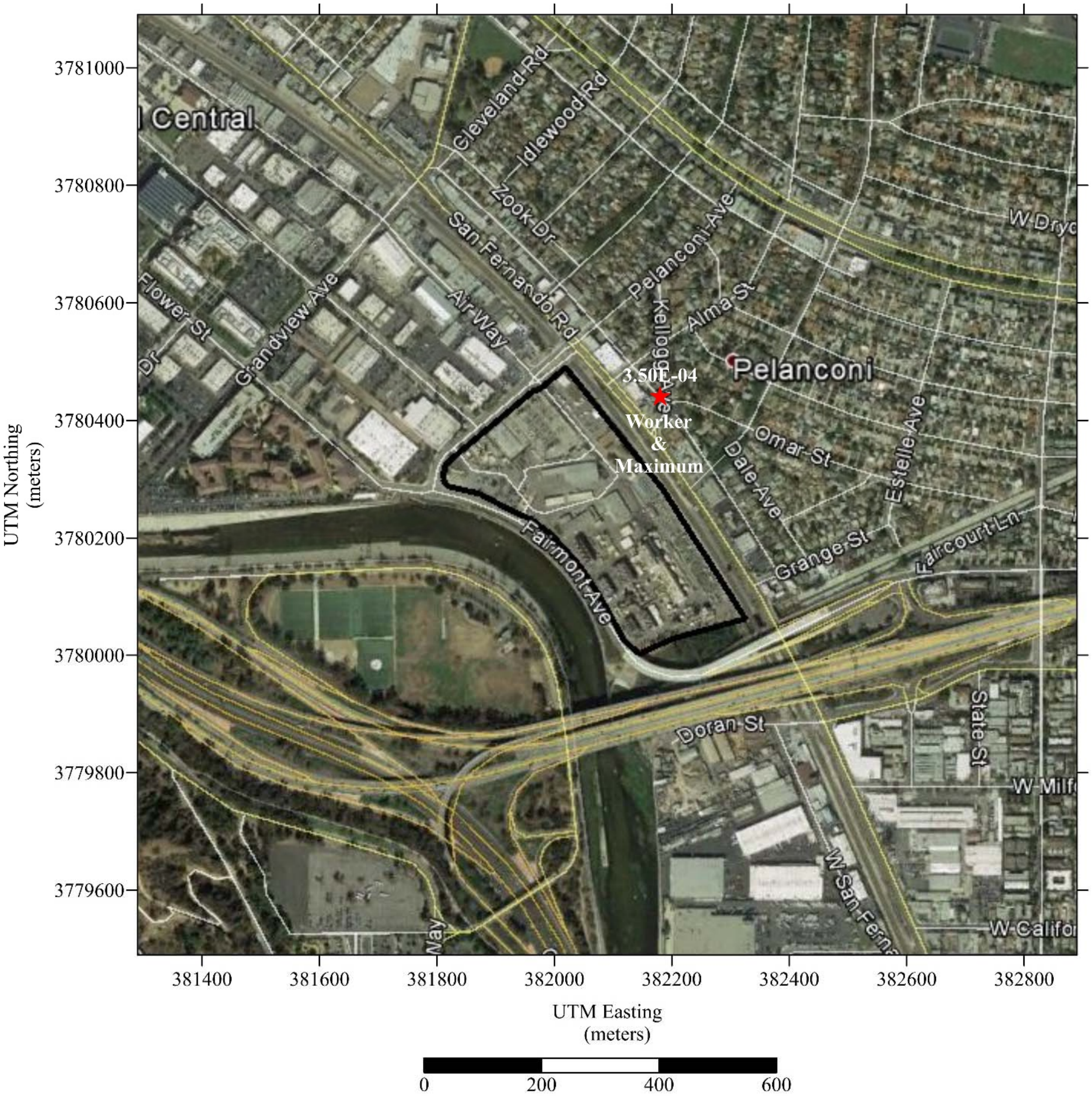
(UNIT OF MEASUREMENT: IN ONE MILLION)



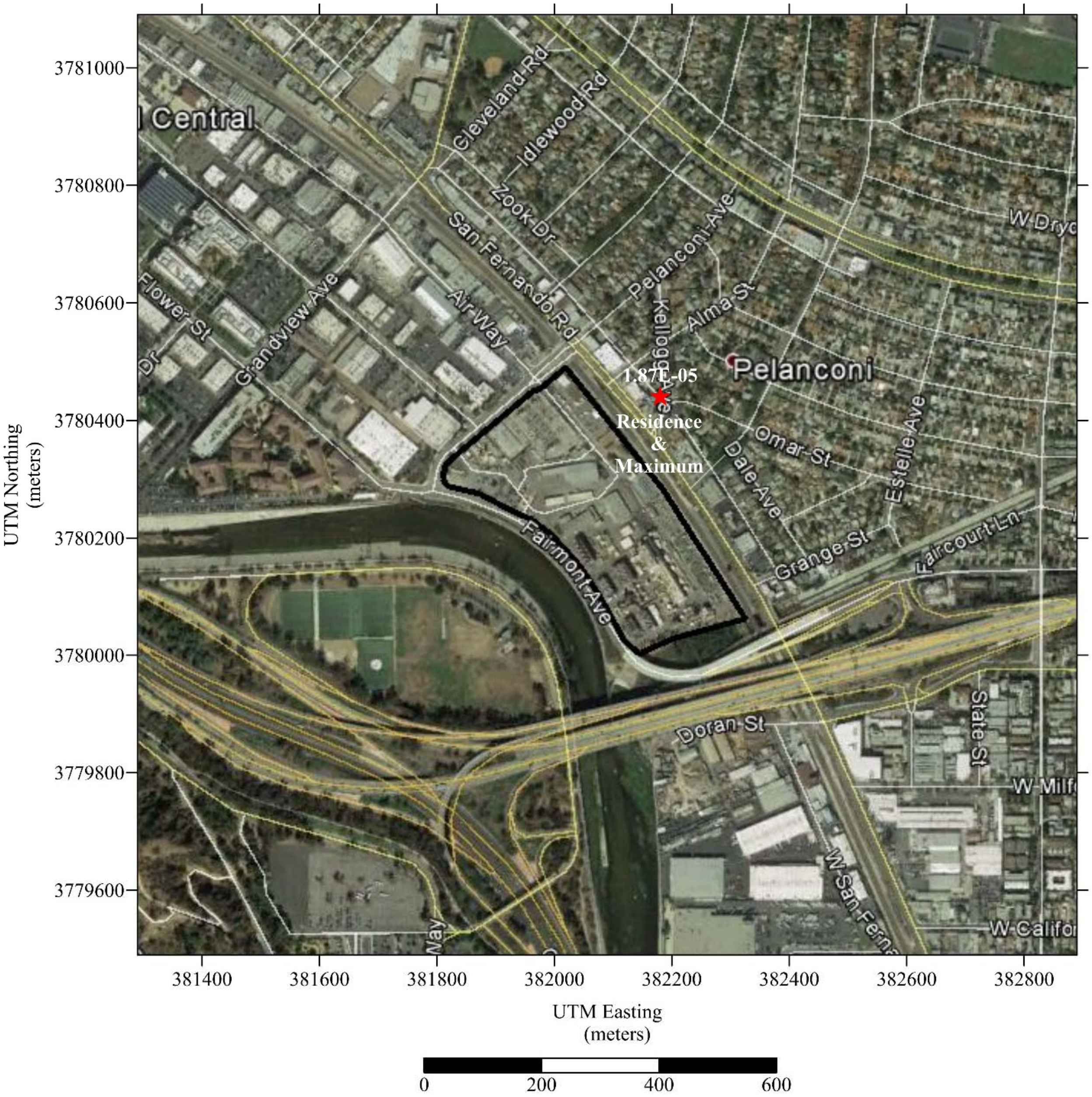
CHRONIC OUTPUT - RESIDENTIAL



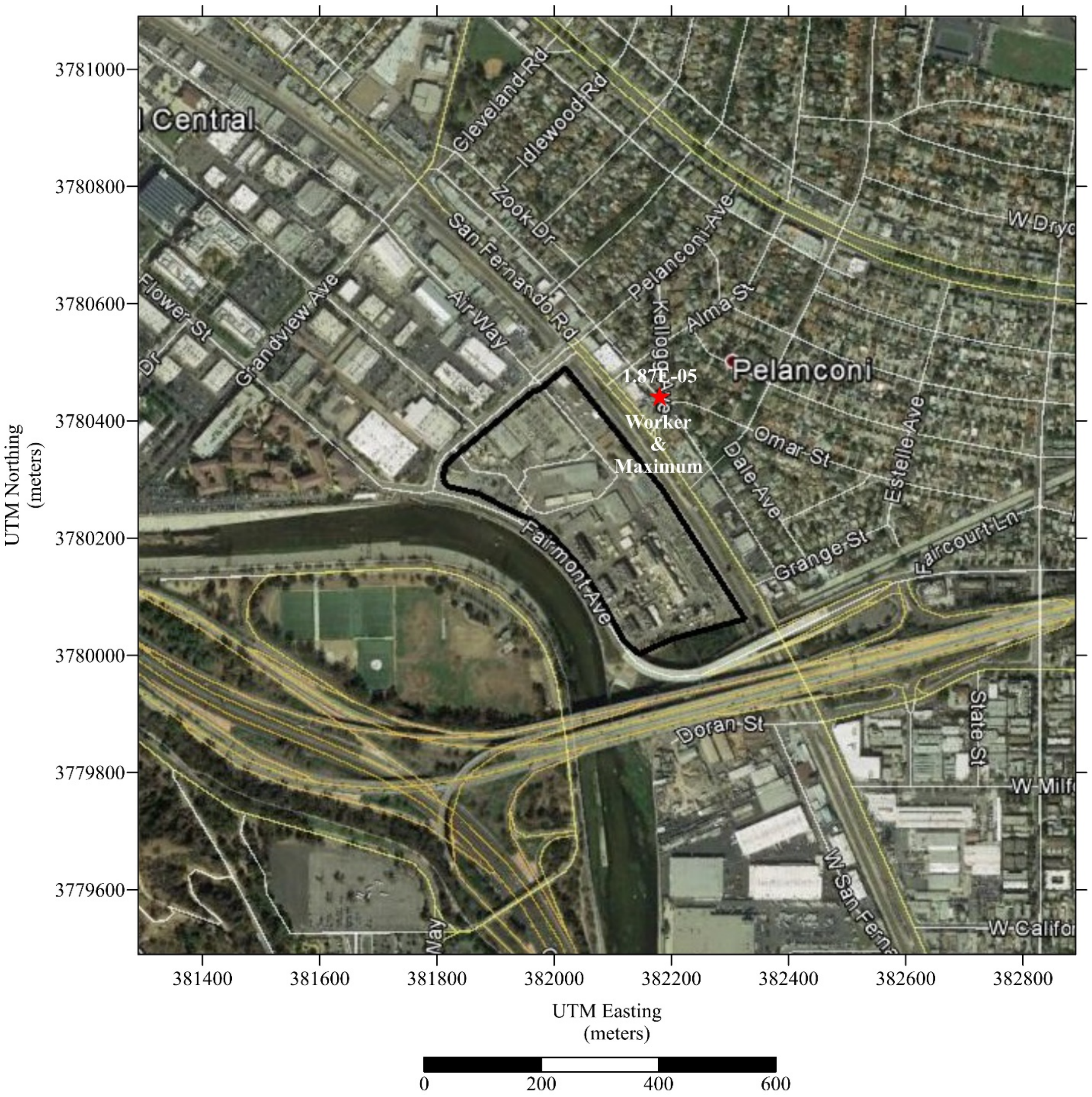
CHRONIC OUTPUT – WORKER



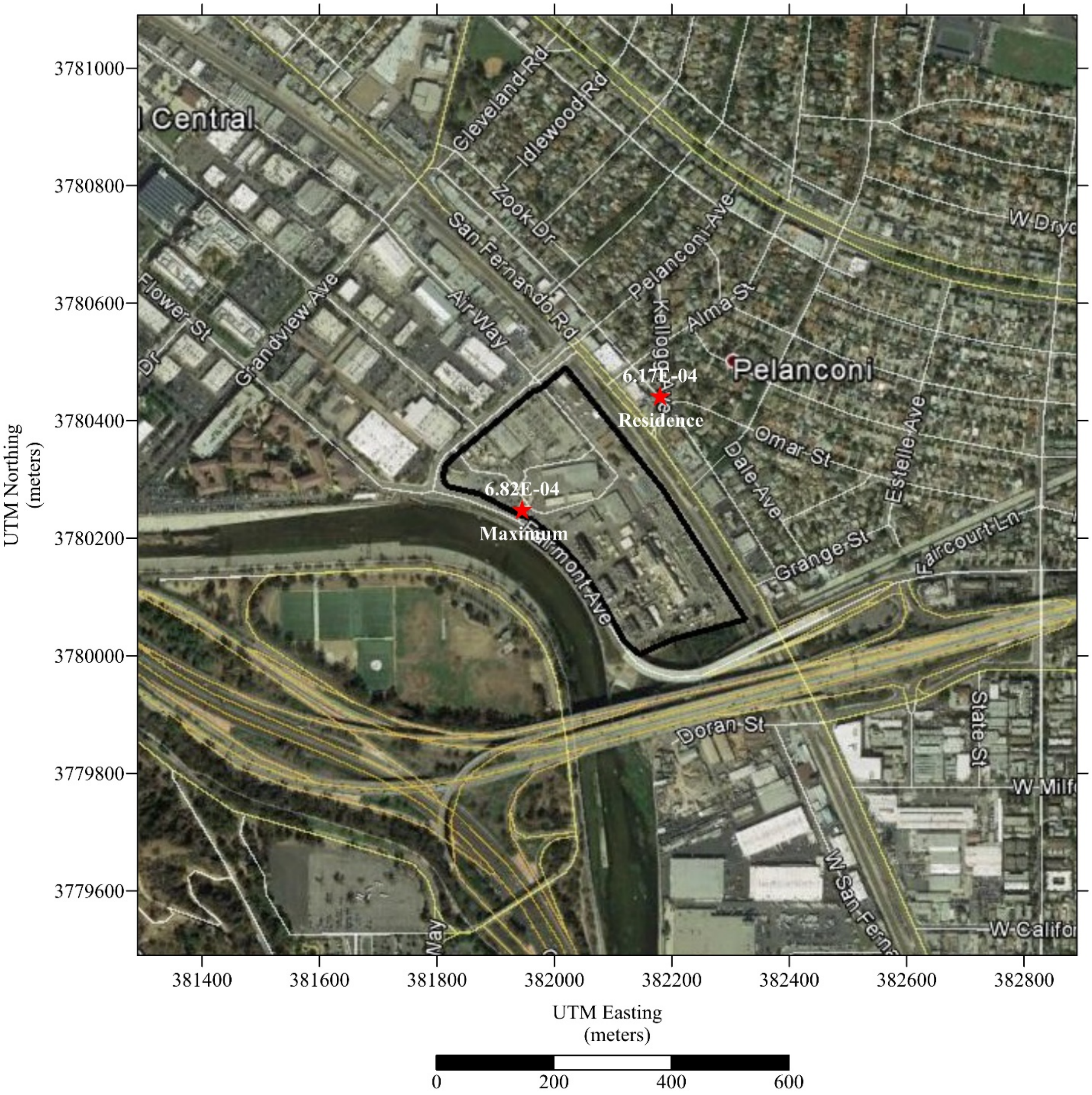
CHRONIC 8-HOUR - RESIDENTIAL



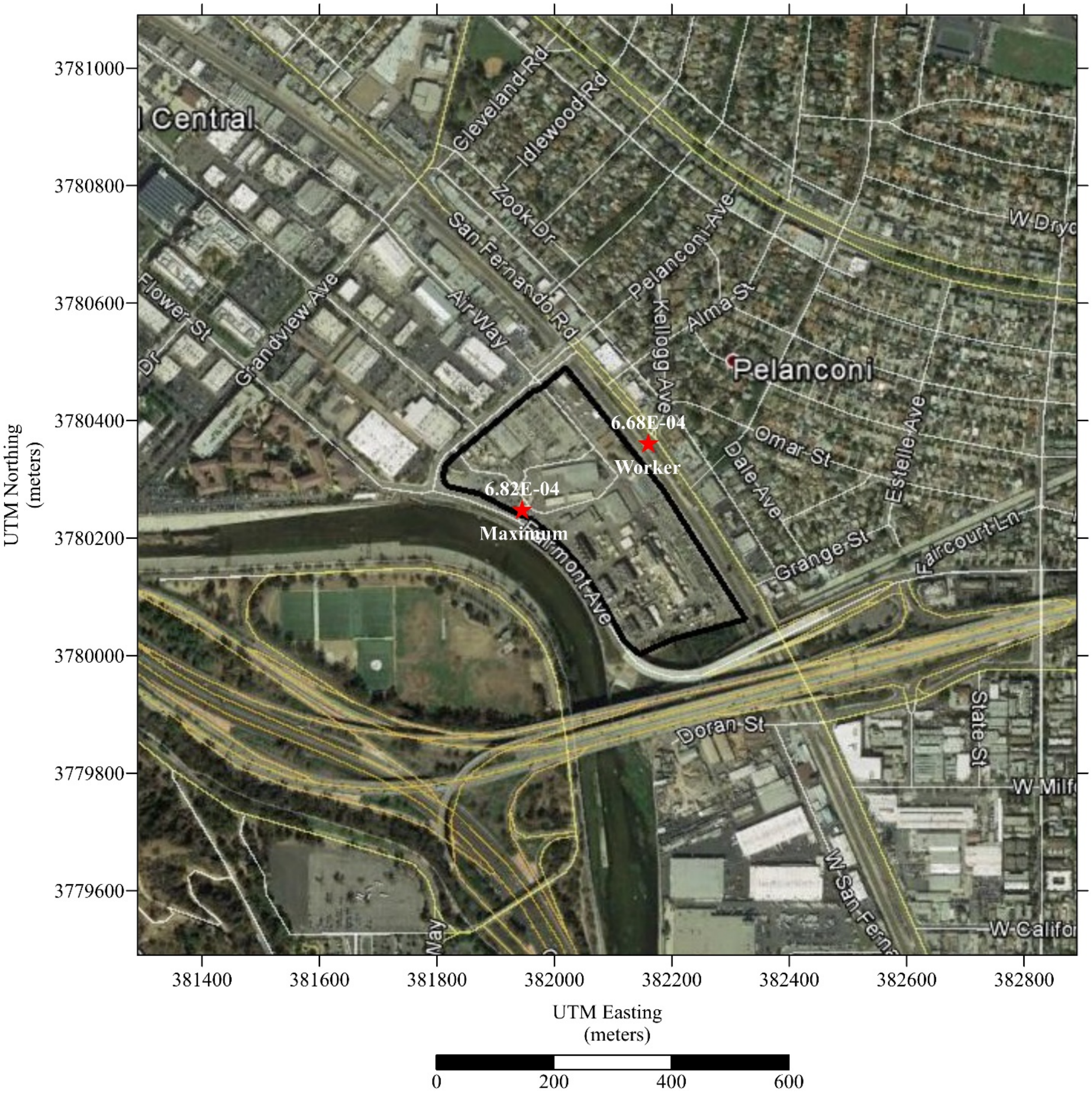
CHRONIC 8-HOUR - WORKER



ACUTE - RESIDENTIAL



ACUTE – WORKER



ALTERNATE 8
ATTACHMENTS

GHG EMISSION INVENTORY

ALTERNATIVE 8 EMISSION INVENTORY
GHG EMISSIONS

GREENHOUSE GASES EMISSION INVENTORY
GRAYSON REPOWERING PROJECT

Greenhouse Gases	GWP[1]	Natural gas emission factor[2], kg/mmBtu	Natural gas emission factor[2], kg/mmcf
CO_2	1	53.06	54400
CH_4	25	0.001	1.03
N_2O	298	0.0001	0.1

NOTES:

[1] GWP = Global Warming Potential. [Source: IPCC, 4th Assessment Report, 2007]

[2] Source: https://www.epa.gov/sites/production/files/2015-11/documents/emission-factors_nov_2015.pdf

[3] Natural gas heating value of 1026 mmBtu/mmscf

GHG Emissions Project

Device/Activity	**Max. Fuel consumption, MMBtu/hr**	**Annual Op. hours**	**CO_2, MT/year**	**CH_4, MT/year**	**N_2O, MT/year**	**Total CO_2e, MT/year**
Unit 8A and Unit BC	1050	1200	66855.6	1.26	0.126	66,925
Facility Occupants			213.38	0.52	0.01	270
					Total Project GHG Emissions:	67,195

GHG Emissions - Baseline Emissions

Device/Activity	**Fuel consumption, MMcf/year**	**CO_2, MT/year**	**CH_4, MT/year**	**N_2O, MT/year**	**Total CO_2e, MT/year**
Boiler 3 (Natural Gas)	0	0	0	0	0
Boiler 3 (Landfill Gas)*	0	0	0	0	0
Boiler 4 (Natural Gas)	700	38,065	0.721	0.070	38,104
Boiler 4 (Landfill Gas)*	745	0	0	0	0
Boiler 5 (Natural Gas)	634	34,502	0.653	0.063	34,538
Boiler 5 (Landfill Gas)*	71	0	0	0	0
Gas Turbine 8A	0	0	0	0	0
Gas Turbine 8B/C	37	2,019	0.038	0.004	2,021
Facility Occupants		213.38	0.52	0.01	270
				Total Project GHG Emissions:	74,933

Note: GHG emissions due to landfill gas are excluded as baseline emissions in the Alternative 8 because these emissions are counted toward Biogas Renewable (Scholl Canyon) Project

GHG Emissions - Net Emissions

Parameters	**Total CO2e, MT/year**
Alternative 8 Project	67,195
Baseline Emissions	74,933
Net Emissions	-7,738

Appendix D HAZARDS AND HAZARDOUS MATERIALS TECHNICAL REPORTS

D.1 Ammonia Release Modeling New Alternatives (7 and 8)

Stantec

Memo

To:	City of Glendale	From:	Shantanu Kongara & Michael Weber 290 Conejo Ridge Avenue, Thousand Oaks, CA 91361
File:	Off-Site Consequence Analysis for Ammonia	Date:	June 2, 2021

Reference: **Off-Site Consequence Analysis for Aqueous Ammonia – Alternative 7 for the Proposed Grayson Repowering Project**

SUMMARY

As part of the California Environmental Quality Act Environmental Impact Report process for the proposed Grayson Repowering Project, the City of Glendale, Department of Water and Power (GWP) has evaluated an alternative to the proposed Project that would include storing 19-percent aqueous ammonia solution in a new 15,000-gallon stationary above ground storage tank for emissions control of five Wartsila natural-gas-fired electrical generating units. The tank would be surrounded by a secondary concrete containment structure that measures 43 feet long, 33 feet wide and five feet deep. Three-inch diameter High Density Polyethylene (HDPE) balls would be placed at the bottom of the containment structure. In the event of a tank release, aqueous ammonia would flow through the spaces created by the presence of the balls and result in the balls floating to the surface of the aqueous ammonia pool. The HDPE balls reduce the surface area of the pool of aqueous ammonia subject to evaporation by 90 percent thereby reducing the rate and of ammonia evaporation. The containment would additionally be capable of holding the entire contents of the tank, in addition to rainwater accumulation. The closest fence line is approximately 60 feet (18.29 meters) from the ammonia storage tank.

An offsite consequence analysis (OCA) was performed for the accidental release of aqueous ammonia from the proposed 15,000-gallon storage tank. The analysis consists of a worst case accidental release scenario involving the failure and complete discharge of the contents of the storage tank into the secondary containment structure.

ANALYSIS

An analysis of the tank failure and subsequent release of aqueous ammonia was prepared using the U.S. Environmental Protection Agency (USEPA) approved SLAB dispersion mode. A complete description of the SLAB model is available in *User's Manual for SLAB: An Atmospheric Dispersion Model for Denser-Than-Air Releases, D.E. Ermak, Lawrence Livermore National Laboratory, June 1990*. The SLAB model user manual contains a substance database, which includes chemical-specific data for ammonia. These data were used in the modeling analysis without any modifications. The analysis assumed the complete failure of the storage tank, the immediate release of the contents of the tank, and the formation of an evaporating pool of aqueous ammonia within the secondary containment structure. Evaporative emissions of ammonia would be subsequently released into the atmosphere. The dispersion and transport of these emissions into the atmosphere would be subject to meteorological conditions at the time of the release. To be conservative, the following meteorological data were used:

- USEPA default (worst case) meteorological data, supplemented by daily temperature data as defined by 19 CCR 2750.2.

The maximum temperature recorded near the Grayson Power Plant in the three years preceding the Notice of Preparation of the Environmental Impact Report was 113° F (degrees Fahrenheit), measured at the Burbank Airport located in Burbank, California (Appendix A). Maximum temperature combined with worst case meteorological conditions (i.e. low wind speeds and stable dispersion conditions) would result in the highest modeled ammonia concentrations at the furthest distance downwind from the release site. The temperature, wind speed, relative humidity, and atmospheric stability used in the modeling are consistent with the USEPA's Risk Management Program Guidance for OCA.[1]

Local surface roughness influences local dispersion rates and wind profiles; thus, at a given distance from the release site, a site with smoother surface (fewer terrain/structure related obstructions) will have smaller dispersion rates and accordingly higher concentrations due to less surface induced mechanical-mixing, than a site with a rougher surface. The USEPA approved AERSURFACE model was used to generate a site-specific surface roughness value for use in the SLAB model.

Emissions of aqueous ammonia used in the SLAB model were estimated using the emissions calculation tool for evaporating solutions provided in the USEPA Areal Locations of Hazardous Atmospheres (ALOHA) model (https://www.epa.gov/cameo/aloha-software). Table 1 below provides the input values used in the SLAB model to perform the OCA.

The ammonia release rate depends on the meteorological conditions and the surface area of the secondary containment area subject to evaporation. The ALOHA model calculated an initial release rate of 12.1 pounds per minute and total emissions of 633 pounds over one hour. For a concentrated solution, the initial evaporation rate is substantially higher than the rate averaged over a few minutes or more since the concentration of solution immediately begins to decrease as evaporation begins. This decrease in evaporation rate of ammonia over time is because ammonia evaporates faster than water, so the amount of ammonia relative to water decreases over time. Correspondingly, the total emission rate over one hour for each scenario was used in the SLAB model rather than an assumed continuation of the initial release rate.

For an evaporating pool type source, the SLAB model fixes the release height at 0 meters above ground level (AGL). This represents a conservative approach although the secondary containment structure is five feet (1.524 meters) AGL. Downwind concentrations of ammonia were calculated at heights of 0 and 1.6 meters above ground level. The California Office of Environmental Health Hazard Assessment (OEHHA) has designated 1.6 meters as the breathing zone height for individuals. Reported distances to specific toxic endpoints are the maximum distances for concentrations at 0 and 1.6 meters AGL.

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[1] USEPA, Risk Management Program Guidance for Off-site Consequence Analysis, 2009, available at https://www.epa.gov/sites/production/files/2013-11/documents/oca-chps.pdf.

Table 1. SLAB Model Inputs

Parameter	Data Used for Dispersion Modelling
Wind Speed:	1.5 meters/second
Relative Humidity:	50 percent
Ambient Temperature:	113° F
Surface Roughness:	0.378 meters
Stability Class:	F (Very Stable)
Secondary Containment Area:	13.18 square-meters
Ammonia Emission Rate:	633 pounds/hour

TOXIC EFFECTS OF AMMONIA

The odor threshold of ammonia is approximately 5 parts per million (ppm).Minor irritation of the nose and throat will occur at 30 to 50 ppm. Concentrations greater than 140 ppm will cause detectable effects on lung function even for short-term exposures (0.5 to 2 hours). At higher concentrations of 700 to 1,700 ppm, ammonia gas will cause severe effects; death occurs at concentrations of 2,500 to 7,000 ppm.

With respect to the assessment of potential impacts associated with an accidental release of ammonia, three offsite “bench mark” exposure levels were evaluated, as follows: (1) the Occupational Safety and Health Administration’s (OSHA) Immediately Dangerous to Life and Health (IDLH) level of 300 ppm; (2) USEPA’s Accidental Release Prevention (ARP) Program Toxic Endpoint (TE) level of 200 ppm; and (3) the level considered by the California Energy Commission (CEC) staff to be without serious adverse effects on the public for a one-time exposure of 75 ppm.

MODELING RESULTS

Table 2 shows the modeled distances to the three benchmark criteria concentrations: OSHA’s IDLH (300 ppm), USEPA’s ARP Program TE (200 ppm), and CEC significance level (75 ppm).

Table 2. Modeling Results

Height	Distance to OSHA’s IDLH[a] 300 ppm	Distance to USEPA’s ARP TE[b] 200 ppm	Distance to CEC Significance Level[b] 75 ppm
0 m, AGL	12.20 m	12.40 m	13.00 m
1.6 m, AGL	13.40 m	13.75 m	14.50 m

[a] Benchmark based on a 30-minute exposure or averaging time

[b] Benchmark based on a 60-minute exposure or averaging time

m = meters

The results of the OCA for the worst-case release of ammonia indicates that the concentrations for all three considered benchmark criteria (300, 200, and 75 ppm)do not extend beyond the facility fence line. Figure 1 shows the dispersion contours associated with the modeling worst case release scenario. The model input and output files are included in Appendix A.

Reference: Off-Site Consequence Analysis for Aqueous Ammonia

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Senior Principal Scientist
Phone (805) 477-8580
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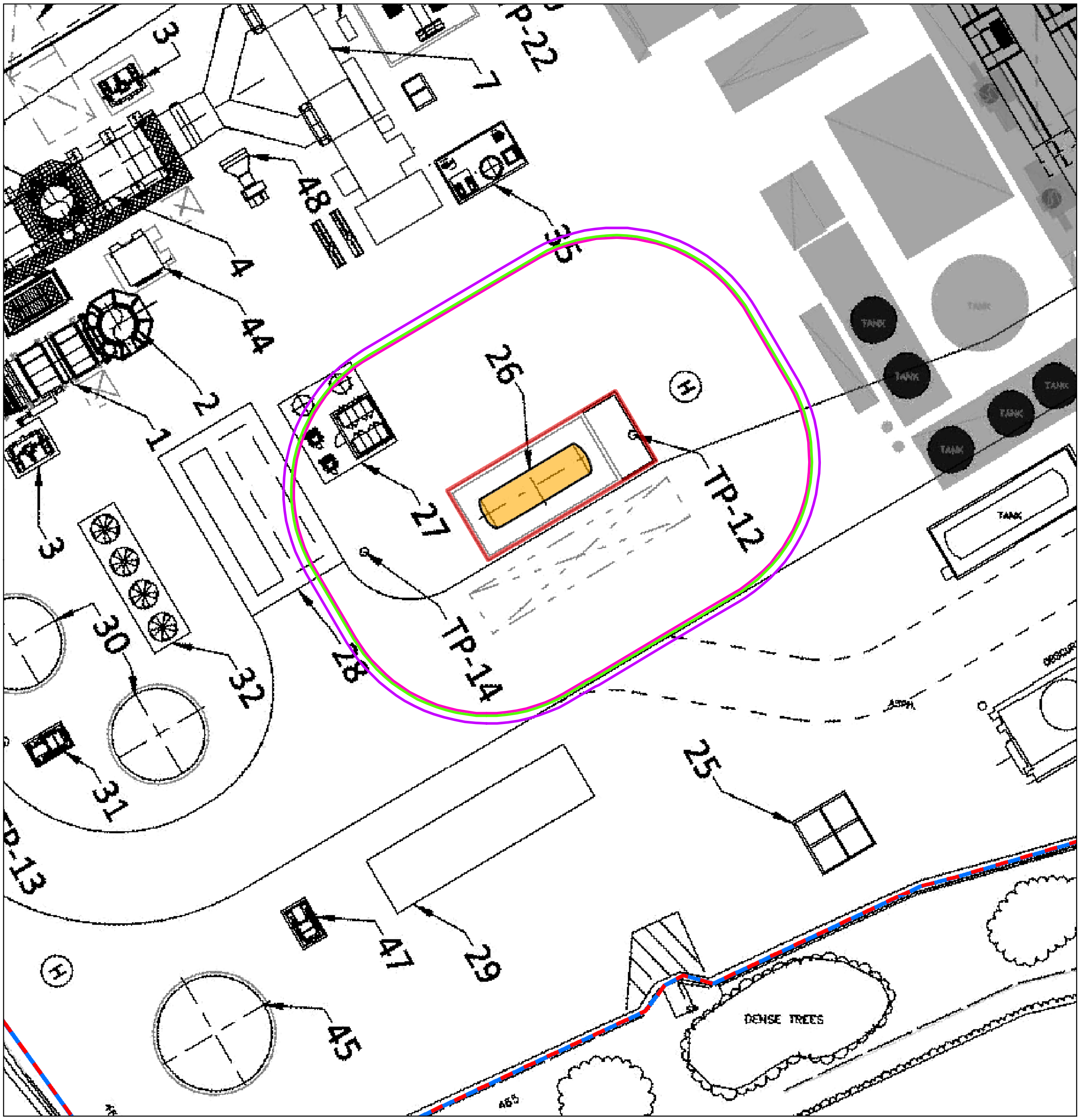
ATTACHMENTS

Figure 1 (Maximum Ammonia Concentrations due to Tank Failure)

Appendix A (Temperature and Modeling Files)



- 🟥 Grayson Power Plant Facility Boundary
- 🟦 Utility Operations Center Boundary
- 🟧 Wartsila NH3 Tank
- 🟥 Secondary Containment
- 🟪 Distance to IDLH (40.02 Feet)
- 🟩 Distance to ARP TE (40.68 Feet)
- 🟪 Distance to CEC Significance Level (42.65 Feet)

0 20 40 Feet

(At original document size of 8.5x11)
1:480

N

Stantec

Project Location
Glendale
Los Angeles County, CA

Prepared by DL on 2021-06-16
TR by RB on 2021-06-16
IR by SR on 2021-06-16

Client/Project
1858046831_002
Grayson Repowering Project
Clean Energy Alternative

Figure No.
1

Title
Maximum Ammonia Concentrations Due To Tank Failure (HDPE Balls in Containment)

Notes
1. Coordinate System: NAD 1983 UTM Zone 11N
2. Data Sources: Stantec 2020.
3. Background: Glendale Water and Power | GRAYSON REPOWERING PROJECT ALTERNATIVE 8 GENERAL ARRANGEMENT SITE | Sheet: G1003 | 07/21/2021

V:\1858\Active\185804681_GraysonRepower03_data\gis_cad\gis\1858046381_002_TankAlt8.mxd Revised: 2021-07-26 By: Dalaw

APPENDIX A

TEMPERATURE AND MODELING FILES

34.15 °N, **118.34** °W

Burbank, CA Weather History ★

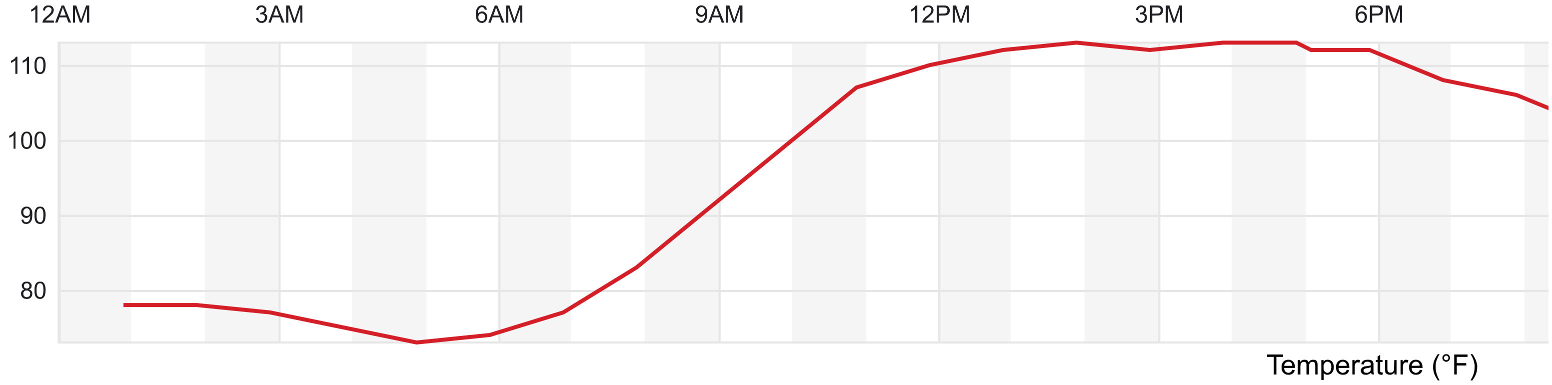
83° BOB HOPE AIRPORT STATION (/WEATHER/US/CA/BURBANK/KBUR?CM_VEN=LOCALWX_PWSDASH) | CHANGE

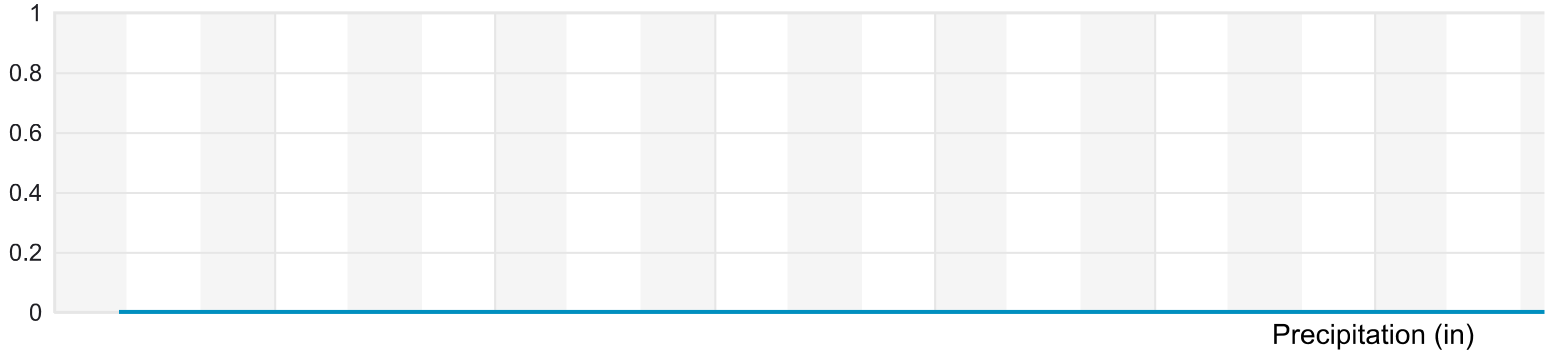
HISTORY (/HISTORY/DAILY/US/CA/BURBANK/KBUR)

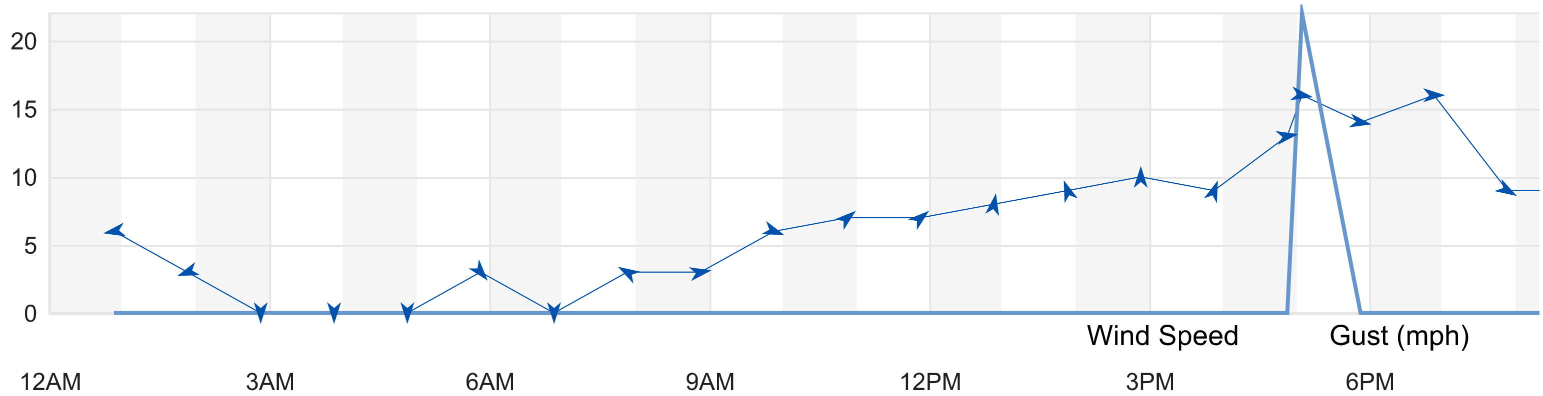
- TODAY (/WEATHER/US/CA/BURBANK/KBUR)
- HOURLY (/HOURLY/US/CA/BURBANK/KBUR)
- 10-DAY (/FORECAST/US/CA/BURBANK/KBUR)
- CALENDAR (/CALENDAR/US/CA/BURBANK/KBUR)
- HISTORY (/HISTORY/DAILY/US/CA/BURBANK/KBUR)
- WUNDERMAP (/WUNDERMAP?LAT=34.15&LON=-118.34)

Daily (/history/daily/us/ca/burbank/KBUR/date/2018-7-6) Weekly (/history/weekly/us/ca/burbank/KBUR/date/2018-7-6) Monthly (/history/monthly/us/ca/burbank/KBUR/date/2018-7)

July 6 2018 View







Summary

Temperature (° F)	Actual	Historic Avg.	Record
High Temp	113	85	115
Low Temp	73	62	53
Day Average Temp	96.72	74	-

Precipitation (Inches)	Actual	Historic Avg.	Record
Precipitation (past 24 hours from 07:53:00)	0.00	--	-

Dew Point (° F)	Actual	Historic Avg.	Record
Dew Point	37.88	-	-
High	57	-	-
Low	24	-	-
Average	37.88	-	-

Wind (MPH)	Actual	Historic Avg.	Record
Max Wind Speed	16	-	-
Visibility	10	-	-

Sea Level Pressure (Hg)	Actual	Historic Avg.	Record
Sea Level Pressure	29.13	-	-

Astronomy	Day Length	Rise	Set
Actual Time	14h 20m	5:48 AM	8:09 PM
Civil Twilight		5:19 AM	8:38 PM

Temperature (° F)	Actual	Historic Avg.	Record	▲
Nautical Twilight		4:44 AM	9:14 PM	
Astronomical Twilight		4:05 AM	9:53 PM	
Moon: waning gibbous		12:54 AM	1:29 PM	

Daily Observations

Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Prec
12:53 AM	78 °F	57 °F	48 %	E	6 mph	0 mph	29.13 in	0.0 i
1:53 AM	78 °F	52 °F	40 %	ENE	3 mph	0 mph	29.13 in	0.0 i
2:53 AM	77 °F	46 °F	33 %	CALM	0 mph	0 mph	29.11 in	0.0 i
3:53 AM	75 °F	43 °F	32 %	CALM	0 mph	0 mph	29.10 in	0.0 i
4:53 AM	73 °F	45 °F	37 %	CALM	0 mph	0 mph	29.10 in	0.0 i
5:53 AM	74 °F	44 °F	34 %	NW	3 mph	0 mph	29.09 in	0.0 i
6:53 AM	77 °F	39 °F	25 %	CALM	0 mph	0 mph	29.10 in	0.0 i
7:53 AM	83 °F	44 °F	25 %	ESE	3 mph	0 mph	29.12 in	0.0 i
8:53 AM	91 °F	34 °F	13 %	W	3 mph	0 mph	29.11 in	0.0 i
9:53 AM	99 °F	33 °F	10 %	WNW	6 mph	0 mph	29.09 in	0.0 i
10:53 AM	107 °F	30 °F	7 %	SW	7 mph	0 mph	29.08 in	0.0 i
11:53 AM	110 °F	24 °F	5 %	SW	7 mph	0 mph	29.08 in	0.0 i
12:53 PM	112 °F	29 °F	6 %	S	8 mph	0 mph	29.06 in	0.0 i
1:53 PM	113 °F	33 °F	7 %	SSE	9 mph	0 mph	29.04 in	0.0 i
2:53 PM	112 °F	32 °F	6 %	S	10 mph	0 mph	29.02 in	0.0 i
3:53 PM	113 °F	30 °F	6 %	SSW	9 mph	0 mph	29.00 in	0.0 i
4:53 PM	113 °F	35 °F	7 %	W	13 mph	0 mph	28.98 in	0.0 i
5:05 PM	112 °F	36 °F	8 %	W	16 mph	22 mph	28.98 in	0.0 i
5:53 PM	112 °F	35 °F	7 %	W	14 mph	0 mph	28.98 in	0.0 i
6:53 PM	108 °F	40 °F	10 %	W	16 mph	0 mph	28.97 in	0.0 i
7:53 PM	106 °F	36 °F	9 %	WNW	9 mph	0 mph	28.98 in	0.0 i
8:53 PM	102 °F	36 °F	10 %	NW	9 mph	0 mph	28.98 in	0.0 i
9:53 PM	99 °F	37 °F	12 %	WNW	7 mph	0 mph	29.00 in	0.0 i
10:53 PM	98 °F	38 °F	12 %	NW	7 mph	0 mph	29.01 in	0.0 i

Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Pre
11:53 PM	96 °F	39 °F	14 %	W	3 mph	0 mph	29.01 in	0.0 i

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Stantec

Memo

To: City of Glendale

From: Shantanu Kongara & Michael Weber

290 Conejo Ridge Avenue,
Thousand Oaks, CA 91361

File: Off-Site Consequence Analysis for Ammonia

Date: June 2, 2021

Reference: Off-Site Consequence Analysis for Aqueous Ammonia – Alternative 8 for the Proposed Grayson Repowering Project

SUMMARY

As part of the California Environmental Quality Act Environmental Impact Report process for the proposed Grayson Repowering Project, the City of Glendale, Department of Water and Power (GWP) has evaluated an alternative to the proposed Project that would include storing 19-percent aqueous ammonia solution in a new 15,000-gallon stationary above ground storage tank for emissions control of five Wartsila natural-gas-fired electrical generating units. The tank would be surrounded by a secondary concrete containment structure that measures 43 feet long, 33 feet wide and five feet deep. Three-inch diameter High Density Polyethylene (HDPE) balls would be placed at the bottom of the containment structure. In the event of a tank release, aqueous ammonia would flow through the spaces created by the presence of the balls and result in the balls floating to the surface of the aqueous ammonia pool. The HDPE balls reduce the surface area of the pool of aqueous ammonia subject to evaporation by 90 percent thereby reducing the rate and of ammonia evaporation. The containment would additionally be capable of holding the entire contents of the tank, in addition to rainwater accumulation. The closest fence line is approximately 100 feet (30.48 meters) from the ammonia storage tank.

An offsite consequence analysis (OCA) was performed for the accidental release of aqueous ammonia from the proposed 15,000-gallon storage tank. The analysis consists of a worst case accidental release scenario involving the failure and complete discharge of the contents of the storage tank into the secondary containment structure.

ANALYSIS

An analysis of the tank failure and subsequent release of aqueous ammonia was prepared using the U.S. Environmental Protection Agency (USEPA) approved SLAB dispersion mode. A complete description of the SLAB model is available in *User's Manual for SLAB: An Atmospheric Dispersion Model for Denser-Than-Air Releases, D.E. Ermak, Lawrence Livermore National Laboratory, June 1990*. The SLAB model user manual contains a substance database, which includes chemical-specific data for ammonia. These data were used in the modeling analysis without any modifications. The analysis assumed the complete failure of the storage tank, the immediate release of the contents of the tank, and the formation of an evaporating pool of aqueous ammonia within the secondary containment structure. Evaporative emissions of ammonia would be subsequently released into the atmosphere. The dispersion and transport of these emissions into the atmosphere would be subject to meteorological conditions at the time of the release. To be conservative, the following meteorological data were used:

- USEPA default (worst case) meteorological data, supplemented by daily temperature data as defined by 19 CCR 2750.2.

The maximum temperature recorded near the Grayson Power Plant in the three years preceding the Notice of Preparation of the Environmental Impact Report was 113° F (degrees Fahrenheit), measured at the Burbank Airport located in Burbank, California (Appendix A). Maximum temperature combined with worst case meteorological conditions (i.e. low wind speeds and stable dispersion conditions) would result in the highest modeled ammonia concentrations at the furthest distance downwind from the release site. The temperature, wind speed, relative humidity, and atmospheric stability used in the modeling are consistent with the USEPA's Risk Management Program Guidance for OCA.[1]

Local surface roughness influences local dispersion rates and wind profiles; thus, at a given distance from the release site, a site with smoother surface (fewer terrain/structure related obstructions) will have smaller dispersion rates and accordingly higher concentrations due to less surface induced mechanical-mixing, than a site with a rougher surface. The USEPA approved AERSURFACE model was used to generate a site-specific surface roughness value for use in the SLAB model.

Emissions of aqueous ammonia used in the SLAB model were estimated using the emissions calculation tool for evaporating solutions provided in the USEPA Areal Locations of Hazardous Atmospheres (ALOHA) model (https://www.epa.gov/cameo/aloha-software). Table 1 below provides the input values used in the SLAB model to perform the OCA.

The ammonia release rate depends on the meteorological conditions and the surface area of the secondary containment area subject to evaporation. The ALOHA model calculated an initial release rate of 12.1 pounds per minute and total emissions of 633 pounds over one hour. For a concentrated solution, the initial evaporation rate is substantially higher than the rate averaged over a few minutes or more since the concentration of solution immediately begins to decrease as evaporation begins. This decrease in evaporation rate of ammonia over time is because ammonia evaporates faster than water, so the amount of ammonia relative to water decreases over time. Correspondingly, the total emission rate over one hour for each scenario was used in the SLAB model rather than an assumed continuation of the initial release rate.

For an evaporating pool type source, the SLAB model fixes the release height at 0 meters above ground level (AGL). This represents a conservative approach although the secondary containment structure is five feet (1.524 meters) AGL. Downwind concentrations of ammonia were calculated at heights of 0 and 1.6 meters above ground level. The California Office of Environmental Health Hazard Assessment (OEHHA) has designated 1.6 meters as the breathing zone height for individuals. Reported distances to specific toxic endpoints are the maximum distances for concentrations at 0 and 1.6 meters AGL.

---

[1] USEPA, Risk Management Program Guidance for Off-site Consequence Analysis, 2009, available at https://www.epa.gov/sites/production/files/2013-11/documents/oca-chps.pdf.

Table 1. SLAB Model Inputs

Parameter	Data Used for Dispersion Modelling
Wind Speed:	1.5 meters/second
Relative Humidity:	50 percent
Ambient Temperature:	113° F
Surface Roughness:	0.378 meters
Stability Class:	F (Very Stable)
Secondary Containment Area:	13.18 square-meters
Ammonia Emission Rate:	633 pounds/hour

TOXIC EFFECTS OF AMMONIA

The odor threshold of ammonia is approximately 5 parts per million (ppm).Minor irritation of the nose and throat will occur at 30 to 50 ppm. Concentrations greater than 140 ppm will cause detectable effects on lung function even for short-term exposures (0.5 to 2 hours). At higher concentrations of 700 to 1,700 ppm, ammonia gas will cause severe effects; death occurs at concentrations of 2,500 to 7,000 ppm.

With respect to the assessment of potential impacts associated with an accidental release of ammonia, three offsite "bench mark" exposure levels were evaluated, as follows: (1) the Occupational Safety and Health Administration's (OSHA) Immediately Dangerous to Life and Health (IDLH) level of 300 ppm; (2) USEPA's Accidental Release Prevention (ARP) Program Toxic Endpoint (TE) level of 200 ppm; and (3) the level considered by the California Energy Commission (CEC) staff to be without serious adverse effects on the public for a one-time exposure of 75 ppm.

MODELING RESULTS

Table 2 shows the modeled distances to the three benchmark criteria concentrations: OSHA's IDLH (300 ppm), USEPA's ARP Program TE (200 ppm), and CEC significance level (75 ppm).

Table 2. Modeling Results

Height	Distance to OSHA's IDLH[a] 300 ppm	Distance to USEPA's ARP TE[b] 200 ppm	Distance to CEC Significance Level[b] 75 ppm
0 m, AGL	12.20 m	12.40 m	13.00 m
1.6 m, AGL	13.40 m	13.75 m	14.50 m

[a] Benchmark based on a 30-minute exposure or averaging time
[b] Benchmark based on a 60-minute exposure or averaging time
m = meters

The results of the OCA for the worst-case release of ammonia indicates that the concentrations for all three considered benchmark criteria (300, 200, and 75 ppm)do not extend beyond the facility fence line. Figure 1 shows the dispersion contours associated with the modeling worst case release scenario. The model input and output files are included in Appendix A.

Reference: Off-Site Consequence Analysis for Aqueous Ammonia

STANTEC CONSULTING SERVICES INC.

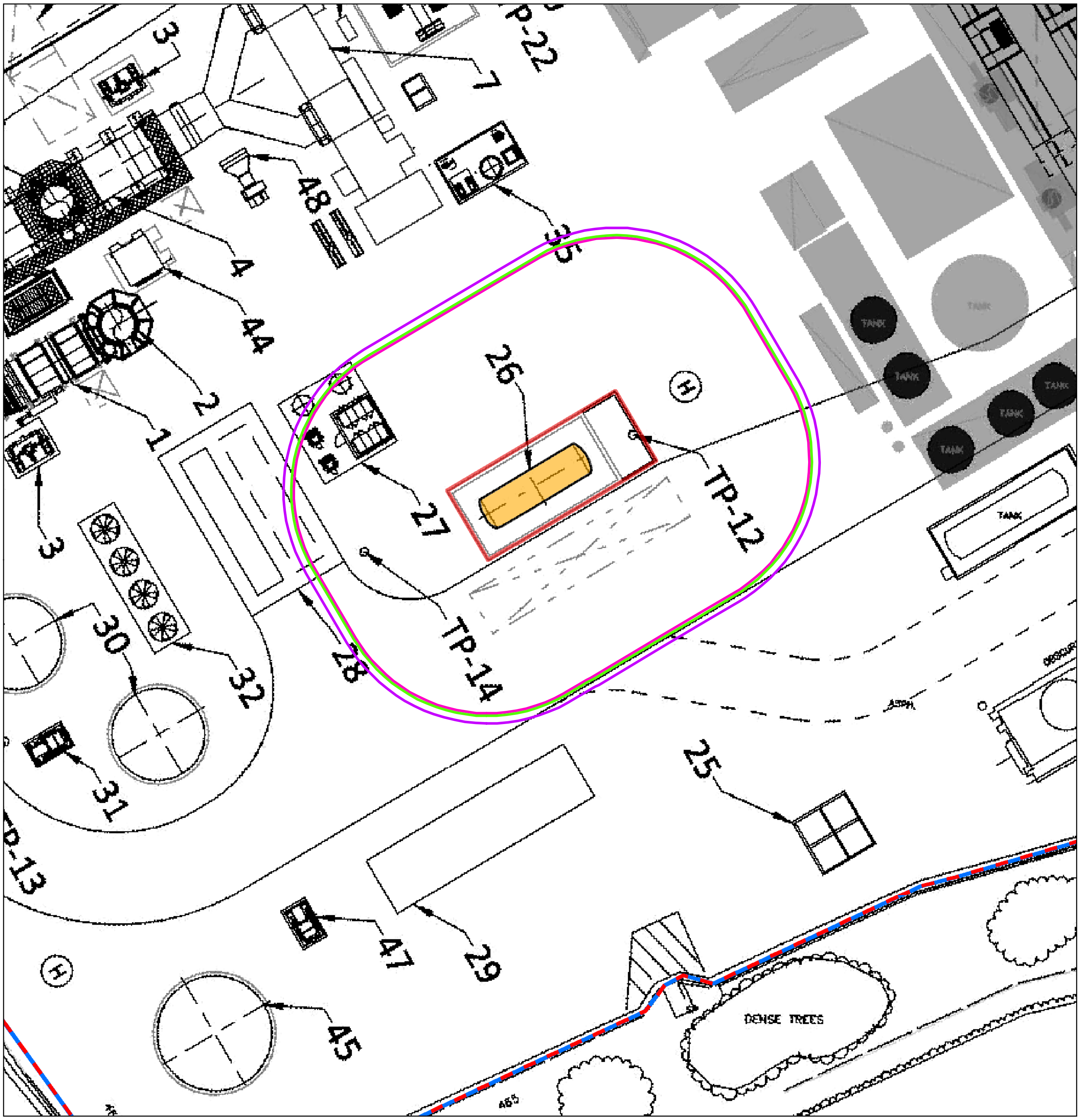
Shantanu Kongara
Engineering Consultant
Phone: (480) 829-0457
shantanu.kongara@stantec.com

Michael Weber
Senior Principal Scientist
Phone (805) 477-8580
michael.weber@stantec.com

ATTACHMENTS

Figure 1 (Maximum Ammonia Concentrations due to Tank Failure)

Appendix A (Temperature and Modeling Files)



- 🟥 Grayson Power Plant Facility Boundary
- 🟦 Utility Operations Center Boundary
- 🟧 Wartsila NH3 Tank
- 🟥 Secondary Containment
- 🟪 Distance to IDLH (40.02 Feet)
- 🟩 Distance to ARP TE (40.68 Feet)
- 🟪 Distance to CEC Significance Level (42.65 Feet)

0 20 40 Feet

(At original document size of 8.5x11)
1:480

N

Notes
1. Coordinate System: NAD 1983 UTM Zone 11N
2. Data Sources: Stantec 2020.
3. Background: Glendale Water and Power | GRAYSON REPOWERING PROJECT ALTERNATIVE 8 GENERAL ARRANGEMENT SITE | Sheet: G1003 | 07/21/2021

Stantec

Project Location
Glendale
Los Angeles County, CA

Prepared by DL on 2021-06-16
TR by RB on 2021-06-16
IR by SR on 2021-06-16

Client/Project
1858046831_002

Grayson Repowering Project
Clean Energy Alternative

Figure No.
1

Title
Maximum Ammonia Concentrations Due To Tank Failure (HDPE Balls in Containment)

V:\1858\Active\185804681_GraysonRepower\03_data\gis_cad\gis\1858046381_002_TankAlt8.mxd Revised: 2021-07-26 By: Dalaw

APPENDIX A

TEMPERATURE AND MODELING FILES

Search Locations Log in (Log…

★ Popular Cities

San Francisco, CA ⚠
63 °F Partly Cloudy

Manhattan, NY
85 °F Mostly Cloudy

Schiller Park, IL (601
75 °F Sunny

34.15 °N, **118.34** °W

Burbank, CA Weather History ★

83° BOB HOPE AIRPORT STATION (/WEATHER/US/CA/BURBANK/KBUR?CM_VEN=LOCALWX_PWSDASH) | CHANGE

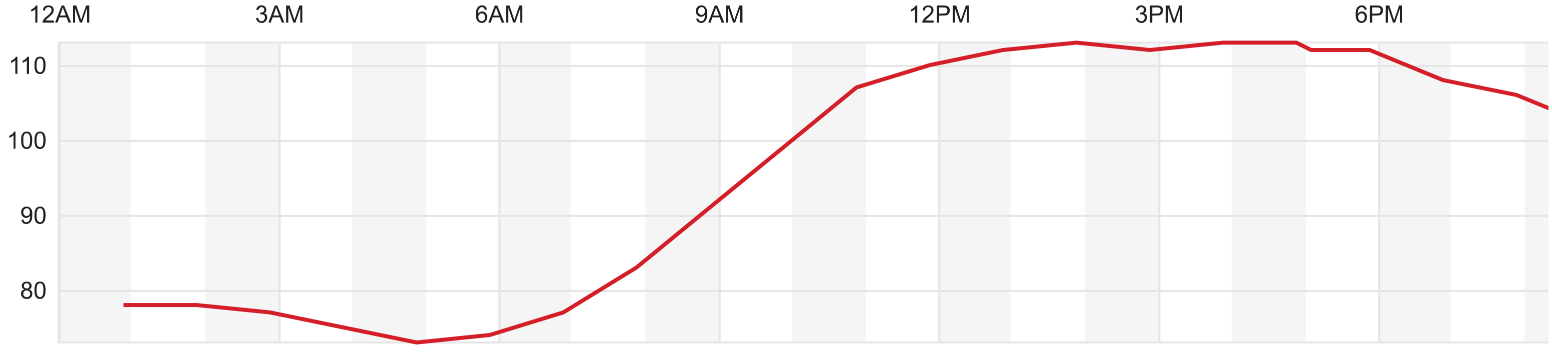
HISTORY (/HISTORY/DAILY/US/CA/BURBANK/KBUR)

- TODAY (/WEATHER/US/CA/BURBANK/KBUR)
- HOURLY (/HOURLY/US/CA/BURBANK/KBUR)
- 10-DAY (/FORECAST/US/CA/BURBANK/KBUR)
- CALENDAR (/CALENDAR/US/CA/BURBANK/KBUR)
- HISTORY (/HISTORY/DAILY/US/CA/BURBANK/KBUR)
- WUNDERMAP (/WUNDERMAP?LAT=34.15&LON=-118.34)

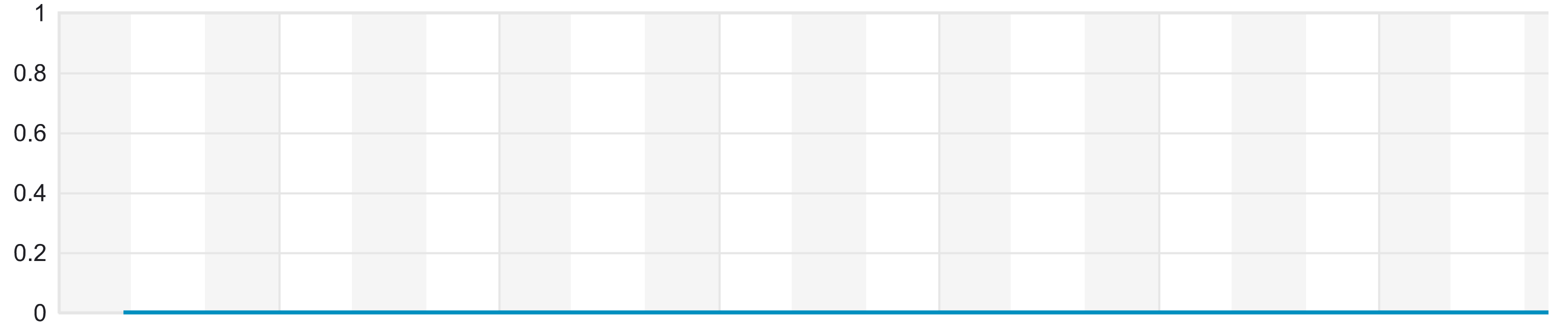
Daily Weekly Monthly

(/history/daily/us/ca/burbank/KBUR/date/2018-7-6) (/history/weekly/us/ca/burbank/KBUR/date/2018-7-6) (/history/monthly/us/ca/burbank/KBUR/date/2018-7)

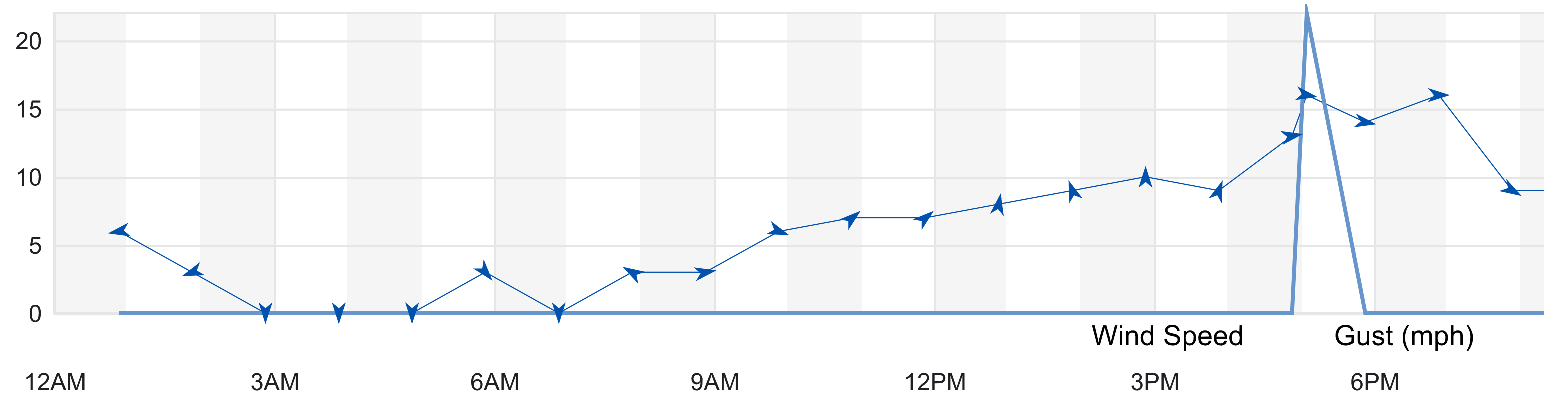
July 6 2018 View



Temperature (°F)



Precipitation (in)



Summary

Temperature (° F)	Actual	Historic Avg.	Record	▲
High Temp	113	85	115	
Low Temp	73	62	53	
Day Average Temp	96.72	74	-	

Precipitation (Inches)	Actual	Historic Avg.	Record	▲
Precipitation (past 24 hours from 07:53:00)	0.00	--	-	

Dew Point (° F)	Actual	Historic Avg.	Record	▲
Dew Point	37.88	-	-	
High	57	-	-	
Low	24	-	-	
Average	37.88	-	-	

Wind (MPH)	Actual	Historic Avg.	Record	▲
Max Wind Speed	16	-	-	
Visibility	10	-	-	

Sea Level Pressure (Hg)	Actual	Historic Avg.	Record	▲
Sea Level Pressure	29.13	-	-	

Astronomy	Day Length	Rise	Set	▲
Actual Time	14h 20m	5:48 AM	8:09 PM	
Civil Twilight		5:19 AM	8:38 PM	

Temperature (° F)	Actual	Historic Avg.	Record	▲
Nautical Twilight		4:44 AM	9:14 PM	
Astronomical Twilight		4:05 AM	9:53 PM	
Moon: waning gibbous		12:54 AM	1:29 PM	

Daily Observations

Time	**Temperature**	**Dew Point**	**Humidity**	**Wind**	**Wind Speed**	**Wind Gust**	**Pressure**	**Pre**
12:53 AM	78 °F	57 °F	48 %	E	6 mph	0 mph	29.13 in	0.0 i
1:53 AM	78 °F	52 °F	40 %	ENE	3 mph	0 mph	29.13 in	0.0 i
2:53 AM	77 °F	46 °F	33 %	CALM	0 mph	0 mph	29.11 in	0.0 i
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4:53 AM	73 °F	45 °F	37 %	CALM	0 mph	0 mph	29.10 in	0.0 i
5:53 AM	74 °F	44 °F	34 %	NW	3 mph	0 mph	29.09 in	0.0 i
6:53 AM	77 °F	39 °F	25 %	CALM	0 mph	0 mph	29.10 in	0.0 i
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10:53 PM	98 °F	38 °F	12 %	NW	7 mph	0 mph	29.01 in	0.0 i

Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Pre
11:53 PM	96 °F	39 °F	14 %	W	3 mph	0 mph	29.01 in	0.0 i

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D.2 Tesla Battery Release Modeling New Alternatives (7 & 8)

Stantec **Memo**

To:	City of Glendale	From:	Kristy Edblad & Reid Blaich 290 Conejo Ridge Avenue, Thousand Oaks, CA 91361
File:	Off-Site Consequence Analysis for BESS Fire Emissions Modeling	Date:	August 1, 2021

Reference: **BESS Fire Emissions Modeling –Alternative 7 for the Proposed Grayson Repowering Project**

SUMMARY

As part of the California Environmental Quality Act Environmental Impact Report process for the proposed Grayson Repowering Project, the City of Glendale, Department of Water and Power (GWP) has evaluated an alternative to the proposed Project that would include the installation of a 75 megawatt/300 megawatt-hour battery energy storage system (BESS).

Under normal operations, the Megapacks do not store or generate hazardous materials in quantities that would represent a risk to off-site receptors. However, a fire or thermal runaway event of a Megapack may release hazardous materials to the environment. Stantec understands that based on Tesla's testing results from the ANSI-UL 9540A Unit Level and Cell Module Level Reports[1], the reasonable worst-case scenario for Alternative 7 would be a fire or thermal runaway event consuming one Tesla Megapack. A site-wide catastrophic event, such as an airplane impact or terrorist incident which could involve multiple Megapacks or thermal generation equipment was not evaluated as such an event was outside the range of credibly anticipated events.

There are a number of engineered design features to preclude or limit the spread of a battery fire. These include:

1. The Megapacks would be located within the Grayson facility where they would be protected from external hazards such as high-speed vehicle traffic or the adjacent rail lines.
2. Vehicle traffic within the Grayson facility is low speed (the speed limit is 15 mph).
3. There would be bollards that surround and protect the Megapacks from vehicle traffic.
4. The Megapacks have numerous built-in safety features. The product meets and exceeds many industry safety standards including notably UL1642 (cell-level certification), UL1973 (module-level certification), UL9540 (Megapack-level certification) and UL1998 (functional safety of software).
5. The Megapack control system monitors the condition of the unit at the module level and will isolate and take off-line modules that begin to exhibit off-normal behavior.
6. The Megapacks are supported by Tesla's Network Operations Center from which Tesla operators monitor fleet performance and alerts, enabling rapid response in an emergency.

---

[1] Tesla, ANSI/CAN/UL 9540A:2019 Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems, 2019.

7. In the event a fire was to initiate within a Megapack, a combination of dedicated runaway gas igniters and overpressure vents built into the roof would serve to ignite any flammable gas and ensure that a build-up of gas would not occur mitigating the risk of deflagration hazards in case of thermal runaway or arc flash events.

Tesla has previously performed a rigorous full-scale UL9540A fire test of a Megapack. The test configuration included a Megapack within which a thermal runaway event was artificially induced, as well as surrounding it with other Megapacks that tested their susceptibility to propagation of a fire from an adjacent burning Megapack.

The test report provided by Telsa, which contained some data that is proprietary to Tesla, demonstrated that the burning Megapack did so in a safe and controlled manner, consuming itself slowly without explosive bursts, projectiles, or unexpected hazards. In addition, the test demonstrated that a fire in a burning Megapack would not propagate to neighboring Megapack units even without the application of water or specialized response equipment. To date, Tesla has deployed more than 6 Gigawatt-hours of stationary energy storage products globally.

Lithium batteries may generate hazardous substances such as hydrogen chloride, hydrogen fluoride, hydrogen cyanide, and carbon monoxide which may be released to the environment during a BESS thermal runaway and/or fire event. For the Megapacks that Tesla is planning to deploy at Grayson, hydrogen cyanide is not expected to be measured in the module level 9540a test, but small amounts may be present at the unit level during a thermal runaway event or fire. Tesla products produce limited concentrations of hydrogen cyanide, which is mostly due to the internal plastic materials. At close distance from the product (within one foot), concentrations of hydrogen cyanide can reach, for a few minutes, levels comparable to typical values measured in an effluent plume from a well-developed compartment fire in a building (1,500 parts per million).

An offsite consequence analysis (OCA) was performed for the accidental release of carbon monoxide and hydrogen fluoride from the proposed BESS as these are the only two hazardous substances detected as noted in Tesla's ANSI-UL 9540A Unit Level Report (the Report). The analysis consists of a worst-case accidental release scenario involving the dispersion of hazardous substances from a single Tesla Megapack during a fire. The closest fence line is approximately 76 feet (23.16 meters) from the BESS as depicted in Figures 1 and 2.

TESLA MEGAPACK TESTING

A Megapack contains 17 module, with each module containing sub-modules which are in turn composed of battery cells. Tesla has conducted three UL9540A tests applicable to the Megapack: 1) a cell level report, 2) module level report, and 3) a Megapack unit level report.

For the unit level test, a heating rod was used to artificially induce a thermal runaway event by heating the cells of a single sub-module. Additionally, the control system features that would have detected off-normal conditions and isolated the sub-module were defeated. During the unit level test, the Megapack within which a thermal runaway event was initiated was also surrounded by other Megapacks.

This test demonstrated two major conclusions that were used in the project specific analysis that follows:

1) The resulting fire consumed the Megapack and proceeded in an orderly manner over several hours with no explosions or eruptions of material.

2) The fire did not spread to any of the surrounding Megapacks

Cell and Sub-Module Level Test

Tesla has conducted 9540a testing at the sub-module and cell level and augmented that testing with additional analysis and modeling. A key result from that testing and modeling was that a cell would release 6 grams (g) of gas during a fire.

ANALYSIS

A project specific analysis of the BESS fire and subsequent release of carbon monoxide and hydrogen fluoride was prepared using the U.S. Environmental Protection Agency's (USEPA) Areal Locations of Hazardous Atmospheres (ALOHA) to identify estimated distances to regulatory-established toxic endpoints to determine potential significance of hazards impacts pursuant with CEQA. A complete description of the ALOHA model is available in *ALOHA User's Manual, U.S. Environmental Protection Agency, February 2007*. The ALOHA model contains a substance database, which includes chemical-specific data for carbon monoxide and hydrogen fluoride. These data were used in the modeling analysis without any modifications.

The analysis assumed the complete burning of an entire Tesla Megapack. Based on the results of Tesla's ANSI-UL 9540A Unit Level Report, the thermal runaway event consumed the Megapack over a several hour time period with a certain release of carbon monoxide and hydrogen fluoride emissions into the atmosphere. The dispersion and transport of these emissions into the atmosphere would be subject to meteorological conditions at the time of the release. To be conservative, the following meteorological data were used:

- USEPA default (worst-case) meteorological data, supplemented by daily temperature data as defined by 19 CCR 2750.2.

The maximum temperature recorded near the Grayson Power Plant in the past three years preceding the Notice of Preparation of the Environmental Impact Report was 113° F (degrees Fahrenheit), measured at the Burbank Airport located in Burbank, California. Maximum temperature combined with worst-case meteorological conditions (i.e. low wind speeds and stable dispersion conditions) would result in the highest modeled carbon monoxide and hydrogen fluoride concentrations at the furthest distance downwind from the release site. The temperature, wind speed, relative humidity, and atmospheric stability used in the modeling are consistent with the USEPA's Risk Management Program Guidance for OCA.[2]

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[2] USEPA, Risk Management Program Guidance for Off-site Consequence Analysis, 2009, available at https://www.epa.gov/sites/production/files/2013-11/documents/oca-chps.pdf.

Local surface roughness influences local dispersion rates and wind profiles; thus, at a given distance from the release site, a site with smoother surface (fewer terrain/structure related obstructions) will have smaller dispersion rates and accordingly higher concentrations due to less surface induced mechanical-mixing, than a site with a rougher surface. The USEPA approved AERSURFACE model was used to generate a site-specific surface roughness value for use in the ALOHA model.

By utilizing the measured gas composition data from Tesla's testing as well as the constituent molecular weights, Stantec calculated the percentage of carbon monoxide and hydrogen fluoride on a mass basis. These percentages were then applied to the mass of the total gas released (i.e. 6 g/cell) to determine the total mass of carbon monoxide and hydrogen fluoride released during the test. It was assumed the gas concentrations are directly proportional to the weight composition within each cell. As previously discussed, the thermal runaway and combustion of an entire Megapack took several hours to complete during the test. A rate of mass per hour of gas released was determined by dividing the total mass of the gas by the total burn time of the Megapack. The calculations assumed all of the gas within each of the cells in an entire Megapack is released. The percent of carbon monoxide and hydrogen fluoride present in the gas is based upon the total concentration of the eight constituents reported. As a result, the calculated release rate for both carbon monoxide and hydrogen fluoride is conservative.

For this analysis, a direct source release height of 7.9 feet above ground level (AGL) was inputted into the ALOHA model because the BESS system is equipped with vents at this height. As a result of this design, all gases released during a thermal runaway fire would be released through the vents since the thermal runaway occurs internally within the BESS enclosure. This was confirmed during Tesla's observations of the test as it was clear that the flames and smoke were only being released from the Megapack through the vents. No flames or smoke were released through non-vent areas. There are no other outlets located on the unit for emissions to be released. As a result, downwind concentrations of carbon monoxide and hydrogen fluoride were calculated utilizing a source height of 7.9 feet above ground level.

Tables 2 and 3 below provide the input values used in the ALOHA model to perform the OCA for both carbon monoxide and hydrogen fluoride, respectively.

Table 2. ALOHA Model Inputs for Carbon Monoxide

Parameter	Data Used for Dispersion Modelling
Wind Speed:	1.5 meters/second
Relative Humidity:	50 percent
Ambient Temperature:	113° F
Surface Roughness:	0.378 meters
Stability Class:	F (Very Stable)
Carbon Monoxide Emission Rate:	Tesla Proprietary

Table 3. ALOHA Model Inputs for Hydrogen Fluoride

Parameter	Data Used for Dispersion Modelling
Wind Speed:	1.5 meters/second
Relative Humidity:	50 percent
Ambient Temperature:	113° F
Surface Roughness:	0.378 meters
Stability Class:	F (Very Stable)
Hydrogen Fluoride Emission Rate:	Tesla Proprietary

TOXIC EFFECTS OF CARBON MONOXIDE

Carbon monoxide is a colorless, odorless, non-irritating and tasteless gas that is ubiquitous in the atmosphere. The extent of injury from carbon monoxide exposure depends upon the concentration and duration of exposure and the underlying health status of the exposed individual. Most people will not experience any symptoms from prolonged exposure to carbon monoxide levels of approximately 1 to 70 ppm but some heart patients might experience an increase in chest pain. As CO levels increase and remain above 70 ppm, symptoms become more noticeable and can include headache, fatigue and nausea. At sustained carbon monoxide concentrations above 150 to 200 ppm, disorientation, unconsciousness, and death are possible[3].

With respect to the assessment of potential impacts associated with an accidental release of carbon monoxide, four offsite "bench mark" exposure levels were evaluated, as follows: (1) the Occupational Safety and Health Administration's (OSHA) Immediately Dangerous to Life and Health (IDLH) level of 1200 ppm; (2) the National Oceanic and Atmospheric Administration (NOAA) Office of Response and Restoration's Acute Exposure Guideline Levels (AEGLs) AEGL-3 level of 330 ppm which predicts that the general population, including susceptible individuals, could experience life-threatening health effects or death; (3) AEGL-2 level of 83 ppm which predicts that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape; and (4) AEGL-1 level (not established

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[3] U.S. Consumer Product Safety Commission, available at https://www.cpsc.gov/Safety-Education/Safety-Education-Centers/Carbon-Monoxide-Information-Center/Carbon-Monoxide-Questions-and-Answers.

for carbon monoxide) which predicts that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure. The concentration based AEGL thresholds are time weighted and for purposes of this analysis were based on consistency with the 60-minute reasonable worst-case release scenario.

TOXIC EFFECTS OF HYDROGEN FLUORIDE

The odor threshold of hydrogen fluoride is approximately 0.02-0.13 ppm[4]. Irritation of the eyes, nose and throat occurs at low levels. Breathing in at high levels or in combination with skin contact can cause death from an irregular heartbeat or from fluid buildup in the lungs. Skin contact with high-concentration hydrogen fluoride products may not cause immediate pain or visible skin damage, but can be fatal if left untreated[5].

With respect to the assessment of potential impacts associated with an accidental release of hydrogen fluoride, four offsite “bench mark” exposure levels were evaluated, as follows: (1) the OSHA’s IDLH level of 30 ppm; (2) the NOAA Office of Response and Restoration’s AEGLs AEGL-3 level of 44 ppm which predicts that the general population, including susceptible individuals, could experience life-threatening health effects or death; (3) AEGL-2 level of 24 ppm which predicts that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape; and (4) AEGL-1 level of 1 ppm which predicts that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure. The concentration based AEGL thresholds are time weighted and for purposes of this analysis were based on consistency with the 60-minute reasonable worst-case release scenario.

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[4] NCBI, Hydrogen Fluoride: Acute Exposure Guideline Levels, available at https://www.ncbi.nlm.nih.gov/books/NBK207733/.

[5] Center for Disease Control and Prevention, Facts About Hydrogen Fluoride (Hydrofluoric Acid), available at https://emergency.cdc.gov/agent/hydrofluoricacid/basics/facts.asp.

MODELING RESULTS

Tables 4 and 5 show the modeled distances to the four benchmark criteria concentrations of carbon monoxide and hydrogen fluoride, respectively.

Table 4. Carbon Monoxide Modeling Results

Height	Distance to IDLH[a] 1200 ppm	Distance to AEGL-3[b] 330 ppm	Distance to AEGL-2[b] 83 ppm	Distance to AEGL-1 Not Established
7.9 ft, AGL	Not Exceeded	Not Exceeded	167.98 ft	N/A

[a] Benchmark based on a 30-minute exposure or averaging time

[b] Benchmark based on a 60-minute exposure or averaging time

m = meters

Table 5. Hydrogen Fluoride Modeling Results

Height	Distance to IDLH[a] 30 ppm	Distance to AEGL-3[b] 44 ppm	Distance to AEGL-2[b] 24 ppm	Distance to AEGL-1[b] 1 ppm
7.9 ft, AGL	Not Exceeded	Not Exceeded	Not Exceeded	108.01 ft

[a] Benchmark based on a 30-minute exposure or averaging time

[b] Benchmark based on a 60-minute exposure or averaging time

ft = feet

The results of the OCA for the worst-case release of carbon monoxide indicates that the concentrations for benchmark criteria IDLH (1200 ppm) and AEGL-3 (330 ppm) would not extend beyond the facility fence line. AEGL-1 thresholds have not been established for carbon monoxide. However, the distance to AEGL-2 thresholds could potentially extend beyond the fence line by a distance of approximately 91.99 feet (28.04 meters). As displayed in Figure 1, this would be mainly in a lightly trafficked segment of Fairmont Avenue on the southwestern fence line of the Grayson Power Plant. Thresholds would not be exceed for any residences, schools, or commercial land uses. Receptors along Fairmont Avenue would be mobile receptors such as vehicles that would not be exposed to substantial concentrations of carbon monoxide for the 60 minutes assumed in the reasonable worst-case scenario and AEGL thresholds. For example, the carbon monoxide AEGL-2 for a 30-minute and 10-minute exposures are 150 ppm and 420 ppm. Consequently, it would be unlikely that a receptor on Fairmont Avenue would be exposed to carbon monoxide concentrations of significant concern for a substantial period of time.

An infrared camera system would be installed as part of this Project alternative to monitor the Megapacks. In the event of thermal runaway within the Megapack, the camera would detect the unit's change in temperature and provide notification to the plant operators. The plant operators would then contact the local fire department. The initial detection occurs approximately 15 minutes prior to smoke being released from the Megapack units. According to the City of Glendale, the average response time for the Local Fire Department is four minutes and 36 seconds[6]. The Fire Department would arrive on site in less than five minutes of the initial notification as the nearest fire station, Station 27, is located approximately 1.23 miles from the proposed Project. The affected section of Fairmont Avenue and the adjacent pedestrian bike path on the west side of Fairmont Avenue would immediately be closed to the public before carbon monoxide levels exceed AEGL-2 thresholds in the area. The closure would remain in place until the area is deemed safe to the public.

As stated above, downwind distances to AEGL-2 threshold exceedances would be limited to a lightly trafficked section of Fairmont Avenue along the southwestern fence line of the Grayson Power Plant. There is only potential for mobile receptors such as vehicles to be affected as no additional receptors are located in the vicinity. These mobile receptors would not be exposed to substantial concentrations of carbon monoxide for the 60 minutes assumed in the reasonable worst-case scenario and AEGL thresholds. Additionally, the proposed infrared camera and associated notification system would automatically notify Grayson personnel and the local fire department at first detection of a thermal runaway event. The fire department would arrive onsite to close Fairmont Avenue prior to exposure of carbon monoxide. As a result, any long-term or permanent effects to the public from carbon monoxide are unlikely to occur. Health-related impacts to the public from carbon monoxide are expected to be less than significant.

The results of the OCA for the worst-case release of hydrogen fluoride indicates that the concentrations for all four considered benchmark criteria (30, 44, and 24 ppm) would not extend beyond the facility fence line. However, the distance to AEGL-1 thresholds could potentially extend beyond the fence line by a distance of approximately 32.02 feet (9.76 meters). As displayed in Figure 2, this would be similar to the AEGL-2 distance of threshold exceedance for carbon monoxide, concentrated mainly in a lightly trafficked segment of Fairmont Avenue on the southwestern fence line of the Grayson Power Plant. Exceeding thresholds of hydrogen fluoride would not come in contact with sensitive receptors and this section of Fairmont Avenue and the adjacent pedestrian bike path would be closed to the public within five minutes of initial detection of thermal runaway. Moreover, the AEGL-1 threshold of exceedance predicts that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. These effects would not be disabling and are transient and reversible upon cessation of exposure. No long-term or permanent effects to the public from hydrogen fluoride exposure would likely result.

As previously discussed, this analysis made conservative assumptions in calculating the total mass of carbon monoxide that would potentially be released into surrounding areas. Since only eight constituents were noted in the Report, Stantec calculated the percentages of carbon monoxide and hydrogen fluoride of the total gas released during a thermal runaway event. In reality, there are most likely more constituents in the total gas released that were not accounted for in Appendix F of the Report which would generate a higher total ppm value. With additional volumetric constituent data for the total gas released, the concentration of carbon monoxide and hydrogen fluoride would likely be lower resulting in a reduced distance to any exceedances of benchmark criteria.

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[6] City of Glendale, 12.4 Public Safety Response, available at https://www.glendaleca.gov/government/departments/community-development/neighborhood-services/glendale-quality-of-life-indicators/12-4-public-safety-response.

Reference: **Off-Site Consequence Analysis for Carbon Monoxide and Hydrogen Fluoride**

Figures 1 and 2 show the dispersion contours associated with the modeling reasonable worst-case release scenario. The radius of each downwind distance to noted thresholds of exceedance in each Figure were selected based on the perimeter of the proposed Megapacks.

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ATTACHMENTS

Figure 1 (Maximum Carbon Monoxide Concentrations due to Battery Fire)

Figure 2 (Maximum Hydrogen Fluoride Concentrations due to Battery Fire)

🟥 Grayson Power Plant Facility Boundary

🟦 Utility Operations Center Boundary

🟧 Proposed Megapack Alt 7 Area

🟩 AEGL-2 Threshold (Downwind Distance 168 Feet)

■ Closest Point to Fence Line

IDLH not exceeded
AEGL-3 not exceeded
AEGL-1 not applicable

0 70 140 Feet

N

(At original document size of 8.5x11)
1:1,680

Stantec

Project Location	Prepared byDL on 2021-06-04
Glendale	TR by RB on 2021-06-04
Los Angeles County, CA	IR by SR on 2021-06-04
Client/Project	185804681_003

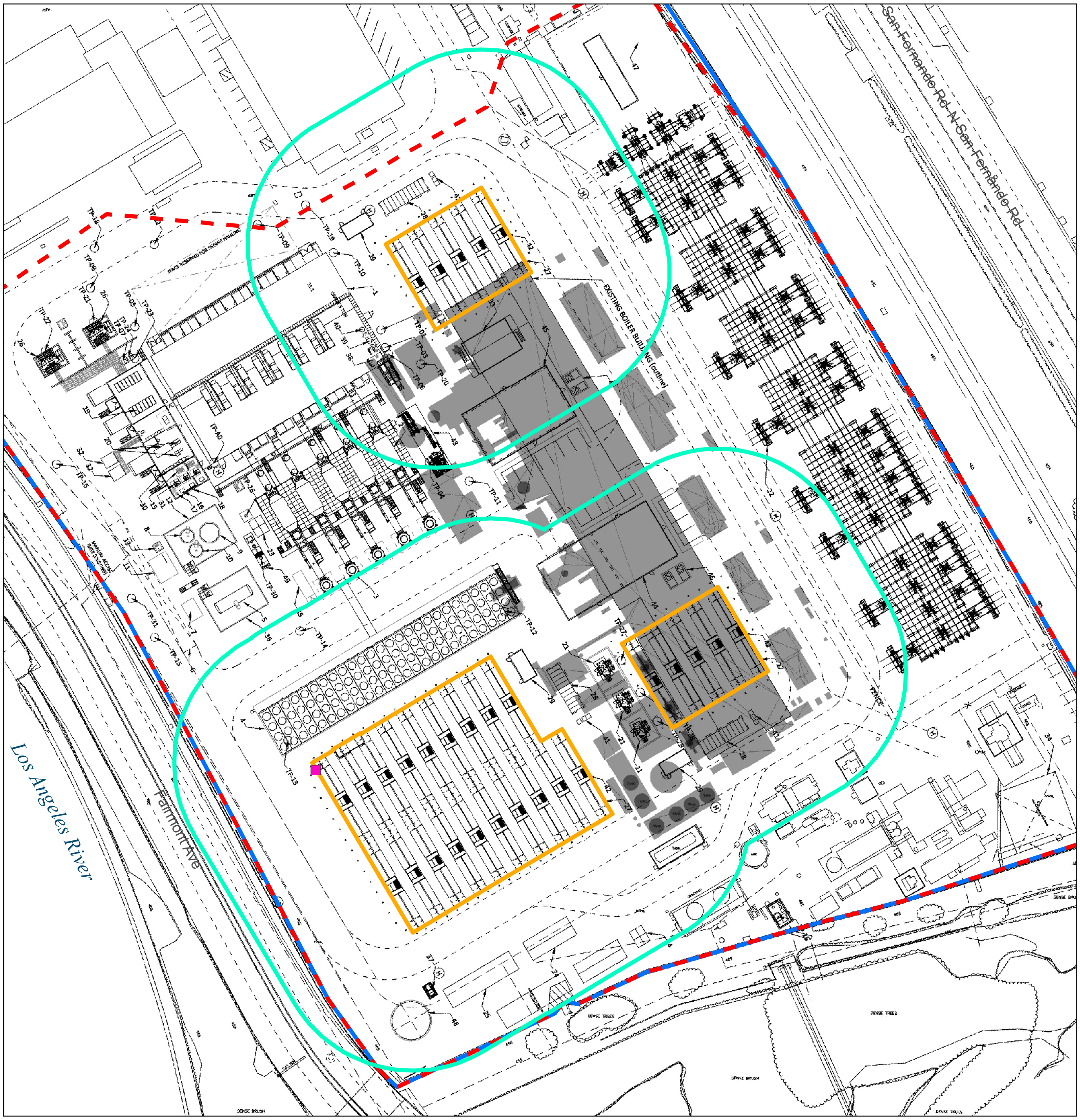
Grayson Repowering Project
Alternative 7

Figure No.
1

Title
Maximum Carbon Monoxide Concentrations Due To Tesla Megapack Thermal Runaway

Notes
1. Coordinate System: NAD 1983 UTM Zone 11N
2. Data Sources: Stantec 2020.
3. Background: Glendale Water and Power| GRAYSON REPOWERING PROJECT ALTERNATIVE 7 GENERAL ARRANGEMENT SITE | Sheet: G1002 | 07/21/2021

V:\1858\Active\185804681_GraysonRepower\03_data\gis_cad\gis\185804681_003_MegapackAlt7_CO.mxd Revised: 2021-07-26 By: Dalaw



- 🟥 Grayson Power Plant Facility Boundary
- 🟦 Utility Operations Center Boundary
- 🟧 Proposed Megapack Alt 7 Area
- 🟩 AEGL 1 Threshold (Downwind Distance 108 Feet)
- ■ Closest Point to Fence Line

IDLH not exceeded
AEGL-3 not exceeded
AEGL-2 not exceeded

0 60 120 Feet
(At original document size of 8.5x11)
1:1,440

N

Stantec

Project Location
Glendale
Los Angeles County, CA

Prepared byDL on 2021-06-04
TR by RB on 2021-06-04
IR by SR on 2021-06-04

Client/Project
185804681_006
Grayson Repowering Project
Alternative 7

Figure No.
2

Title
Maximum Hydrogen Fluoride Concentrations Due To Tesla Megapack Thermal Runaway

Notes
1. Coordinate System: NAD 1983 UTM Zone 11N
2. Data Sources: Stantec 2020.
3. Background: Glendale Water and Power| GRAYSON REPOWERING PROJECT ALTERNATIVE 7 GENERAL ARRANGEMENT SITE | Sheet: G1002 | 07/21/2021

V:\1858\Active\185804681_GraysonRepower\03_data\gis_cad\gis\185804681_006_MegapackAlt7_HF.mxd Revised: 2021-07-26 By: Dalaw

Memo

To:	City of Glendale	From:	Kristy Edblad & Reid Blaich 290 Conejo Ridge Avenue, Thousand Oaks, CA 91361
File:	Off-Site Consequence Analysis for BESS Fire Emissions Modeling	Date:	August 1, 2021

Reference: BESS Fire Emissions Modeling –Alternative 8 for the Proposed Grayson Repowering Project

SUMMARY

As part of the California Environmental Quality Act Environmental Impact Report process for the proposed Grayson Repowering Project, the City of Glendale, Department of Water and Power (GWP) has evaluated an alternative to the proposed Project that would include the installation of a 75 megawatt/300 megawatt-hour battery energy storage system (BESS).

Under normal operations, the Megapacks do not store or generate hazardous materials in quantities that would represent a risk to off-site receptors. However, a fire or thermal runaway event of a Megapack may release hazardous materials to the environment. Stantec understands that based on Tesla's testing results from the ANSI-UL 9540A Unit Level and Cell Module Level Reports[1], the reasonable worst-case scenario for Alternative 8 would be a fire or thermal runaway event consuming one Tesla Megapack. A site-wide catastrophic event, such as an airplane impact or terrorist incident which could involve multiple Megapacks or thermal generation equipment was not evaluated as such an event was outside the range of credibly anticipated events.

There are a number of engineered design features to preclude or limit the spread of a battery fire. These include:

1. The Megapacks would be located within the Grayson facility where they would be protected from external hazards such as high-speed vehicle traffic or the adjacent rail lines.
2. Vehicle traffic within the Grayson facility is low speed (the speed limit is 15 mph).
3. There would be bollards that surround and protect the Megapacks from vehicle traffic.
4. The Megapacks have numerous built-in safety features. The product meets and exceeds many industry safety standards including notably UL1642 (cell-level certification), UL1973 (module-level certification), UL9540 (Megapack-level certification) and UL1998 (functional safety of software).
5. The Megapack control system monitors the condition of the unit at the module level and will isolate and take off-line modules that begin to exhibit off-normal behavior.
6. The Megapacks are supported by Tesla's Network Operations Center from which Tesla operators monitor fleet performance and alerts, enabling rapid response in an emergency.

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[1] Tesla, ANSI/CAN/UL 9540A:2019 Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems, 2019.

7. In the event a fire was to initiate within a Megapack, a combination of dedicated runaway gas igniters and overpressure vents built into the roof would serve to ignite any flammable gas and ensure that a build-up of gas would not occur mitigating the risk of deflagration hazards in case of thermal runaway or arc flash events.

Tesla has previously performed a rigorous full-scale UL9540A fire test of a Megapack. The test configuration included a Megapack within which a thermal runaway event was artificially induced, as well as surrounding it with other Megapacks that tested their susceptibility to propagation of a fire from an adjacent burning Megapack.

The test report provided by Telsa, which contained some data that is proprietary to Tesla, demonstrated that the burning Megapack did so in a safe and controlled manner, consuming itself slowly without explosive bursts, projectiles, or unexpected hazards. In addition, the test demonstrated that a fire in a burning Megapack would not propagate to neighboring Megapack units even without the application of water or specialized response equipment. To date, Tesla has deployed more than 6 Gigawatt-hours of stationary energy storage products globally.

Lithium batteries may generate hazardous substances such as hydrogen chloride, hydrogen fluoride, hydrogen cyanide, and carbon monoxide which may be released to the environment during a BESS thermal runaway and/or fire event. For the Megapacks that Tesla is planning to deploy at Grayson, hydrogen cyanide is not expected to be measured in the module level 9540a test, but small amounts may be present at the unit level during a thermal runaway event or fire. Tesla products produce limited concentrations of hydrogen cyanide, which is mostly due to the internal plastic materials. At close distance from the product (within one foot), concentrations of hydrogen cyanide can reach, for a few minutes, levels comparable to typical values measured in an effluent plume from a well-developed compartment fire in a building (1500 parts per million).

An offsite consequence analysis (OCA) was performed for the accidental release of carbon monoxide and hydrogen fluoride from the proposed BESS as these are the only two hazardous substances detected as noted in Tesla's ANSI-UL 9540A Unit Level Report (the Report). The analysis consists of a worst-case accidental release scenario involving the dispersion of hazardous substances from a single Tesla Megapack during a fire. The closest fence line is approximately 40 feet (12.19 meters) from the BESS as depicted in Figures 1 and 2.

TESLA MEGAPACK TESTING

A Megapack contains 17 module, with each module containing sub-modules which are in turn composed of battery cells. Tesla has conducted three UL9540A tests applicable to the Megapack: 1) a cell level report, 2) module level report, and 3) a Megapack unit level report.

For the unit level test, a heating rod was used to artificially induce a thermal runaway event by heating the cells of a single sub-module. Additionally, the control system features that would have detected off-normal conditions and isolated the sub-module were defeated. During the unit level test, the Megapack within which a thermal runaway event was initiated was also surrounded by other Megapacks.

This test demonstrated two major conclusions that were used in the project specific analysis that follows:

1) The resulting fire consumed the Megapack and proceeded in an orderly manner over several hours with no explosions or eruptions of material.

2) The fire did not spread to any of the surrounding Megapacks

Cell and Sub-Module Level Test

Tesla has conducted 9540a testing at the sub-module and cell level and augmented that testing with additional analysis and modeling. A key result from that testing and modeling was that a cell would release 6 grams (g) of gas during a fire.

ANALYSIS

A project specific analysis of the BESS fire and subsequent release of carbon monoxide and hydrogen fluoride was prepared using the U.S. Environmental Protection Agency's (USEPA) Areal Locations of Hazardous Atmospheres (ALOHA) to identify estimated distances to regulatory-established toxic endpoints to determine potential significance of hazards impacts pursuant with CEQA. A complete description of the ALOHA model is available in *ALOHA User's Manual, U.S. Environmental Protection Agency, February 2007*. The ALOHA model contains a substance database, which includes chemical-specific data for carbon monoxide and hydrogen fluoride. These data were used in the modeling analysis without any modifications.

The analysis assumed the complete burning of an entire Tesla Megapack. Based on the results of Tesla's ANSI-UL 9540A Unit Level Report, the thermal runaway event consumed the Megapack over a several hour time period with a certain release of carbon monoxide and hydrogen fluoride emissions into the atmosphere. The dispersion and transport of these emissions into the atmosphere would be subject to meteorological conditions at the time of the release. To be conservative, the following meteorological data were used:

- USEPA default (worst-case) meteorological data, supplemented by daily temperature data as defined by 19 CCR 2750.2.

The maximum temperature recorded near the Grayson Power Plant in the past three years preceding the Notice of Preparation of the Environmental Impact Report was 113° F (degrees Fahrenheit), measured at the Burbank Airport located in Burbank, California. Maximum temperature combined with worst-case meteorological conditions (i.e. low wind speeds and stable dispersion conditions) would result in the highest modeled carbon monoxide and hydrogen fluoride concentrations at the furthest distance downwind from the release site. The temperature, wind speed, relative humidity, and atmospheric stability used in the modeling are consistent with the USEPA's Risk Management Program Guidance for OCA.[2]

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[2] USEPA, Risk Management Program Guidance for Off-site Consequence Analysis, 2009, available at https://www.epa.gov/sites/production/files/2013-11/documents/oca-chps.pdf.

Local surface roughness influences local dispersion rates and wind profiles; thus, at a given distance from the release site, a site with smoother surface (fewer terrain/structure related obstructions) will have smaller dispersion rates and accordingly higher concentrations due to less surface induced mechanical-mixing, than a site with a rougher surface. The USEPA approved AERSURFACE model was used to generate a site-specific surface roughness value for use in the ALOHA model.

By utilizing the measured gas composition data from Tesla's testing as well as the constituent molecular weights, Stantec calculated the percentage of carbon monoxide and hydrogen fluoride on a mass basis. These percentages were then applied to the mass of the total gas released (i.e. 6 g/cell) to determine the total mass of carbon monoxide and hydrogen fluoride released during the test. It was assumed the gas concentrations are directly proportional to the weight composition within each cell. As previously discussed, the thermal runaway and combustion of an entire Megapack took several hours to complete during the test. A rate of mass per hour of gas released was determined by dividing the total mass of the gas by the total burn time of the Megapack. The calculations assumed all of the gas within each of the cells in an entire Megapack is released. The percent of carbon monoxide and hydrogen fluoride present in the gas is based upon the total concentration of the eight constituents reported. As a result, the calculated release rate for both carbon monoxide and hydrogen fluoride is conservative.

For this analysis, a direct source release height of 7.9 feet above ground level (AGL) was inputted into the ALOHA model because the BESS system is equipped with vents at this height. As a result of this design, all gases released during a thermal runaway fire would be released through the vents since the thermal runaway occurs internally within the BESS enclosure. This was confirmed during Tesla's observations of the test as it was clear that the flames and smoke were only being released from the Megapack through the vents. No flames or smoke were released through non-vent areas. There are no other outlets located on the unit for emissions to be released. As a result, downwind concentrations of carbon monoxide and hydrogen fluoride were calculated utilizing a source height of 7.9 feet above ground level.

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Carbon Monoxide Emission Rate:	Tesla Proprietary

Table 3. ALOHA Model Inputs for Hydrogen Fluoride

Parameter	Data Used for Dispersion Modelling
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Stability Class:	F (Very Stable)
Hydrogen Fluoride Emission Rate:	Tesla Proprietary

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[3] U.S. Consumer Product Safety Commission, available at https://www.cpsc.gov/Safety-Education/Safety-Education-Centers/Carbon-Monoxide-Information-Center/Carbon-Monoxide-Questions-and-Answers.

for carbon monoxide) which predicts that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure. The concentration based AEGL thresholds are time weighted and for purposes of this analysis were based on consistency with the 60-minute reasonable worst-case release scenario.

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The odor threshold of hydrogen fluoride is approximately 0.02-0.13 ppm[4]. Irritation of the eyes, nose and throat occurs at low levels. Breathing in at high levels or in combination with skin contact can cause death from an irregular heartbeat or from fluid buildup in the lungs. Skin contact with high-concentration hydrogen fluoride products may not cause immediate pain or visible skin damage, but can be fatal if left untreated[5].

With respect to the assessment of potential impacts associated with an accidental release of hydrogen fluoride, four offsite “bench mark” exposure levels were evaluated, as follows: (1) the OSHA’s IDLH level of 30 ppm; (2) the NOAA Office of Response and Restoration’s AEGLs AEGL-3 level of 44 ppm which predicts that the general population, including susceptible individuals, could experience life-threatening health effects or death; (3) AEGL-2 level of 24 ppm which predicts that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape; and (4) AEGL-1 level of 1 ppm which predicts that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure. The concentration based AEGL thresholds are time weighted and for purposes of this analysis were based on consistency with the 60-minute reasonable worst-case release scenario.

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[4] NCBI, Hydrogen Fluoride: Acute Exposure Guideline Levels, available at https://www.ncbi.nlm.nih.gov/books/NBK207733/.

[5] Center for Disease Control and Prevention, Facts About Hydrogen Fluoride (Hydrofluoric Acid), available at https://emergency.cdc.gov/agent/hydrofluoricacid/basics/facts.asp.

MODELING RESULTS

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7.9 ft, AGL	Not Exceeded	Not Exceeded	167.98 ft	N/A

[a] Benchmark based on a 30-minute exposure or averaging time

[b] Benchmark based on a 60-minute exposure or averaging time

m = meters

Table 5. Hydrogen Fluoride Modeling Results

Height	Distance to IDLH[a] 30 ppm	Distance to AEGL-3[b] 44 ppm	Distance to AEGL-2[b] 24 ppm	Distance to AEGL-1[b] 1 ppm
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[a] Benchmark based on a 30-minute exposure or averaging time

[b] Benchmark based on a 60-minute exposure or averaging time

ft = feet

The results of the OCA for the worst-case release of carbon monoxide indicates that the concentrations for benchmark criteria IDLH (1200 ppm) and AEGL-3 (330 ppm) would not extend beyond the facility fence line. AEGL-1 thresholds have not been established for carbon monoxide. However, the distance to AEGL-2 thresholds could potentially extend beyond the fence line by a distance of approximately 127.99 feet (39.01 meters). As displayed in Figure 1, this would be mainly in a lightly trafficked segment of Fairmont Avenue on the southwestern fence line of the Grayson Power Plant. Thresholds would not be exceed for any residences, schools, or commercial land uses. Receptors along Fairmont Avenue would be mobile receptors such as vehicles that would not be exposed to substantial concentrations of carbon monoxide for the 60 minutes assumed in the reasonable worst-case scenario and AEGL thresholds. For example, the carbon monoxide AEGL-2 for a 30-minute and 10-minute exposures are 150 ppm and 420 ppm. Consequently, it would be unlikely that a receptor on Fairmont Avenue would be exposed to carbon monoxide concentrations of significant concern for a substantial period of time.

An infrared camera system would be installed as part of this Project alternative to monitor the Megapacks. In the event of thermal runaway within the Megapack, the camera would detect the unit's change in temperature and provide notification to the plant operators. The plant operators would then contact the local fire department. The initial detection occurs approximately 15 minutes prior to smoke being released from the Megapack units. According to the City of Glendale, the average response time for the Local Fire Department is four minutes and 36 seconds[6]. The Fire Department would arrive on site in less than five minutes of the initial notification as the nearest fire station, Station 27, is located approximately 1.23 miles from the proposed Project. The affected section of Fairmont Avenue and the adjacent pedestrian bike path on the west side of Fairmont Avenue would immediately be closed to the public before carbon monoxide levels exceed AEGL-2 thresholds in the area. The closure would remain in place until the area is deemed safe to the public.

As stated above, downwind distances to AEGL-2 threshold exceedances would be limited to a lightly trafficked section of Fairmont Avenue along the southwestern fence line of the Grayson Power Plant. There is only potential for mobile receptors such as vehicles to be affected as no additional receptors are located in the vicinity. These mobile receptors would not be exposed to substantial concentrations of carbon monoxide for the 60 minutes assumed in the reasonable worst-case scenario and AEGL thresholds. Additionally, the proposed infrared camera and associated notification system would automatically notify Grayson personnel and the local fire department at first detection of a thermal runaway event. The fire department would arrive onsite to close Fairmont Avenue prior to exposure of carbon monoxide. As a result, any long-term or permanent effects to the public from carbon monoxide are unlikely to occur. Health-related impacts to the public from carbon monoxide are expected to be less than significant.

The results of the OCA for the worst-case release of hydrogen fluoride indicates that the concentrations for all four considered benchmark criteria (30, 44, and 24 ppm) would not extend beyond the facility fence line. However, the distance to AEGL-1 thresholds could potentially extend beyond the fence line by a distance of approximately 68.01 feet (20.73 meters). As displayed in Figure 2, this would be similar to the AEGL-2 distance of threshold exceedance for carbon monoxide, concentrated mainly in a lightly trafficked segment of Fairmont Avenue on the southwestern fence line of the Grayson Power Plant. Exceeding thresholds of hydrogen fluoride would not come in contact with sensitive receptors and this section of Fairmont Avenue and the adjacent pedestrian bike path would be closed to the public within five minutes of initial detection of thermal runaway. Moreover, the AEGL-1 threshold of exceedance predicts that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. These effects would not be disabling and are transient and reversible upon cessation of exposure. No long-term or permanent effects to the public from hydrogen fluoride exposure would likely result.

As previously discussed, this analysis made conservative assumptions in calculating the total mass of carbon monoxide that would potentially be released into surrounding areas. Since only eight constituents were noted in the Report, Stantec calculated the percentages of carbon monoxide and hydrogen fluoride of the total gas released during a thermal runaway event. In reality, there are most likely more constituents in the total gas released that were not accounted for in Appendix F of the Report which would generate a higher total ppm value. With additional volumetric constituent data for the total gas released, the concentration of carbon monoxide and hydrogen fluoride would likely be lower resulting in a reduced distance to any exceedances of benchmark criteria.

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[6] City of Glendale, 12.4 Public Safety Response, available at https://www.glendaleca.gov/government/departments/community-development/neighborhood-services/glendale-quality-of-life-indicators/12-4-public-safety-response.

Figures 1 and 2 show the dispersion contours associated with the modeling reasonable worst-case release scenario. The radius of each downwind distance to noted thresholds of exceedance in each Figure were selected based on the perimeter of the proposed Megapacks.

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ATTACHMENTS

Figure 1 (Maximum Carbon Monoxide Concentrations due to Battery Fire)

Figure 2 (Maximum Hydrogen Fluoride Concentrations due to Battery Fire)

0 75 150 Feet

(At original document size of 8.5x11)
1:1,800

N

- 🟥 Grayson Power Plant Facility Boundary
- 🟦 Utility Operations Center Boundary
- 🟧 Proposed Megapack Alt 8 Area
- 🟩 AEGL-2 Threshold (Downwind Distance 168 Feet)
- ■ Closest Point to Fence Line

IDLH not exceeded
AEGL-3 not exceeded
AEGL-1 not applicable

Notes
1. Coordinate System: NAD 1983 UTM Zone 11N
2. Data Sources: Stantec 2020.
3. Background: Glendale Water and Power | GRAYSON REPOWERING PROJECT ALTERNATIVE 8 GENERAL ARRANGEMENT SITE | Sheet: G1003 | 07/21/2021

Stantec

Project Location
Glendale
Los Angeles County, CA

Prepared byDL on 2021-06-04
TR by RB on 2021-06-04
IR by SR on 2021-06-04

Client/Project
185804681_004
Grayson Repowering Project
Alternative 8

Figure No.
1

Title
Maximum Carbon Monoxide Concentrations Due To Tesla Megapack Thermal Runaway

V:\1858\Active\185804681_GraysonRepower\03_data\gis_cad\gis\185804681_004_MegapackAlt8_CO.mxd Revised: 2021-07-26 By: Dalaw

🟥	Grayson Power Plant Facility Boundary
🟦	Utility Operations Center Boundary
🟧	Proposed Megapack Alt 8 Area
🟩	AEGL 1 Threshold (Downwind Distance 108 Feet)
■	Closest Point to Fence Line

IDLH not exceeded
AEGL-3 not exceeded
AEGL-2 not exceeded

0 60 120
Feet
(At original document size of 8.5x11)
1:1,440

N

Stantec

Project Location
Glendale
Los Angeles County, CA

Prepared byDL on 2021-06-04
TR by RB on 2021-06-04
IR by SR on 2021-06-04

Client/Project
185804681_005
Grayson Repowering Project
Alternative 8

Figure No.
2

Title
Maximum Hydrogen Fluoride Concentrations Due To Tesla Megapack Thermal Runaway

Notes
1. Coordinate System: NAD 1983 UTM Zone 11N
2. Data Sources: Stantec 2020.
3. Background: Glendale Water and Power | GRAYSON REPOWERING PROJECT ALTERNATIVE 8 GENERAL ARRANGEMENT SITE | Sheet: G1003 | 07/21/2021

V:\1858\Active\185804681_GraysonRepower\03_data\gis_cad\gis\185804681_005_MegapackAlt8_HF.mxd Revised: 2021-07-26 By: Dalaw

Appendix E UPDATED NOISE TECHNICAL REPORT

June 27, 2021

1.1 NOISE

This section discusses the potential noise impacts that may result from demolition, construction, and operation of the Project. Two operational scenarios are considered. These are referred to as Alternative 7 and Alternative 8.

1.1.1 ENVIRONMENTAL SETTING

Terminology and Fundamentals of Environmental Acoustics

The decibel (dB) is the preferred unit used to measure sound levels utilizing a logarithmic scale to account for large range in audible sound intensities. A general rule for the decibel scale is that a 10-dB increase in sound is perceived as a doubling of loudness by the human ear. For example, a 55-dB sound level will sound twice as loud as a 45-dB sound level. The average healthy person cannot detect differences of 1 dB whereas a 5-dB change is noticeable to most.

Several sound measurement descriptors are used to assess the effects of sound on the human environment. These include the equivalent continuous sound level, Leq, which is the level of a constant sound that has the same acoustic energy as the actual fluctuating sound. Leq is similar to the average sound level. The day-night average sound level (L_{dn}) is similar to the 24-hour Leq except that a 10-dB penalty is added to sound levels between 10 p.m. and 7 a.m. to account for the greater sensitivity of people to sound at night. The Community Noise Equivalent Level (CNEL) additionally places a 5-dB penalty on sound occurring in the evening hours between 7 pm and 10 pm.

Acoustics is defined as the science of sound, including the generation, transmission, and effects of sound waves. Noise is generally defined as unpleasant, unexpected, or undesired sound that disrupts or interferes with normal human activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The objectionable nature of sound is caused by its pitch and loudness. Pitch is a person’s perception of the dominant frequencies making up the sound. Higher pitched signals (higher frequencies) sound louder to humans than sounds with a lower pitch. Loudness is a person’s perception of the intensity of sound waves. Sound intensity reflects the rate with which the acoustic energy is being transmitted and is a measure of the amplitude or height of the sound wave. Frequency describes the sound’s pitch and is measured in Hertz (Hz), while intensity describes the sound’s loudness and is measured in dB.

The dB is the preferred unit for measuring sound that indicates the relative amplitude (height) of a particular sound wave. The zero (0) on the decibel scale is based on the lowest sound level that a healthy, unimpaired human ear can detect. The A–weighted decibel (dBA) is a method of sound measurement which assigns weighted values to selected frequency bands in an attempt to reflect how the human ear responds to sound. The range of human hearing is from 0 dBA (the threshold of hearing) to about 140 dBA which is the threshold of pain. Examples of noise and their A–weighted decibel levels are shown in Table 4-38. In general, a 3- to 5-dBA change in community noise levels starts to become noticeable, while 1- to 3-dBA changes are generally not perceived. Quiet suburban areas typically have noise levels in the range of 40–50 dBA, while those along arterial streets are in the 50–60 dBA or greater range. Normal conversational levels are in the 60–65 dBA ranges. The C-weighted decibel scale (dBC) was originally developed to reflect the frequency sensitivity of the human ear to high sound levels (above 85 dB). However, in recent years, the C-weighting has increasingly been used to assess the low frequency content of sound, often in combination with the A-weighted scale. C-weighting is generally flat, and thus includes more of the low-frequency range of sounds.

In addition to the actual instantaneous measurements of sound levels, the duration of sound is important since sounds that occur over a long period of time are more likely to be an annoyance or cause direct physical damage or environmental stress. To analyze the overall noise levels in an area, time-varying noise is averaged over a specific time period in a way that represents the same acoustic energy as the time-varying noise. Such average is referred to as equivalent continuous sound level and represented by Leq. Statistical sound levels, Ln, are also frequently used as environmental noise descriptors. The subscript n denotes the percentage of time that the noise level is exceeded during the measurement period. Common levels in environmental acoustics are L10, L50, and L90. L10 indicates the sound level that is exceeded 10 percent of the time and is generally taken to be indicative of the highest noise levels experienced at the Project Site. Construction noise criteria are often based on L10. The L90 is the level exceeded 90 percent of the time and this level is often called the base or background level of noise at a location. The L50 sound (that level exceeded 50 percent of the time) is frequently used in standards and ordinances dealing with traffic noise.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within ±1 dBA. The data from sound level measurements can be used to quantify emissions from noise sources which can be imported into computer sound models. These computer models are used to predict environmental noise levels over a given area. The accuracy of the predicted models depends on the accuracy of the noise sources data, the distance from the source to receptor, atmospheric conditions, and ground representation and its effective attenuation. The closer to the noise source, the greater is the model's accuracy.

Table 1 defines technical terms that are used in this document.

Table 1 Definitions of Acoustical Terms

Terms	Definitions
dB, Decibel	Unit of measurement of sound level
dBA, decibel A-Weighted	A unit of measurement of sound level corrected using the A–weighting network (scale), as defined in American National Standards Institute, Inc. ((ANSI) S1.4–1971 (R1976), using a reference level of 20 micro-Pascals (0.00002 Newtons per square meter).
A – Weighted Scale	A frequency weighting scale, which corrects the sound pressures in individual frequency bands according to human sensitivities. The scale is based upon the fact

Terms	**Definitions**
	that the region of highest sensitivity for the average ear is between 2,000 and 4,000 Hz. Sound levels are measured on a logarithmic scale in decibels, dB. The universal measure for environmental sound is the A–weighted sound level, dBA.
C—Weighted Scale	A frequency weighting scale which currently is most commonly used to assess the low frequency noise component of environmental sound. The scale of C-weighting is generally flat, and thus includes more of the low-frequency range of sounds.
Hz, Hertz	Unit of measurement of frequency, numerically equal to cycles per second.
Loudness	A listener's perception of sound pressure incident on his ear.
L01, L10, L50, L90	The A–weighted noise levels that are exceeded 1 %, 10 %, 50 %, and 90 % of the time during the measurement period.
Leq, Equivalent Noise Level	Also, called the equivalent continuous noise level. It is the continuous sound level that is equivalent, in terms of noise energy content, to the actual fluctuating noise existing at the location over a given period, usually one hour. Leq is usually measured in hourly intervals over long periods in order to develop 24–hour noise levels.
CNEL, Community Noise Equivalent Level	The CNEL is a measure of the cumulative noise exposure in the community. This noise descriptor represents the noise level averaged over a 24–hour period with penalties applied to the evening and nighttime noise levels when residents are more sensitive to intrusive noise. The daytime period is from 7:00 a.m. to 7:00 p.m.; evening from 7:00 p.m. to 10:00 p.m.; and nighttime from 10:00 p.m. to 7:00 a.m. No penalty is applied to the measured day levels defined as 7 a.m. to 7 p.m. A 5-dB penalty is applied to the evening levels (7 p.m. to 10 p.m.) and a 10-dB penalty is applied to the nighttime levels (10 p.m. to 7 a.m.).
Ldn, Day/Night Noise Level	The same as CNEL except that the evening time period is not considered separately, but instead it is included as part of the daytime period. Measurements of both CNEL and Ldn in the same residential environments reveal that CNEL is usually slightly higher (usually less than 1 dB) than Ldn due to the penalties applied during evening hours.
Lmin, Lmax	The minimum and maximum A–weighted noise level during the measurement period.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Effects of Noise

Hearing Loss

While physical damage to the ear from an intense noise impulse is rare, a degradation of auditory acuity can occur even within a community noise environment. Hearing loss occurs mainly due to chronic exposure to excessive noise but may also be due to a single event such as an explosion. Natural hearing loss associated with aging may also be accelerated from chronic exposure to loud or even moderate noise.

The Occupational Safety and Health Administration (OSHA) has a worker noise exposure standard, which is set at the noise threshold where hearing loss may occur from long–term exposures. The maximum allowable level is 90 dBA averaged over an eight (8)-hour time period. CDC's National Center for Environmental Health is currently advising that prolonged exposure to noise levels above 70 dB may begin to damage a person's hearing.

Sleep and Speech Interference

The threshold for speech interference depends on the speaker-to-listener distance and the vocal effort of the speech. At a speaker-to-listener distance of 1 meter a normal relaxed conversation is fully intelligible at background sound levels of 35 dBA and is fairly well understood with the background levels of 45 dBA. Outdoor thresholds are 15 dBA higher. With the background sound level of 65 dBA, a conversation at a distance of 1 meter can be intelligible but requires a considerable vocal effort. Thresholds of speech interference are affected by hearing impairment. Even a slight hearing impairment of the listener in the upper frequencies can significantly affect speech intelligibility in noisy environment.

Steady noise of sufficient intensity (above 35 dBA), and fluctuating noise levels above 45 dBA have been shown to affect sleep. Interior residential standards for multi–family residences are set by the State of California at 45 dB Ldn. Typically, the highest steady traffic noise level during the daytime is equal to the Ldn, and nighttime levels are generally 10 dB lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses. Typical sound attenuation for residential building walls is 12–17 dB(A) with open windows. With closed windows in good condition, the noise attenuation factor is 20 dB(A) for older structures and 25 dB(A) for newer structures. Sleep and speech interference is therefore possible when exterior noise levels are 57–62 dB Ldn with open windows and 65–70 dB Ldn if the windows are closed. Levels of 55–60 dB are common along collector streets and secondary arterials, while 65–70 dB is a typical value for primary and major arterials. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed and those facing major roadways and freeways typically need special glass windows.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noise intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio, and television, house vibrations, and interference with sleep and rest. The Ldn as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. When measuring the percentage of the population that is highly annoyed, the threshold for ground vehicle noise is 55 dB Ldn. At an Ldn of 60 dB, 7.7 percent of the population is highly annoyed. When the Ldn increases to 70 dB, the percentage of the population increases to 24 percent highly annoyed. This corresponds to an average increase of 1.6 percent per dB between an Ldn of 60–70 dB.

People appear to respond more adversely to aircraft noise as opposed to general community noise levels. When the Ldn is 60 dB; approximately 10 percent of the population is highly annoyed. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2.

Table 2 Typical Sound Levels Measured in the Environment

At a Given Distance from Noise Source	A–Weighted Sound Level in dBA	Noise Environments	Subjective Impression
	140		
Civil Defense Siren (100')	130	Rock Music Concert	
Jet Takeoff (200')	120		Pain Threshold
	110		
Diesel Pile Driver (100')	100		Very Loud
	90	Boiler Room Printing Press Plant	
Freight Cars (50')			
Pneumatic Drill (50')	80		
Freeway (100')	70	In Kitchen with Garbage Disposal Running	Moderately Loud
Vacuum Cleaner (10')			
	60	Data Processing Center	
Light Traffic (100')	50	Department Store	
Large Transformer (200')			
	40	Private Business Office	Quiet
Soft Whisper (5')	30	Quiet Bedroom	
	20	Recording Studio	
	10		Threshold of Hearing
	0		

Fundamentals of Ground Vibration

The ground vibration can be defined as oscillatory displacement of the ground as a result of a disturbance (excitation) from vibration source. The disturbance propagates away from the source by means of vibration waves. The main vibration waves are the: "primary" or "compression" waves (P-waves), "secondary" or "shear" waves (S-waves), and Rayleigh waves (R-waves). The first two waves are called "body waves". The third one is a type of a surface wave as it is confined to a zone near the surface. The motion of ground particles associated with a P-wave is the back-and-forth movements along the direction of the wave travel. The motion of ground particles associated with an S-wave is in a direction transverse to the direction of the wave. For R-waves, the motion of ground particles has both horizontal and vertical components, and these movements attenuate rapidly with depth. Since Rayleigh waves are confined to a narrow zone along the surface of the ground, they tend to carry more energy and do not attenuate with distance as much as the P-waves or S-waves. The main properties of ground vibration are the vibration amplitude – the maximum displacement and the vibration frequencies.

Ground vibration can induce vibration of buildings and structures that it supports. Construction as well as traffic induced vibration in buildings can be a common source of annoyance affecting residents and, in some cases, can degrade the performance of precision measuring equipment (MRI, etc.). Any perceptible vibration from extraneous sources tends to result in residential concerns about possible building (structure) damage, even when the associated amplitudes of vibration are much, much lower than those barely sufficient to cause superficial damage such as cracks stucco or drywall. Also, vibration below the threshold of perception can affect people through their sense of hearing if causes airborne noise from rattling objects or building surfaces. Traffic (including heavy trucks) on major highways, rarely generates vibration amplitudes high enough to cause any type of structural or cosmetic damage and in most instances the resulting vibrations would not be perceptible. Traffic along secondary roadways closer to residences where vehicles travel over potholes or other discontinuities in the pavement can induce high enough vibration levels to result in complaints from the residents. Freight trains and light-rail trains can also be significant sources of ground vibration.

Most construction and traffic induced vibration involve sources of vibration at or near the surface, making the R-waves the primary waves of concern. Even when the actual vibration sources are below the surface (e.g., pile driving) R-waves form at the surface within a short distance from the location of the source. Therefore, propagation of vibration from construction or traffic sources is typically modeled assuming R-waves. Vibration can be continuous or transient. According to the California Department of Transportation (Caltrans) Vibration Guidance Manual (2013), the following vibration sources result in the continuous vibration:

- excavation equipment,
- static compaction equipment,
- tracked vehicles,
- traffic on a highway,
- vibratory pile drivers,
- pile-extraction equipment, and
- vibratory compaction equipment.

Transient and low-rate repeated vibration may result from the following activities:

- impact pile drivers,
- blasting,
- drop balls,
- “pogo stick” compactors, and
- crack-and-seat equipment

The effects of vibration on people or structures are primarily a function its amplitude and frequency. The typical frequency range of interest in ground and building vibration is from 1 to

80 Hz. Most of construction and traffic induced vibration occurs in the frequency range of 10 to 30 Hz. Single-number vibration amplitude limits for construction are generally set assuming the corresponding vibration frequencies are between 10 and 30 Hz.

The ground and building vibration can be measured directly using velocity transducers or accelerometers. The most common descriptors for ground and building vibration amplitude is the peak particle velocity (PPV) and peak particle acceleration (PPA) defined in inches per second (in/s) and inches per second squared (in/s^2), respectively. Similarly, to noise, the amplitude of vibration is also commonly expressed in decibels. The most common descriptors here are the vibration velocity level (L_v) and vibration acceleration level (L_a).

In this document only construction vibration is considered. The criteria for vibration are set using the PPV as a descriptor.

1.1.1.1 Existing Conditions

Sensitive Receptors and Existing Noise Environment

Some land uses are recognized as being more sensitive than others to noise levels and vibration. Residences, motels and hotels, schools, libraries, houses of worship, hospitals, nursing homes, auditoriums, parks, and outdoor recreation areas are generally more sensitive to noise and vibration than are commercial and industrial land uses. The land use of the Project site is industrial and is adjacent to other industrial, low density residential and recreation land uses. The Project site is bounded to the north by other portions of the Utility Operations Center, on the east by a Union Pacific/Los Angeles METRO rail line and San Fernando Road, on the west by the Los Angeles River and John Ferraro Athletic Fields across the river in the City of Los Angeles, and to the south by Verdugo Wash. Interstate 5 is located adjacent to the John Ferraro Athletic Fields and State Highway 134 is located adjacent to the Verdugo Wash.

The primary noise sources in the Project area are the traffic on adjacent roadway/highways, trains on the adjacent railway, and operation of industrial land uses including the Grayson Power Plant.

Although noise levels at sensitive receptors to the Grayson Power Plant are primarily influenced by vehicle traffic on San Fernando Road, existing operation of the Grayson Power Plant also contributes to these ambient noise levels. Many of the power generation noise sources associated with the current operation of the Grayson Power Plant would be removed during the demolition phase of the Project and replaced with other power generation equipment and the associated noise sources. Basing the Project's assessment on ambient noise levels that included sources that would be removed as part of the Project, would be inaccurate and result in overestimating potential noise impacts. In effort to avoid this, the collection of ambient noise measurements was coordinated, to the extent possible, to coincide with times of low equipment usage at Grayson Power Plant (the units at Grayson are only used for occasional peaking use and do not operate 24/7). Equipment that was in operation during the ambient sound measurements was noted. The noise contributions from these sources were subsequently removed from the measured ambient sound levels to ensure that the quantified ambient sound levels were net of Grayson Power Plant contribution. Some of the sources that were in operation during the surveys included a cooling tower, air washer, air preheater, compressor, vapor extractor, oil pump, turbine gear/decks and fans. These sources will be removed as part of the Project and will no longer contribute to noise.

Existing noise levels were measured at seven representative receptors (R1 – R7) near the Project site on March 23 and 24, 2017. An additional receptor, R8, was surveyed in April of 2021 to capture the new sensitive land use. The measurements were used to estimate ambient noise levels in the surrounding environment. As described above, these noise measurements, to the extent possible, were collected at times that reflected ambient noise levels without operation of the existing Grayson Power Plant primary noise sources which would be removed as part of the Project. Ambient measurement locations were selected at the nearest sensitive receptors to the Project site, which are primarily the residences located to the east/northeast and across the railway and San Fernando Road, the Confluence Park at the confluence of the Los Angeles River and the Verdugo Wash, and the John Ferraro Athletic Fields across the Los Angeles River.

In accordance with Chapter 8.36 (Noise Control) of the City of Glendale Municipal Code and Chapter XI (Noise Regulation) of the City of Los Angeles Municipal Code, noise measurements were collected using a sound level meter set to A-weighing and positioned close to property line with the microphone located four to five feet above the ground and ten or more feet from the nearest reflective surface where practical. Measurements were collected for minimum of 15-minute continuous intervals during day, evening, and nighttime periods. These measurement lengths meet or exceed the five-minute criteria identified in Chapter 8.36 (Noise Control) of the City of Glendale Municipal Code and the 15-minute criteria identified in the City of Los Angeles Municipal Code used to determine ambient noise levels. Ambient noise levels at one location were measured for 25 continuous hours, consistent with that applied by the California Energy Commission for determining ambient noise levels for proposed power plants undergoing their licensing process. The sensitive receptors, proximity to the project site, and the ambient noise level are presented in Table 3 below. The locations of the sensitive receptors are shown in Figure 1. Receptors 1 through 6 are located in the City of Glendale and Receptor 7 is located within the City of Los Angeles. Ambient noise measurements collection logs are included as Appendix I.

Table 3 Sensitive Receptors and Ambient Noise Levels in Proximity to Project Site

Receptor Identification	Receptor Description	Receptor Location	Ambient Noise Level (Leq)		
			Day	Evening	Night
R1	Residential land use	Residences along Kellogg Ave. Approximately 740 feet northeast of the Grayson Power Plant (across the railway tracks and San Fernando Ave).	54.2	55.3	49.6
R2	Residential land use	Residences along Highland Ave. Approximately 470 feet northeast of the Grayson Power Plant	64.7	61.7	52.8

Receptor Identification	Receptor Description	Receptor Location	Ambient Noise Level (Leq)		
			Day	Evening	Night
		(across the railway tracks and San Fernando Ave).			
R3	Residential land use	Residences near Grange St and Dale Ave (particularly those abutting the alley between the mixed use and residential land uses. Approximately 430 feet east of the Grayson Power Plant (across the railway tracks and San Fernando Ave).	57.1	57.2	52.8
R4	Grayson Power Plant Property boundary	Grayson Power Plant exit gate on Flower Street at western property boundary.	68.4	67.8	56.0
R5	Industrial land use	Near corner of Fairmont and Flower St. Approximately 1,200 feet northwest of Grayson Power Plant.	60.5	61.2	57.7
R6	Grayson Power Plant Property boundary	Near the corner of Flower St and Grand Central Ave at the northwestern property boundary.	61.7	58.6	55.6
R7	Recreation land use	East end of John Ferraro Athletic Fields. Approximately 510 feet west of Grayson Power Plant.	60.6	61.8	58.8
R8	Recreation land use	Centre-north location of the Confluence Park. Approximately, 120 feet south of Grayson Power Plant.	69.6	67.7	65.6

Note:
- Data collected by Stantec Personnel on March 23 and 24, 2017 at receptors R1 to R7 and on April 7, 2021 at receptor R8.
- Data does not include the abnormal noise events recorded during the survey or the contribution from the existing Grayson Power operation

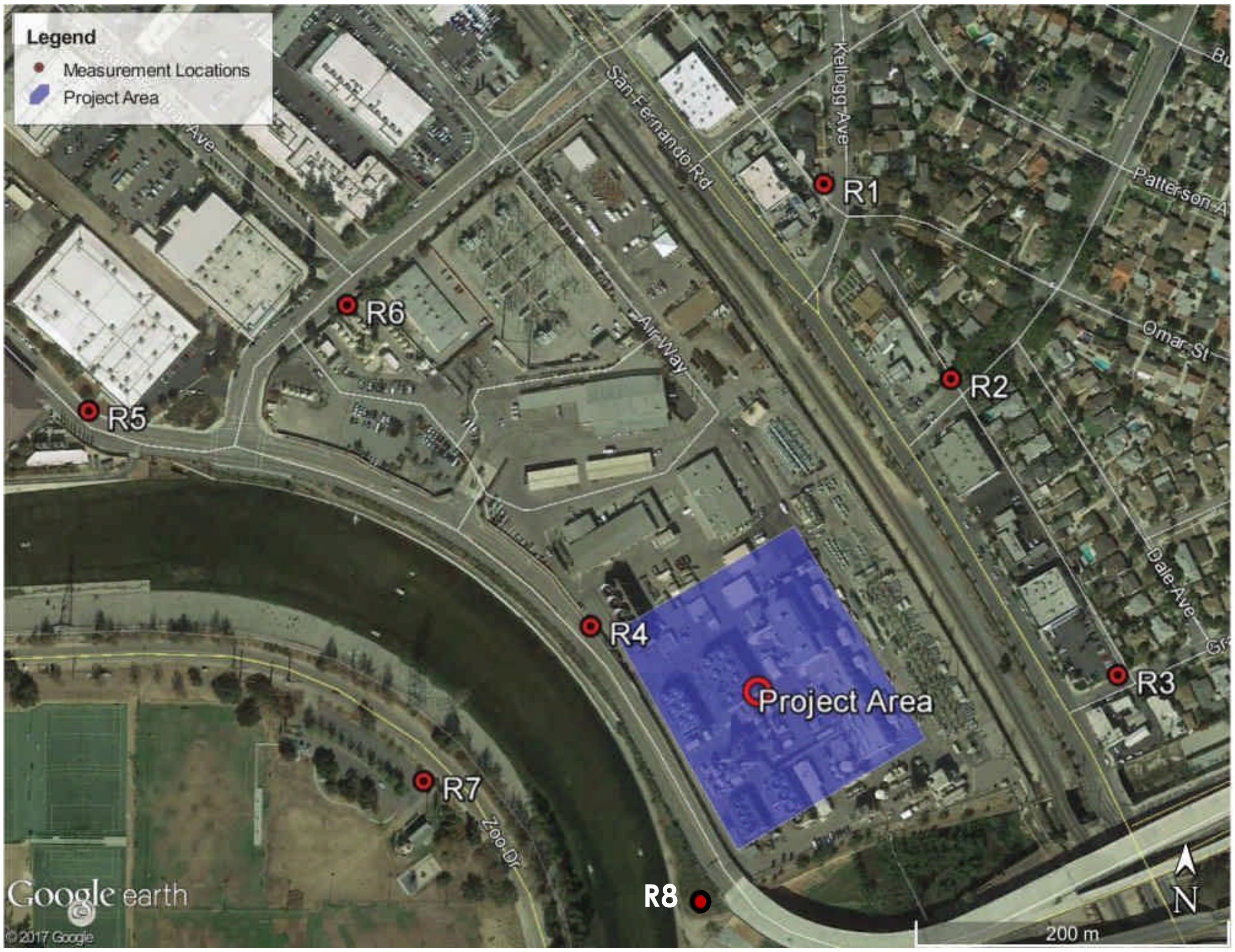


Figure 1 Ambient Noise Measurement Locations

1.1.2 LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The federal, state and local noise LORS applicable to the Project or adopted for purposes of this noise impact analysis are listed in Table 4 and summarized below.

Table 4 Laws, Ordinances, Regulations, and Standards (LORS) for Noise

LORS	Administering Agency
Federal	
Federal Noise Control Act of 1972 (40 CFR Part 204)	USEPA
29 CFR 1919.120	OSHA
State	
Government Code Section 65302(g)	California Office of Noise Control
20 CCR Division 2, Appendix B(g)(4)(A)	California Energy Commission
CCR Title 24, California Noise Insulation Standards	California Building Standards Commission
8 CCR Section 5095 et seq.	Cal-OSHA
Local	
General Plan Noise Element	City of Glendale
Noise Ordinance	City of Glendale
General Plan Noise Element	City of Los Angeles
Noise Ordinance	City of Los Angeles

Federal

The Federal Noise Control Act regulates noise emissions from operation of construction equipment and facilities; establishes noise emission standards for construction and other categories of equipment and provides standards for testing, inspection, and monitoring of such equipment. It also gives states and municipalities primary responsibility for noise control.

There are no Federal LORS directly regulating offsite (community) noise. Federal regulations applicable to the Amended Project have been incorporated into state and local requirements. USEPA noise guidelines have been considered in developing local requirements.

Federal regulations safeguard the hearing of workers exposed to occupational noise, enforced by OSHA (29 CFR 1910.95). For example, it is unlawful for employees to be exposed to noise levels in excess of 115 dBA for more than 15 minutes during any working day. The USEPA has developed guidelines on recommended maximum noise levels to protect public health and welfare. The USEPA identifies a 24-hour exposure level of 70 dBA as the level of environmental noise which will prevent any measurable hearing loss over a lifetime.

State

California State Government Code Section 65302g mandates that noise elements be included as a part of city general plans and that cities adopt comprehensive noise ordinances. The Cities of Glendale and Los Angeles both have noise elements and ordinances which are discussed further below under Local LORS.

According to Cal-OSHA, the standard is set at the noise threshold where hearing loss may occur from long–term exposures. The maximum allowable level is 90 dBA averaged over an eight (8)-hour time period. Standards and implementation are administered by the California Department of Industrial Relations' Division of Occupational Safety and Health (Cal-OSHA) which are based on the USEPA occupational guidelines to protect the hearing of workers. Onsite Project areas above 85 dBA will be posted as high noise level areas and hearing protection will be required in these work areas and the 8-hour exposure levels below 90 dBA will be maintained.

The California Energy Commission (CEC) guidelines state that the area of impact to be studied should include areas where the noise of the project plus the background exceeds the existing background levels by 5 dB(A) or more at the sensitive receptor, including those receptors that are considered a minority population. The CEC has considered it reasonable to assume that an increase in background noise levels up to 5 dBA in a residential setting is considered insignificant, while an increase of more than 10 dBA in a residential setting is considered significant. For projects where the increase is between 5 and 10 dBA, the level of an impact depends on the particular circumstances of a case. Factors to be considered in determining the significance of an impact for this plus 5 to plus 10 dB situation include:

- Resulting noise level.
- Duration and frequency of the noise.
- Number of people affected; and
- Land use designation of the affected receptor sites.

CCR Title 24 establishes a maximum interior noise level of 45 dBA CNEL, with windows closed, due to exterior noise sources, for dwellings other than detached single-family dwellings.

8 CCR Section 5095 et seq. establishes Cal-OSHA employee noise exposure limits. These standards are equivalent to the Federal OSHA standards. Worker noise exposure is limited to 90 dBA over an eight-hour work shift. Areas where worker noise exposure exceeds 85 dBA must be posted as a noise hazard zone and a hearing conservation program is required.

Local

Community noise standards relevant to the Project are contained in the City of Glendale General Plan and Noise Ordinance due to the Project's location, and the City of Los Angeles General Plan and Noise Ordinance due to the John Ferraro Athletic Fields across the Los Angeles River from the Project.

City of Glendale General Plan Noise Element

The City of Glendale General Plan Noise Element (adopted June 7, 2007) specifies outdoor and indoor noise standards for various land uses impacted by transportation noise sources. The City's noise standards are consistent with the State of California's noise standards. The interior and exterior noise standards are set using CNEL scale. The standards state that for residential land use, the exterior noise exposure level shall not exceed 65 CNEL and the interior noise exposure level shall not exceed 45 CNEL. Based on Noise/Land Use Compatibility Table (Table 1) CNEL of up to 70 dB is acceptable for playgrounds and neighborhood parks. Parks where peace and quiet is of primary importance, have an exterior standard of 65 CNEL. Hotel, motel, transient lodging, church, school classroom, and hospital uses have interior noise limits of 45 CNEL. These levels are also consistent with the land use compatibility guidelines developed by the California Department of Health.

City of Glendale Noise Ordinance

A noise ordinance is designed to control unnecessary, excessive, and annoying sounds from stationary (non-transportation) noise sources. Noise ordinance requirements cannot be applied to mobile noise sources such as heavy trucks when traveling on public roadways. Federal and state laws preempt control of mobile noise sources on public roads. Noise ordinance standards typically apply to industrial and commercial noise sources impacting residential areas.

The City of Glendale Noise Ordinance, located in Chapter 8.36, Section 8.36.040 of the Municipal Code specifies exterior noise standards in terms of equivalent sound levels (Leq). The Ordinance applies the most stringent exterior noise limits of 55 to 60 dBA Leq, depending on the type of residential, for the daytime period (7:00 A.M. to 10:00 P.M.) and 45 dBA Leq for the nighttime period (10:00 P.M. to 7:00 A.M.) at the nearest residential property. Also, the exterior noise level cannot exceed 65 dBA (Leq) at any time at an adjacent commercial property, and 70 dBA (Leq) at any time at an adjacent industrial property. The noise limits pertain to the amount by which the particular noise is allowed to exceed the actual (measured) ambient. Section 8.36.050 of the City of Glendale's Noise Ordinance specifies that when determining ambient and allowable noise levels, the following applies:

- Where the actual ambient is less than the presumed ambient, the actual ambient shall control and any noise in excess of the actual ambient, plus five dBA, shall be a violation.

- Where the actual ambient is equal to or more than the presumed ambient, the actual ambient shall control and any noise may not exceed the actual ambient by more than five dBA; however, in no event may the actual ambient exceed the presumed noise standards by five dBA.

- At the boundary line between two zones, the arithmetic average of the presumed ambient noise levels shall be used.

The City of Glendale Noise Ordinance exempts noise from construction activity for certain time periods. Activities that take place between 7:00 A.M. and 7:00 P.M. Monday through Saturday will be exempt from the noise standard. Construction will not be allowed at any time on a Sunday or on holidays with a waiver provided by the City. The City of Glendale does not have regulations that establish maximum construction noise levels. However, Section 8.36.290(K) provides an exemption from the Noise Ordinance for any activity, operation, or noise, that cannot be brought into compliance (with the Noise Ordinance) because it is technically infeasible to do so. "Technical infeasibility," for the purpose of this section, means that noise limitations cannot be complied with despite the use of mufflers, shields, sound barriers, and/or any other noise reduction devices or techniques during the operation of the equipment.

Section 8.36.210 of the Noise Ordinance provides that vibration created by the operation of any device would be a violation of City standards if such vibration were above the vibration perception threshold of an individual at or beyond the property boundary of a source on private property. For sources on a public space or public right-of-way, a violation would occur if the vibration perception threshold of an individual were exceeded at a distance of 150 feet from the source. Under the Noise Ordinance, the vibration perception is presumed to be at 0.01 in/s over the frequency range of 1 Hz to 100 Hz. The Noise Ordinance, however, does not state whether the presumed perception limit represents the peak particle velocity (PPV) or the root-mean-square (RMS) value and does not establish maximum allowable vibration levels during construction activities, where limited options exist to eliminate ground vibration. The presumed perception limit of 0.01 in/s is lower than 0.03 in/s PPV typically used for steady-state vibration perceptibility criterion (e.g., Reiher-Meister chart). Additionally, the background levels of vibration in buildings in urban areas are typically 0.03 in/s or more.

City of Los Angeles General Plan Noise Element

The City of Los Angeles's noise standards are correlated with the type of land use (e.g., residential, commercial, etc.) in order to maintain identified ambient noise levels and to limit, mitigate, or eliminate intrusive noise that exceeds prescribed noise levels for different land use types.

In accordance with the Noise Element, noise exposure of up to 60 dB CNEL is considered to be the most desirable target for the exterior of noise-sensitive land uses, or sensitive receptors, such as homes, schools, churches, libraries, etc. It is also recognized that such a level may not always be possible in areas of substantial traffic noise intrusion. Exposures up to 70 dB CNEL for noise-sensitive uses are considered conditionally acceptable if all measures to reduce such exposure have been taken. Noise levels above 70 dB CNEL are normally unacceptable for sensitive receptors except in unusual circumstances (City of Los Angeles, 1999).

City of Los Angeles Noise Ordinance

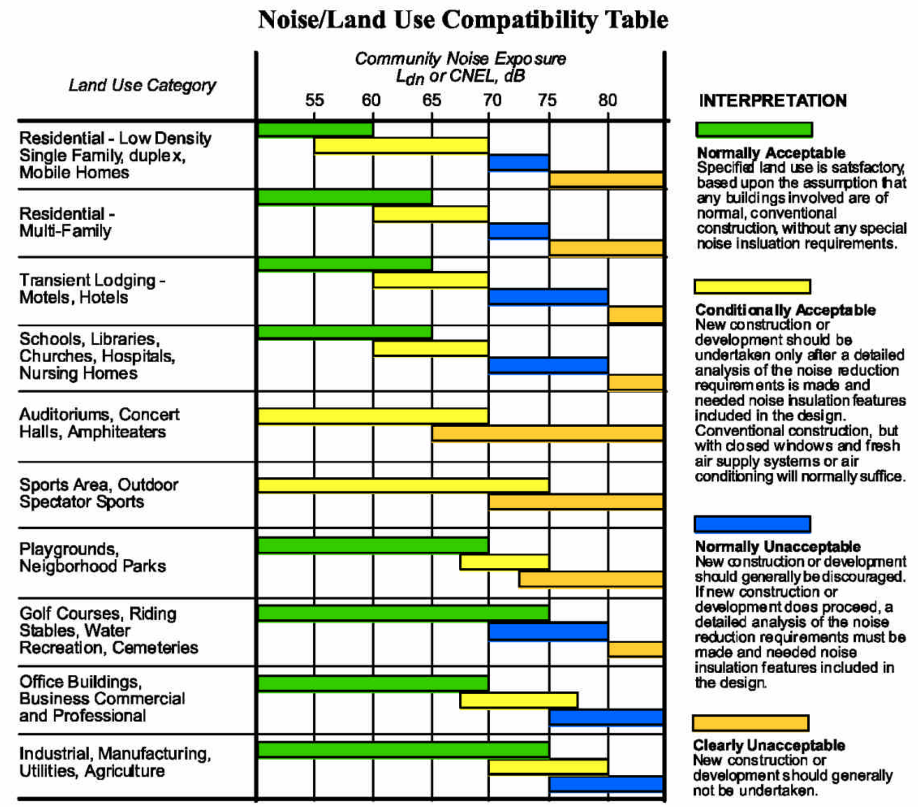
The City of Los Angeles Noise Control Ordinance Chapter XI Noise Regulation, Sec. 111.03, prohibits unnecessary, excessive and annoying noise. Increases of 5 decibels above the existing measured or presumed ambient noise levels are in violation of the City of Los Angeles Noise Ordinance. Where the existing measured ambient noise level is less than the presumed ambient noise level designated in the City Noise Ordinance, the increase is measured from the presumed ambient noise level. The nearest sensitive receptor in the City of Los Angeles to the Project site are the John Ferraro Athletic Fields west of the Los Angeles River. The athletic fields have an open space land use designation and zoning. Chapter XI does not include presumed ambient noise levels for open space zones.

The City of Los Angeles noise ordinance (Section 41.40) states that construction activity within 500 feet of any residential zone shall be limited to between the hours of 7:00 A.M. and 9:00 P.M., Monday through Friday, and 8:00 A.M. and 6:00 P.M. on Saturday. Construction will not be allowed at any time on a Sunday or on holidays.

Land Use and Noise Compatibility Matrix

The Cities of Glendale and Los Angeles Noise Elements contain similar compatibility matrices for determining the compatibility of various land uses with noise levels. These matrices are consistent with the California Noise/Land Use Compatibility Guidelines. This matrix is shown below. This exhibit classifies various land uses in terms of Normally Acceptable, Conditionally Acceptable, Normally Unacceptable and Unacceptable based on their noise exposure in the Community Noise Equivalent Level (CNEL) scale. For residential uses, CNEL levels from 50 to 60 dB are Normally Acceptable, CNEL levels from 65 to 70 dB are Conditionally Acceptable, CNEL levels of greater than 75 dB are Normally Unacceptable.

A land use exposed to noise levels that are considered Normally Acceptable indicates that the land use is compatible with the noise environment and no special noise insulation is required. If new construction is exposed to a Conditionally Acceptable noise level, a noise analysis is typically required to determine noise mitigation required to reduce noise levels to a compatible level. Conventional construction will normally suffice with a fresh air supply system or air conditioning to allow windows to remain closed. A noise analysis is also required for new construction exposed to a Normally Unacceptable noise level. The analysis is required to determine mitigation measures, which may be significant, to reduce noise levels to a compatible level. Proposed development exposed to Clearly Unacceptable noise levels should generally not be undertaken.



Normally Acceptable
Specified land use is satsfactory, based upon the assumption that any buildings involved are of normal, conventional construction, without any special noise insluation requirements.

Conditionally Acceptable
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

Normally Unacceptable
New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

Clearly Unacceptable
New construction or development should generally not be undertaken.

Source: State of Califronia, "General Plan Guidelines," 1998

Noise Land Use Compatibility Chart

Low Frequency Noise

There are no applicable regulations that address the Project's low frequency noise (LFN) emissions at either Federal, State, on Municipal level. However, to ensure a complete evaluation the Project did assess the potential impacts of LFN.

In the absence of regulations, the preferred LFN limits for the Project are defined using guidance in ANSI 12.9 Part 4 standard. ANSI 12.9 uses the logarithmic (energy) summation of sound pressure levels in the 16-Hz, 31.5-Hz, and 63-Hz octave bands as single number descriptor for LFN content. The standard advises that generally, annoyance is minimal when sound pressure levels at 16 Hz, 31.5 Hz and 63 Hz are below 65 dB (equivalent LFN of up to 70 dB) and such LFN levels are generally acceptable. Environmental noise with sound pressure levels at 16 Hz, 31.5 Hz and 63 Hz in excess of 75 dB (LFN of up to 80 dB), can result in noticeable noise induced rattles and such LFN noise levels are generally unacceptable. For LFN above 75 dB, ANSI 12.9 advises additional adjustment for increased annoyance from rattles that result when LFN exceeds 75 dB.

1.1.3 ENVIRONMENTAL IMPACTS

1.1.3.1 Methodology

Assessment Methodology

The approach used to assess the potential noise effects during normal operations of the Project is:

1. Define the noise thresholds of significance in accordance with the regulatory requirements framework
2. Create a noise model based on the Project facility's layout and equipment noise emissions as provided by the equipment vendors
3. Predict noise levels at the identified noise sensitive receptor locations
4. Determine cumulative sound levels for the Project operation at the identified receptors by combining predicted sound levels with the established ambient sound levels
5. Assess compliance of cumulative sound levels with the noise thresholds
6. Assess low-frequency noise
7. Summarize project noise mitigation measures
8. Evaluate the Project's compliance with the regulatory requirements

The approach used to assess the potential noise effects during the Project construction and demolition is:

1. Define the noise thresholds of significance using the same regulatory requirements framework as that for normal operation of the Project
2. Identify construction and demolition activities with the highest intensities of noise emissions and quantify such noise emissions utilizing commonly used equipment emissions lists and databases (e.g., FHWA[1], DEPRA[2])
3. Identify the areas for the aforementioned demolition and construction activities and create the respective noise models utilizing the quantified noise emissions
4. Predict noise levels at the identified noise sensitive receptor locations
5. Determine cumulative sound levels for the Project construction and demolition activities at the identified receptors by combining predicted sound levels with the established ambient sound levels
6. Assess compliance of cumulative sound levels with the noise thresholds
7. Summarize Project demolition and construction noise mitigation measures
8. Evaluate the Project's compliance with the regulatory requirements

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[1] FHWA Highway Construction Noise Handbook, Final Report, August 2006

[2] Update of Noise Database for Prediction of Noise on Construction and Open Sites, Department for Environment Food and Rural Affairs, UK, 2005.

1.1.3.2 Assessment Scenarios

The Project assessment considered two operating scenarios, demolition of the existing Grayson Power plant, and three construction phases deemed to have the highest potential intensity of noise emissions.

The two operating scenarios considered in this assessment are referred to as Alternative 7 and Alternative 8. Alternative 7 combines natural gas engine (Wartsila W18V50SG) driven generator sets with battery storage (Tesla Megapacks) during off-peak times. Alternative 8 combines the refurbished gas turbine (Pratt & Whitney FT4C) driven generator units 8A and 8B/C with Tesla battery storage during the off-peak times. As only one of the two Alternatives will be selected for the Project, the noise emissions from the two Alternatives are not cumulative.

The three construction phases considered in this assessment include building construction, piling, and concrete pouring. The equipment used in each assessed operating scenario, demolition activities, and each assessed construction phase is summarized tables below. The acoustic usage factor, which defines the fraction of the time that the particular piece of equipment operates at full power, was set to 100% for the two operating scenarios. The acoustic usage factor for demolition and construction was set in accordance with FHWA recommendations[3].

Table 5 Operation, Alternative 7 - Equipment Summary

Equipment/Component	Quantity	Acoustic Use Factor (%)
Wartsila W18V50SG gas engines (interior to powerhouse)	5	100
Electrical generators (interior to powerhouse)	5	100
Combustion air inlet (aperture)	10	100
Combustion air filter housing	5	100
Combustion air inlet ducting (interior to powerhouse)	5	100
Combustion exhaust ducting	5	100
Selected catalytic reduction unit (SCR)	5	100
Combustion exhaust stack casing	5	100
Combustion exhaust stack exit	5	100
Powerhouse ventilation exhaust fans (roof-mounted)	10	100
Powerhouse ventilation inlets	15	100
Compressor (interior to the compressor compartment)	1	100
Compressor compartment ventilation inlets	3	100
Compressor compartment ventilation outlets	5	100
Gas pressure reduction station	1	100
Radiator coolers (4-fan units)	25	100
69 kV Generator step-up transformers (GSU transformers)	2	100
Tesla 4-hour Megapack battery unit	70	100
69 kV GSU transformers (battery storage)	2	100

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[3] Federal Highway Administration (FHWA). 2006. Roadway Construction Noise Model User's Guide.

Table 6 Operation, Alternative 8 – Equipment Summary

Equipment/Component	Quantity	Acoustic Use Factor (%)
Pratt & Whitney FT4C gas turbines (Units 8A/B/C, enclosed)	3	100
Unit 8A electrical generator (TEWAC – totally enclosed water-air cooled)	1	100
Units 8B/C electrical generator (TEWAC)	1	100
Gas turbine enclosure ventilation inlets	6	100
Gas turbine enclosure ventilation discharges	3	100
Combustion air inlets (apertures)	3	100
Combustion air filter housing	3	100
Combustion air inlet ducting and inlet silencer casing	3	100
Combustion exhaust ducting (Units 8B/C)	2	100
Once thru boiler (OTB) transition (Units 8B/C)	1	100
OTB body (Units 8B/C)	1	100
OTB exhaust stack casing (Units 8B/C)	1	100
OTB exhaust stack exit (Units 8B/C)	1	100
OTB tempering air blower (Units 8B/C)	1	100
SCR transition (Unit 8A)	1	100
SCR body (Unit 8A)	1	100
SCR exhaust stack casing (Unit 8A)	1	100
SCR exhaust stack exit (Unit 8A)	1	100
SCR tempering air blower (Unit 8A)	1	100
Ammonia flow control skid	2	100
Air cooled heat exchanger (fin-fan cooler)	1	100
Wet cooling tower	1	100
Boiler feedwater pumps	2	100
Circulating water pumps	2	100
Steam turbine (interior to steam turbine building)	1	100
Steam turbine generator (TEWAC, interior to steam turbine building)	1	100
Steam turbine condenser (interior to steam turbine building)	1	100
Steam turbine building ventilation openings (inlet and discharge)	1	100
Steam piping (feet)	130	100
69 kV GT generator step-up transformer (Unit 8A)	1	100
69 kV GT generator step-up transformer (Units 8B/C)	1	100
69 kV ST generator step-up transformer	1	100
Tesla 4-hour Megapack battery unit	70	100
69 kV GSU transformers (battery storage)	2	100

Table 7 Demolition

Equipment/Component	Quantity	Acoustic Use Factor (%)
Excavator (loading dump truck)	1	40
Excavator with crusher	1	40
Graders	1	40
Rubber Tired Dozers	2	40
Tractors/Loader (debris loading)	2	40

Equipment/Component	Quantity	Acoustic Use Factor (%)
Tractors/Backhoes (breaker)	2	40
Cranes (150 hp)	1	16
Forklifts	2	20
Rollers	1	20
Other Equipment	1	50

Table 8 Construction – Building Construction

Equipment/Component	Quantity	Acoustic Use Factor (%)
Cranes (250 hp)	2	16
Cranes (150 hp)	4	16
Cranes (500 hp)	2	16
Forklifts	4	20
Tractors/Loaders/Backhoes (200-hp, scaled)	2	40
Generator Sets	1	50
Tractors/Loaders/Backhoes	2	40
Welders	1	40
Rollers - 100hp	1	20
Excavators - tracked	2	40
Other Equipment (general/mat. handling)	5	50

Table 9 Construction – Concrete Pouring

Equipment/Component	Quantity	Acoustic Use Factor (%)
Concrete Mixer Truck	4	40
Concrete Pump truck	4	20
Other Equipment	2	50

Table 10 Construction – Pile Driving

Equipment/Component	Quantity	Acoustic Use Factor (%)
Impact Pile Drivers	2	20
Cranes (500 hp)	2	16
Other equipment	1	50

1.1.3.3 Noise Thresholds of Significance

Based on the City of Glendale and City of Los Angeles noise standards, supplemented by measured background noise levels, the applicable noise limits were developed to which the project must adhere for residential and recreational receptors.

For the residential receptors, such limits were set as the difference between the Community Noise Standard as set out by the City of Glendale and the actual (measured) or maximum presumed ambient sound level. These limits were then used to assess the acceptability of predicted noise emissions that are presented later in the report.

For the recreational receptors, the Project only CNEL were calculated from the difference between the maximum acceptable CNEL based on the City of Glendale the City of Los Angelis noise elements and the measured background CNEL. The Project only CNEL limit was subsequently converted to the equivalent A-weighted Leq limit assuming continuous 24/7 operation.

Residential Receptors

Thresholds of significance at the residential receptors are provided by the City of Glendale Noise Ordinance. The thresholds of significance represent limits beyond which the exposure of persons to or generation of noise exceeds the standards established in the local general plan or noise ordinance, or applicable standards of other agencies. These limits are specified for daytime and nighttime periods and incorporate the actual measured ambient sound levels.

Conveniently, the thresholds can be used to define the allowed noise contributions from the Project (noise design targets) at the noise sensitive receptors, which in turn, establish limits on noise emissions from the Project demolition, construction and operation.

Project Operation

The Project is expected to operate occasionally (15% or less on annual basis) at varying loads primarily during the daytime, but may also operate during the night. For the purpose of this assessment in order to adequately quantify noise impacts, the Project operation was assumed as continuous and under full load. For residential receptors, nighttime limits as specified in the City of Glendale Noise Ordinance are most stringent. At the same time, the noise emissions from the Project are assumed to be substantially unchanged from daytime to nighttime hours and reflecting full power operating condition. Therefore, the nighttime thresholds define Project noise limits and govern the Project noise control requirements at the residential receptors. Residential area east of San Fernando Road is the area most affected by the project. The area’s boundary between R2 and R3 represents the most affected noise sensitive receptors. Project compliance at these receptors will automatically result in compliance at the commercial area along San Fernando Road where noise limits are 10 dB higher. Table 5 below shows the summary of Project design targets for the residential noise sensitive receptors.

Table 11 Determination of Noise Design Targets for the Project Operation at Residential Locations

Receptor	Measured Nighttime Ambient (dBA)	Presumed Nighttime Ambient (dBA)	Cumulative Nighttime Limit (dBA)	Project Noise Design Target (dBA)	
				Based on Measured Ambient	Based on Presumed Ambient
R1	49.6	49.6	54.6	53.0	**53.0**
R2	52.8	50.0	55.0	51.0	**53.4**
R3	52.8	50.0	55.0	51.0	**53.4**

Note:
- Noise design targets reflect the City of Glendale Noise Ordinance and are based on ambient sound level data which excludes the contribution from existing Grayson Power operation.
- The noise targets assume that the Project operates continuously at full power.

Project Demolition and Construction

The Project demolition and construction activities are expected to occur during the daytime hours only. Therefore, the daytime thresholds define Project demolition and construction noise limits and govern the noise control requirements that may be required during these phases of the Project. Residential area east of San Fernando Road is the area most affected by the project. The area's boundary between R1 and R3 represents the most affected noise sensitive receptors. Compliance at these receptors will automatically result in compliance at the commercial area along San Fernando Road where noise limits are 10 dB higher. Table 6 below shows the summary of Project demolition and construction design targets for the residential noise sensitive receptors.

Table 12 Determination of Noise Design Targets for the Project Demolition and Construction Activities at Residential Locations

Receptor	Measured Daytime Ambient (dBA)	Presumed Daytime Ambient (dBA)	Cumulative Daytime Limit (dBA)	Project Noise Design Target (dBA)	
				Based on Measured Ambient	Based on Presumed Ambient
R1	54.2	54.2	59.6	58.1	**58.1**
R2	64.7	60.0	65.0	53.2	**63.3**
R3	57.1	57.1	62.1	60.4	**60.4**

Note:
- Noise design targets reflect the City of Glendale Noise Ordinance and are based on ambient sound level data which excludes the contribution from existing Grayson Power operation.
- The noise targets assume that the Project demolition and construction operations are at full equipment utilization.

Recreational Receptors

Two recreational receptors, R7 and R8, relevant to the Project have been identified. Receptor R7 represents the most affected recreational receptor at John Ferraro Athletic Fields in the City of

Los Angeles. Receptor R8 represent the Confluence Park in the City of Glendale. The threshold of significance at Receptor R7 is provided by the City of Los Angeles CEQA Thresholds Guide land use compatibility matrix and is specified in terms of maximum acceptable CNEL. Under the Guide, CNEL of up to 70 dB are considered normally acceptable at playgrounds and neighborhood parks.

Thresholds of significance at receptor R8 are provided by the City of Glendale Noise Element land use compatibility matrix and is specified in terms of maximum acceptable CNEL. CNEL of up to 70 dB are considered normally acceptable at parks and playgrounds unless peace and quiet are of particular importance in which case the limit of acceptability is 65 dB CNEL. Ambient sound level measurements performed at R8 yielded current CNEL of 73.1 dB which exceed the threshold of 70 dB. The high existing ambient sound levels at Confluence Park results from park's proximity to Ventura Freeway. Under the City of Glendale Noise Element, CNEL of up to 75 dB are considered conditionally acceptable and in view of existing ambient sound levels, 75 dB is set as the maximum acceptable CNEL for the Confluence Park.

Project noise design target can be derived from the threshold using the measured ambient sound levels at R7 and R8 and assuming that the project operation is unchanged throughout any 24-hour period and reflects operation at 100 percent power. Table 7 below shows the summary of Project noise design target for John Ferraro Athletic Fields to the west of the Project.

Table 13 Determination of Noise Design Targets for the Project Operation at Recreational Receptors

Receptor	Measured CNEL (dB)	Maximum Acceptable CNEL (dB)	Project Only CNEL Limit (dB)	Allowed Project Contribution (dBA, Leq)
R7	66.0	70.0	67.8	**61.1**
R8	73.1	75.0	70.5	**63.8**

Note:
- Noise design target for R7 is based on the City of Los Angeles land use compatibility table and measured CNEL which excludes the contribution from existing Grayson Power operation,
- Noise design target for R8 is based on maximum conditionally acceptable CNEL under the City of Glendale Noise Element and measured CNEL which excludes contribution of Grayson Power
- The allowable Project contribution is based on the assumption that Project operates continuously during the daytime, evening, and nighttime hours.

1.1.3.4 Vibration Limits

In regard to vibration, the City of Glendale Noise Ordinance relates to operation or permitting to operate any device which creates vibration. The ordinance requires that levels of vibration be below the vibration perception threshold defined as 0.01 in/s.

The Ordinance exempts utility company maintenance and construction operations from its provisions. Therefore, for Project construction activities, the vibration limits are set to minimize the potential that such work causes any structural damage to nearby residential and commercial properties. The tolerable vibration levels are shown in Table 8 below. The levels in the table were derived from the data presented in California Department of Transportation, *Transportation and Construction Vibration Guidance Manual*, September 2013. For residential locations to the east of the Project the vibration levels should be limited to 0.2 in/s PPV (peak particle velocity). For the commercial properties along the San Fernando Road, the vibration levels should be limited to 0.5 in/s PPV.

Table 14 Tolerable Vibration Limits for Selected Types of Structures

Structure and Its Condition	**Maximum PPV (in/sec)**	
	Maximum Limit (reflects transient sources of vibration)	**Preferred Limit** Reflects continuous or frequent Intermittent sources of vibration)
Residential structures (gypsum or plastered walls)	0.50	0.20
Modern industrial/commercial buildings	2.00	0.50

Note:

- Limits derived from data presented in Caltrans Construction Vibration Guidance Manual, September 2013.

1.1.3.5 Environmental Noise Modelling

A detailed noise model was built to predict community noise levels from various Project sources. The sound level predictions were then used to assess the noise impacts during operation, demolition and construction and confirm that the main equipment sound power levels as shown in Tables 16, 17, and 18 will result in the Project meeting the community noise standards as defined by allowable project noise contributions.

Sound propagation calculations used in this assessment were in accordance with the International Organization for Standardization (ISO) 9613 Part 1 and 2 Standards. ISO 9613 is commonly used among noise practitioners and is generally accepted by the regulatory bodies for the purpose of sound level predictions. Calculations under ISO 9613-2 account for mild inversion and/or downwind condition (winds from source to receiver of 3 to 11 km/h). The calculation parameters are summarized in Table 15.

Propagation calculation were performed using Cadna/A (v.2019 MR2) computer program from DataKustik, a noise modeling software package incorporating ISO 9613 algorithms.

The model accounted for the following factors:

- Geometric spreading
- Ground absorption
- Screening effects
- Atmospheric absorption
- Noise sources characteristics – type, location, elevations and directivity
- Atmospheric effects of downwind conditions and/or mild temperature inversion

Model Parameters

The modelling parameters used in the assessment are summarized in Table 15 below.

Table 15 Noise Model Parameters used in Project Noise Impact Assessment

Model Parameters	Model Setting
Temperature	68 °F (20 °C)
Relative Humidity	80 %
Number of reflections	1
Propagation Standard	ISO 9613-1, ISO 9613-2
Ground Conditions and Attenuation Factor	Ground absorption (G) = 0.2 within the yard of and at roadways around the Grayson Power, 0.5 in the far-field (at residential and recreational receptors)
Receptor Height	5 feet (1.5 m) above grade
Topography	included
Foliage Attenuation	none
Operating Conditions	Full Load, 100% power

Meteorological factors, such as temperature, humidity, wind speed and direction, affect sound propagation. Effects of wind and atmospheric stability on outdoor sound propagation during various weather conditions can cause large variations in Project-related sound levels when measured at a receptor location. Upwind sound propagation, or propagation during unstable atmospheric conditions, typically results in lower receptor levels, while downwind conditions and stable atmosphere tends to increase receptor levels. ISO 9613 algorithms used in this assessment simulate downwind propagation under a mildly developed temperature inversion (both of which enhance sound propagation) and provide a reasonably conservative assessment of potential effects.

Prediction Accuracy

Overall prediction accuracy depends on two factors: the accuracy of the noise source data and the accuracy of the sound propagation model.

The sound power levels for major pieces of power generating equipment associated with Alternative 7 were provided directly by equipment vendors (Wartsila, Tesla). Noise emissions associated with Alternative 8 power train (FT4C gas turbines and associated generators) are based on past experience with similar equipment. Noise emissions for Alternative 8 equipment which was not yet selected or for which no data was available, were limited to reasonable amounts and suitable spectra fitted based on past experience with similar equipment. The noise model was built using vendor plan and elevation drawings.

Overall, the Project source sound power levels are expected to be conservative. The degree of conservatism is related to the margins of safety and tolerances used by the equipment vendors – often between 2 and 5 dB depending on the particular piece of equipment and the octave band in question.

The ISO 9613 sound propagation algorithms have a published accuracy of +/-3 dB over source receiver distances between 100 m (~330') and 1000 m (0.6 miles). Propagation over shorter distances tends to be more accurate than that over longer distances. The ISO 9613 model also produces results representative of meteorological conditions enhancing sound propagation (e.g., downwind and temperature inversion conditions). These conditions do not occur all the time, therefore, the model predictions are expected to be conservative. Furthermore, to account for the level of uncertainty in the noise predictions, conservative assumptions regarding the Project have been made where practical. These include the assumptions that downwind conditions exist 100 percent of the time or that all equipment operate at full load and 100% throughput during the night.

1.1.3.6 Operation Noise Emissions

Tables 16 and 17 below show the equipment component sound power levels for Alternative 7 and Alternative 8, respectively, proposed for the Project. The sound power levels shown in the tables are for individual sources and include noise mitigation.

Table 16 Mitigated Sound Power Levels for Alternative 7.

Noise Source	QTY	Unweighted Sound Power Levels (dB re. 1 pW) at Octave Band Center Frequencies (Hz)									dBA	dBC
		31.5	63	125	250	500	1000	2000	4000	8000		
Engines 1-5 Combustion Exhaust (top of stack)	5	113	110	102	98	93	92	86	78	80	**97**	**117**
Engines 1-5 SCR Casing	5	109	108	100	94	94	92	84	79	76	**96**	**114**
Engines 1-5 Combustion Air Inlets	5	118	114	100	80	71	85	84	83	93	**95**	**117**
Engines 1-5 CAI Filter Box Casing	5	112	110	95	75	65	79	77	76	85	**89**	**112**
Engine Hall Ventilation Discharges	10	116	103	98	78	68	63	80	80	72	**87**	**113**
Engine Hall Ventilation Discharge Fan Casings	10	102	100	90	73	62	58	70	73	66	**80**	**102**
Engine Hall Ventilation Inlets - Generator Side	10	100	95	96	87	85	80	78	72	66	**87**	**101**
Engine Hall Ventilation Inlets - Auxiliary Side	10	97	96	87	77	73	67	69	78	82	**84**	**98**

Noise Source	QTY	Unweighted Sound Power Levels (dB re. 1 pW) at Octave Band Center Frequencies (Hz)									dBA	dBC
		31.5	63	125	250	500	1000	2000	4000	8000		
Generator Step-up Transformers	2	86	88	92	91	97	83	75	68	63	**95**	**99**
Compressor Room Ventilation Inlets ()	2	84	97	96	100	86	80	69	75	77	**93**	**103**
Compressor Room Ventilation Inlets (S)	3	81	94	93	97	83	77	66	72	74	**90**	**100**
Pressure Reduction Skid	1	83	82	81	79	77	76	79	82	82	**87**	**89**
Combustion Exhaust Duct @ Bldg.	5	105	106	95	93	93	81	73	78	67	**92**	**110**
Combustion Exhaust Duct @ Stack	5	103	101	87	82	82	70	62	67	56	**83**	**107**
Radiator Cooler (4-fan units)	25	98	94	95	90	86	84	79	74	66	**89**	**100**
Powerhouse Roof	1	119	107	111	96	86	76	70	56	48	**96**	**118**
Engines 1-5 Exhaust Stack Casing	5	109	107	99	92	85	83	80	73	77	**90**	**114**
Powerhouse Walls	1	111	98	97	89	79	68	63	50	36	**85**	**109**
Tesla Transformers	2	87	93	95	90	90	84	79	74	67	**91**	**99**
Tesla Battery Storage (70 banks)	70	97	90	82	89	95	91	84	72	68	**95**	**100**

The sound power level data for the power generation equipment shown in Table 16 for Alternative 7 has been confirmed by Wartsila includes mitigations described in section 1.1.3.7. The sound power levels for Tesla battery storage equipment have been estimated from sound pressure level data provided by Tesla and does not include and additional noise mitigations.

Table 17 Mitigated Sound Power Levels for Alternative 8.

Noise Source	QTY	Unweighted Sound Power Levels (dB re. 1 pW) at Octave Band Center Frequencies (Hz)									dBA	dBC
		31.5	63	125	250	500	1000	2000	4000	8000		
Cooling Tower Fan Motor	2	95	93	93	92	91	90	88	88	79	**96**	**100**
Colling Tower Discharge	2	109	108	105	102	97	94	92	89	82	**100**	**112**
Circulating Water Pumps	2	101	101	98	96	97	101	92	89	80	**103**	**107**
Ammonia Flow Control Skids	2	105	108	99	90	72	58	54	56	65	**87**	**109**
Boiler Feedwater Pumps	2	100	104	105	97	101	100	99	96	90	**105**	**110**
Steam Turbine Building	1	111	104	97	95	95	91	88	82	68	**96**	**110**
Cooling Tower Stack B/O	2	107	107	103	100	91	88	83	80	72	**95**	**110**
Cooling Tower Wet Inlets	2	100	101	101	98	94	93	94	97	94	**102**	**107**
Cooling Tower Plenum (sides)	2	103	104	101	98	92	91	84	81	74	**96**	**107**
ST Generator Step-up Transformer	1	87	93	95	90	90	84	79	74	67	**91**	**99**
Unit 8A SCR Stack Exit (TOS)	1	119	117	106	96	78	69	69	69	87	**95**	**119**

Noise Source	QTY	Unweighted Sound Power Levels (dB re. 1 pW) at Octave Band Center Frequencies (Hz)									dBA	dBC
		31.5	63	125	250	500	1000	2000	4000	8000		
Unit 8A SCR Temp Air Fan	1	89	89	92	95	92	90	86	82	78	**95**	**99**
Unit 8A Enclosure Ventilation Discharge	1	112	113	106	103	101	96	92	89	84	**102**	**115**
Unit 8A Enclosure Ventilation Inlets	2	107	108	101	98	96	91	87	84	79	**97**	**110**
Unit 8A Combustion Air Inlet	1	108	110	103	95	91	88	86	86	85	**95**	**111**
Unit 8A Step-up Transformer	1	87	93	95	90	90	84	79	74	67	**91**	**99**
Unit 8A Generator Enclosure Roof	1	94	112	105	95	92	89	86	79	75	**96**	**112**
Unit 8A GT Enclosure Roof	1	108	114	107	101	96	91	98	96	83	**103**	**115**
Unit 8A SCR Stack B/O	1	116	114	104	98	86	81	80	71	69	**94**	**116**
Unit 8A SCR Transition	1	120	117	111	108	97	92	90	80	78	**102**	**120**
Unit 8A SCR Body	1	116	115	109	103	91	89	87	88	88	**99**	**117**
Unit 8A Generator Enclosure Walls	1	98	116	108	98	95	93	90	83	79	**99**	**116**
Unit 8A GT Enclosure Walls	1	112	118	111	105	100	94	101	99	86	**107**	**119**
Units 8B/C Step-up Transformer	1	92	98	100	95	95	89	84	79	72	**95**	**103**
Units 8B/C OTB Stack Exit (TOS)	1	117	112	99	90	75	66	59	52	59	**89**	**116**
Units 8B/C OTB Temp Air Fan	1	89	89	92	95	92	90	86	82	78	**95**	**99**
Unit 8C Combustion Air Inlet	1	108	110	103	95	91	88	86	86	85	**95**	**111**
Unit 8B Combustion Air Inlet	1	108	110	103	95	91	88	86	86	85	**95**	**111**
Unit 8C Enclosure Ventilation Discharge	1	112	113	106	103	101	96	92	89	84	**102**	**115**
Unit 8B Enclosure Ventilation Discharge	1	112	113	106	103	101	96	92	89	84	**102**	**115**
Unit 8B Enclosure Ventilation Inlets	2	107	108	101	98	96	91	87	84	79	**97**	**110**
Unit 8C Enclosure Ventilation Inlets	2	107	108	101	98	96	91	87	84	79	**97**	**110**
Unit 8C Combustion Exhaust Duct	1	118	118	114	107	99	94	93	93	89	**104**	**120**
Unit 8B Combustion Exhaust Duct	1	118	118	114	107	99	94	93	93	89	**104**	**120**
Unit 8B/C Steam Piping	130'	71	75	77	78	82	78	75	70	63	**83**	**86**
Unit 8B GT Enclosure Roof	1	108	114	107	101	96	91	98	96	83	**103**	**115**
Unit 8C GT Enclosure Roof	1	108	114	107	101	96	91	98	96	83	**103**	**115**
Units 8B/C OTB Stack B/O	1	106	105	103	105	96	85	74	60	73	**99**	**110**
Unit 8B GT Enclosure Walls	1	112	118	111	105	100	94	101	99	86	**107**	**119**
Unit 8C GT Enclosure Walls	1	112	118	111	105	100	94	101	99	86	**107**	**119**
Units 8B/C Generator Enclosure Roof	1	98	116	108	98	95	93	90	83	79	**99**	**116**
Units 8B/C Generator Enclosure Walls	1	101	119	111	101	98	96	93	86	82	**102**	**119**
Units 8B/C OTB Body	1	125	119	113	108	97	91	90	85	89	**103**	**124**
Units 8B/C OTB Transition	1	123	115	111	106	94	88	88	84	88	**101**	**122**
Tesla Transformers	2	87	93	95	90	90	84	79	74	67	**91**	**99**

Noise Source	QTY	Unweighted Sound Power Levels (dB re. 1 pW) at Octave Band Center Frequencies (Hz)									dBA	dBC
		31.5	63	125	250	500	1000	2000	4000	8000		
Tesla Battery Banks	70	97	90	82	89	95	91	84	72	68	**95**	**100**
Fin-Fan Cooler Discharge	1	102	101	100	97	92	90	84	78	72	**95**	**106**
Fin-fan Cooler Inlet	1	102	101	100	97	92	90	84	78	72	**95**	**106**

The sound power levels shown in Table 17 for Alternative 8 are based past experience with similar equipment and assumed power rating. Unit 8A – Pratt & Whitney FT4C based power pack – was assumed to produce up to 30 MW of power. The noise emissions for the SCR transition, body, and stack have been estimated on that basis.

Units 8B/C - Pratt & Whitney FT4C based twin pack – was assumed to produce up to 60 MW of power. The noise emissions for the Once Through Boiler (OTB) transition, body, and stack have been estimated on that basis. Limiting noise emissions from the cooling tower, steam turbine building, and auxiliary equipment were defined on the basis of up to 60 MW of base load from Unit 8B/C twin pack.

Table 18 below shows the summary of noise emissions from demolition and various construction activities associated with the Project. Guidance provided in FHWA Highway Construction Noise Handbook and DEFRA database was used to estimate the corresponding equipment noise emissions.

Table 18 Overall Sound Power Levels for Demolition and Construction Activities.

Activity	Unweighted Sound Power Levels (dB re. 1 pW) at Octave Band Center Frequencies (Hz)									dBA	dBC
	31.5	63	125	250	500	1000	2000	4000	8000		
Demolition	131	130	124	118	116	118	117	115	113	**123**	**133**
Building Construction	130	135	131	124	120	119	117	112	107	**125**	**137**
Concrete Pouring	123	127	127	118	113	114	118	107	102	**121**	**131**
Pile Driving	121	125	125	121	116	116	112	107	107	**120**	**129**

Note:

- The overall sound power levels for the demolition and construction activities were estimated using the equipment list shown in Tables 7 – 10.
- The equipment noise ratings were taken from FHWA Highway Construction Noise Handbook, Final Report, August 2006
- The acoustic use factors were taken from Federal Highway Administration (FHWA). 2006. Roadway Construction Noise Model User's Guide.
- The spectral distribution of noise was taken from the Update of Noise Database for Prediction of Noise on Construction and Open Sites, Department for Environment Food and Rural Affairs (DEFRA), UK, 2005.

The noise emissions from the impact pile drivers were specified at85 dBA at 100 feet by the piling equipment vendor. This rating was used in determining the sound power levels for the piling activity.

1.1.3.7 Summary of Specific Noise Mitigation Measures

Table 19 provides the summary of noise controls and noise emissions limits for Alternative 7 for the equipment. The limits shown in Table 19 are reflected in the values presented in Table 16 used in the noise model.

Table 20 provides the summary of noise emissions limits for Alternative 8 for the new equipment. The design requirements shown in the table will be included in the equipment specifications and are considered achievable based on past experience. The limits shown in Table 20 are reflected in the values presented in Table 17 used in the noise model.

Table 19 Summary of Required Noise Control Measures for Alternative 7

Noise Source	Required Noise Control Measure
Powerhouse Walls	Powerhouse walls should be constructed of materials that yield an acoustic performance with a rating of R_w 65. Suitable transmission losses of such an assembly are provided in Section 1 of Wartsila document P19405-WAR-DL-0039_02, Revision J
Powerhouse Roof	Powerhouse walls should be constructed of materials that yield an acoustic performance with a rating of R_w 54. Suitable transmission losses of such an assembly are provided in Section 1 of Wartsila document P19405-WAR-DL-0039_02, Revision J
Powerhouse Ventilation Inlets	Inlet silencers on both the generator side and auxiliary side should be implemented to limit noise emissions from the openings to 88 dBA sound power level. 600-mm active length silencer as with acoustic performance R_w of 19 as shown in Section 5 of Wartsila document P19405-WAR-DL-0039_02, Revision J, should be adequate
Powerhouse Ventilation Outlets	Discharge silencers on should be implemented downstream of the ventilation fans. 2800-mm active length silencer as with acoustic performance of R_w of 28 as shown in Section 7 of Wartsila document P19405-WAR-DL-0039_02, Revision J, should be adequate
Engine Combustion Exhaust	Wartsila W18V50SG engines should be equipped with two stages of silencing. The first stage resistive, Rw = 11, silencer should be installed inside the powerhouse so that it provides required attenuation for all exterior sources associated with combustion exhaust. The second stage, 45 dB(A), Rw = 42, silencer should be installed in the exhaust stacks. The acoustic performance of the silencers should be as shown in Section 2 of Wartsila document P19405-WAR-DL-0039_02, Revision J. Additionally, resonators providing noise reduction of 10 dB in the 16-Hz 1/3 octave band and 6 dB in the 31.5-Hz 1/3 octave band should be installed on exhaust ducting immediately outside the powerhouse to reduce the low frequency noise along the gas path.
Combustion Exhaust Ducting	The combustion exhaust ducting should be constructed so as to limit the sound power levels radiated from the duct to 93 dBA/m when subjected to unsilenced (bare) exhaust as advised in Section 3 of Wartsila document P19405-WAR-DL-0039_02, Revision J

Noise Source	Required Noise Control Measure
Engine Combustion Air Inlet	Wartsila W18V50SG engines should be equipped with combustion air inlet silencers with an acoustic performance as shown in Section 4 of Wartsila document P19405-WAR-DL-0039_02, Revision J (R_w rating of 33)
Gas Compressor Compartment Ventilation Inlets	Inlet silencers on larger and smaller openings should be implemented to limit noise emissions from the openings. 600-mm active length silencer as with acoustic performance R_w of 19 as shown in Section 9 of Wartsila document P19405-WAR-DL-0039_02, Revision J, should be adequate
Gas Compressor Compartment Ventilation Outlets	Discharge silencers on should be implemented downstream of the ventilation fans. 710-mm active length silencer as with acoustic performance of R_w of 18 as shown in Section 7 of Wartsila document P19405-WAR-DL-0039_02, Revision J, should be adequate
Generator Step-up Transformers	Standard National Electrical Manufacturers Association (NEMA) 80 rated transformers are adequate for the project.
Radiator Coolers	The total sound power levels from the radiator cooler should be limited to 103 dBA and 114 dBC. The proposed cooler is composed of 25 4-fan radiators. Each radiator should have a rating of 89 dBA and 100 dBC sound power.

Table 20 Summary of Required Noise Control Measures for Alternative 8

Noise Source	Required Noise Control Measure
Cooling Towers	The noise emissions from the cooling tower should be limited to 58 dBA at 400 feet (108 dBA sound power level). Mats may be required to limit the water splash noise.
Cooling Tower Fan Motors and Gearboxes	The sound power levels for cooling tower motors and gearboxes should be limited to 96 dBA combined (83 dBA @ 3') the motors should be placed on the west side of the towers.
Recirculating Water Pumps	The sound power levels for recirculating water pumps should be limited to 103 dBA.
Steam Turbine Building	Steam turbine building should be designed to limit the radiated sound power level to 97 dBA and 111 dBC from the building envelope, including doors and ventilation openings
Boiler Feed Water Pumps	The sound power levels for boiler feed water pumps should be limited to 105 dBA when placed outside near the Unit 8B/C OTB.
Unit 8A Step-up Transformer	Standard NEMA 73 rated transformers are adequate for the project.
Units 8B/C Step-up Transformer	Standard National Electrical Manufacturers Association (NEMA) 76 rated transformers are adequate for the project.
ST Generator Step-up Transformer	Standard NEMA 73 rated transformers are adequate for the project.
Unit 8A Combustion Exhaust	The SCR stack for Unit 8A should be fitted with an exhaust silencer to limit the sound power levels from the SCR stack exit to 90 dBA and 116 dBC.
Unit 8A SCR Transition	The SCR transition casing should be constructed so as to limit the noise breakout to 102 dBA and 120 dBC sound power level.
Unit 8A SCR Body	The SCR body casing should be constructed so as to limit the noise breakout to 100 dBA and 117 dBC sound power level.
Units 8B/C Combustion Exhaust	The OTB stack for Units 8B/C should be fitted with an exhaust silencer to limit the sound power levels from the OTB stack exit to 93 dBA and 119 dBC.

Noise Source	Required Noise Control Measure
Unit 8B/C OTB Transition	The OTB transition casing should be constructed so as to limit the noise breakout to 101 dBA and 122 dBC sound power level.
Unit 8B/C OTB Body	The SCR body casing should be constructed so as to limit the noise breakout to 103 dBA and 124 dBC sound power level.
Air Cooled Heat Exchanger (fin-fan cooler)	The noise emissions from fin-fan cooler should be limited to 49 dBA at 400 feet (99 dBA sound power level).
Tempering air fans	The sound power levels for the tempering air fans (for air inlet + casing) used with SCR and OTB should be limited to 95 dBA.
Steam Pipe Rack	The sound power level for the steam pipe rack should be limited to 83 dBA per meter of piping

1.1.3.8 Ground Vibration from Project Demolition and Construction Activities

Preliminary screening of ground vibration from the Project construction and demolition activities can be performed using the data shown in Table 21 below. The data in the table below can be extrapolated to other locations using the formula in California Department of Transportation, *Transportation and Construction Vibration Guidance Manual*, September 2013 and conservatively applying the attenuation exponent of 1.1.

Table 21 Vibration Data for Common Construction Equipment

Construction / Demolition Equipment		PPV at 25 feet (in/s)
1.5-Ton Ball, 10-ft drop		3.890
Pile Driver (impact)	Upper range	1.518
	typical	0.644
Pile Driver (sonic)	upper range	0.734
	typical	0.170
Pavement Breaker (6-ft drop)		0.420
2.0-Ton Ball, 4-ft drop		0.215
Clam shovel drop (slurry wall)		0.202
Hydromill (slurry wall)	in soil	0.008
	in rock	0.017
Vibratory Roller		0.210
Hoe Ram		0.089
Large bulldozer		0.089
Caisson drilling		0.089
Trucks		0.073

Construction / Demolition Equipment	**PPV at 25 feet (in/s)**
Note: the data in the table is based on the following publications: • Transit Noise and Vibration Impact Assessment, Federal Transit Authority, U.S. Department of Transportation, (Washington, DC., 2006) Hanson, Towers, and Meister. • Wiss, John F. et al. 1981. Construction vibrations: State-of-the-art. Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 107, Issue 2.	

1.1.4 PROJECT IMPACTS

1.1.4.1 Demolition and Construction

Demolition and construction would result in noise from the operation of conventional construction equipment and associated vehicles. All construction related activities will be conducted during the work week (Monday through Friday) between the hours of 7:00 AM and 7:00 PM. Sound level predictions at the nearest residential receptors in the City of Glendale for the demolition and construction activities were performed using the sound power levels shown in Table 18. No demolition or construction activities are proposed to occur within 500 feet of residential uses in the City of Los Angeles. Construction related noise would therefore not expose persons to or generate noise levels in excess of established standards and potential impacts would be less than significant. The potential for ground borne vibration during construction is discussed further below.

Table 22 summarizes noise effects from demolition activities. The activities will take place during the daytime hours and therefore noise effects during daytime hours only are considered. Only residential receptors are assessed. It is observed from Table 22 that the predicted demolition noise is below the limits established for the demolition on the basis of City of Glendale community noise standards. Cumulative sound levels based on presumed ambient sound levels at the residential receptors during demolition are below the community noise standard. Furthermore, the overall changes in acoustic environment resulting from demolition range from 0.9 dB at R2 to 3.7 dB at R1. Therefore, the effects of demolition on the residential receptors are considered not significant.

Table 22 Summary of Noise Effects from Demolition on Residential Locations

Receptor	**Predicted Demolition Noise (dBA)**	**Noise Limit for Demolition (dBA)**	**Daytime Ambient Sound Levels (dBA)**		**Cumulative Noise Levels During Demolition (dBA)**		**Community Noise Standard for Daytime (dBA)**
			Measured	**Presumed**	**Measured Ambient**	**Presumed Ambient**	
R1	**55.5**	**58.1**	54.2	54.2	57.9	**57.9**	**59.2**
R2	**58.1**	**63.3**	64.7	60.0	65.6	**62.2**	**65.0**
R3	**56.4**	**60.4**	57.1	57.1	59.8	**59.8**	**62.1**
Note: • the above noise design targets for demolition reflect the City of Glendale Noise Ordinance							

- the ambient sound levels are averages over the measurement period and exclude the contribution from existing Grayson Power operation.
- The demolition activities are expected to take place continuously and with full equipment utilization the entire daytime.

Table 23 summarizes noise effects from building construction activities. The activities will take place during the daytime hours and therefore noise effects during daytime hours only are considered. It is observed from Table 23 that the predicted building construction noise is below the limits established on the basis of City of Glendale community noise standards at all receptors. Cumulative sound levels based on presumed ambient sound levels at the residential receptors during building construction are below the community noise standard. Furthermore, the overall changes in acoustic environment resulting from building construction range from 1.1 dB at R2 to 3.9 dB at R1. Overall, the effects of building construction on the residential receptors are considered not significant.

Table 23 Summary of Noise Effects from Building Construction on Residential Locations

Receptor	**Predicted Bldg. Construction Noise (dBA)**	**Noise Limit for Bldg. Construction (dBA)**	**Daytime Ambient Sound Levels (dBA)**		**Cumulative Noise Levels During Building Construction (dBA)**		**Community Noise Standard for Daytime (dBA)**
			Measured	**Presumed**	**Measured Ambient**	**Presumed Ambient**	
R1	**55.8**	**58.1**	54.2	54.2	58.1	**58.1**	**59.2**
R2	**59.2**	**63.3**	64.7	60.0	65.8	**62.6**	**65.0**
R3	**58.4**	**60.4**	57.1	57.1	60.8	**60.8**	**62.1**

Note:

- the above noise design targets for building construction reflect the City of Glendale Noise Ordinance
- the ambient sound levels are averages over the measurement period and exclude the contribution from existing Grayson Power operation.
- The building construction activities are expected to take place continuously and with full equipment utilization the entire daytime.

Table 24 summarizes noise effects from concrete pouring activities. The activities will take place during the daytime hours and therefore noise effects during daytime hours only are considered. It is observed from Table 24 that the predicted noise during concrete pouring is below the limits established on the basis of City of Glendale community noise standards at all receptors. Cumulative sound levels based on presumed ambient sound levels at the residential receptors during concrete pouring activities are below the community noise standard. Furthermore, the overall changes in acoustic environment resulting from building construction range from 0.7 dB at R2 to 2.8 dB at R3. Overall, the effects of concrete pouring on the residential receptors are considered not significant.

Table 24 Summary of Noise Effects from Concrete Pouring on Residential Locations

Receptor	Predicted Concrete Pouring Noise (dBA)	Noise Limit for Concrete Pouring (dBA)	Daytime Ambient Sound Levels (dBA)		Cumulative Noise Levels During Concrete Pouring (dBA)		Community Noise Standard for Daytime (dBA)
			Measured	Presumed	Measured Ambient	Presumed Ambient	
R1	**53.5**	**58.1**	54.2	54.2	56.9	**56.9**	**59.2**
R2	**56.9**	**63.3**	64.7	60.0	65.4	**61.7**	**65.0**
R3	**56.7**	**60.4**	57.1	57.1	59.9	**59.9**	**62.1**

Note:

- the above noise design targets for concrete pouring reflect the City of Glendale Noise Ordinance
- the ambient sound levels are averages over the measurement period and exclude the contribution from existing Grayson Power operation.
- The building construction activities are expected to take place continuously and with full equipment utilization the entire daytime.

Table 25 summarizes noise effects from pile driving activities. The activities will take place during the daytime hours and therefore noise effects during daytime hours only are considered. Noise from pile driving activities has impulsive characteristics and therefore, in accordance with the City of Glendale noise ordinance, the community noise standard and the corresponding limit for pile driving are reduced by 5 dB. It is observed from Table 25 that the predicted noise during pile driving activities exceeds the limits for the activity established on the basis of City of Glendale community noise standards at all residential receptors by approximately 4 to 5 dB. Cumulative sound levels based on presumed ambient sound levels at the residential receptors during pile driving exceed the community noise standard by 4 to 5 dB. The overall changes in acoustic environment resulting from the pile driving activities range from around 2 dB at R2 to 5 dB at R1 and R3. Such an increase is noticeable but within the nominal 5-dB allowance over the ambient levels.

Therefore, overall, the effects of pile driving activities on the residential receptors are considered to be moderate. Noise mitigation for impact pile driving is typically offered by piling contractors and can be implemented for this Project. Noise reduction of 6 to 8 dB from such a mitigation is generally possible. This would bring the piling noise to within the community noise standards.

Table 25 Summary of Noise Effects from Pile Driving Activities on Residential Locations

Receptor	Predicted Pile Driving Noise (dBA)	Noise Limit for Pile Driving (dBA)	Daytime Ambient Sound Levels (dBA)		Cumulative Noise Levels During Pile Driving (dBA)		Community Noise Standard for Daytime (dBA)
			Measured	Presumed	Measured Ambient	Presumed Ambient	
R1	**51.4**	**53.1**	54.2	54.2	56.0	**56.0**	**54.2**
R2	**56.0**	**58.3**	64.7	60.0	65.2	**61.5**	**60.0**
R3	**54.7**	**55.4**	57.1	57.1	59.1	**59.1**	**57.1**

Note:

- The above noise design targets for pile driving reflect the City of Glendale Noise Ordinance. These include the 5-dB penalty for noise containing tones or impulsive sounds.

- The ambient sound levels are averages over the measurement period and exclude the contribution from existing Grayson Power operation.
- The building construction activities are expected to take place continuously and with full equipment utilization the entire daytime.

1.1.4.2 Operation

This section provides calculated noise levels at the receptors from operation. As stated previously, although the generating units will operate during 15% or less of the year, and then primarily when system loads are high (during the day and early evening), the Project operation in this assessment was assumed as continuous and under full load in order to adequately quantify noise impacts.

Residential Noise Levels – Alternative 7

Sound level predictions for the Project operation under Alternative 7 were performed using equipment sound power levels as shown in Table 16 and utilizing the previously described modelling methodology. Noise effects from operation are summarized in Table 26 and Table 27 for the nighttime and daytime periods respectively. Among the assessed receptors, R3 is the most impacted. The post-construction compliance assessment, if required, can be performed at any of the three locations.

Table 26 Summary of Project Noise Effects for Alternative 7 at Residential Locations During the Nighttime

Receptor	Predicted Operational Noise (dBA)	Operational Noise Design Limit (dBA)	Nighttime Ambient Sound Levels (dBA)		Cumulative Nighttime Operational Noise (dBA)		Community Noise Standard for Nighttime (dBA)
			Measured	Presumed	Measured Ambient	Presumed Ambient	
R1	**47.6**	**53.0**	49.6	49.6	51.7	**51.7**	**54.6**
R2	**50.7**	**53.4**	52.8	50.0	54.9	**53.4**	**55.0**
R3	**52.2**	**53.4**	52.8	50.0	55.5	**54.2**	**55.0**

Note:

- the above noise design targets for operations reflect the City of Glendale Noise Ordinance
- the ambient sound levels are averages over the measurement period and exclude the contribution from existing Grayson Power operation.
- the Project operates continuously at full power throughout the entire nighttime.

Table 27 Summary of Project Noise Effects for Alternative 7 at Residential Locations During the Daytime

Receptor	Predicted Operational Noise (dBA)	Operational Noise Design Limit (dBA)	Daytime Ambient Sound Levels (dBA)		Cumulative Daytime Operational Noise (dBA)		Community Noise Standard for Daytime (dBA)
			Measured	Presumed	Measured Ambient	Presumed Ambient	
R1	**47.6**	**58.1**	54.4	54.4	55.1	**55.1**	**59.6**

R2	**50.7**	**63.3**	64.2	60.0	64.9	**60.5**	**65.0**
R3	**52.2**	**60.4**	57.1	57.1	58.3	**58.3**	**62.1**

Note:

- the above noise design targets for operations reflect the City of Glendale Noise Ordinance
- the ambient sound levels are averages over the measurement period and exclude the contribution from existing Grayson Power operation.
- The Project operates continuously at full power throughout the entire daytime.

The results in Tables 26 and 27 show that noise design targets are met with the equipment noise emissions as shown in Tables 16. Additionally, the community noise standards for the nighttime periods (55 dBA or less) are essentially met with slight potential exceedance (0.5 dB) at R3 when measured ambient sound level is used in calculating the cumulative sound level. This potential exceedance is primarily due to the actual ambient sound levels being higher than the maximum permitted presumed ambient sound levels. When the presumed ambient levels are used, compliance with the community noise standards is achieved.

Nighttime ambient sound levels vary from hour to hour. At R3, where the 25-hour survey was conducted, the lowest hourly ambient Leq were 48.5 dBA and 48.9 dBA recorded between 2:00 and 3:00 am 3:00 and 4:00 am respectively. The highest hourly nighttime Leq were 56.0 and 56.9 dBA recorded between 10:00 and 11:00 pm 6:00 and 7:00 am, respectively. It is observed, that during the quietest observed nighttime periods, the Project noise contribution under full operating load and under atmospheric conditions favorable to noise propagation, exceeds the observed ambient sound levels by less than 4 dB. When compared to the overall (9-hour) nighttime period, the Project noise contribution is lower than the measured ambient sound levels at all assessed receptors. It should be noted that although possible, night-time operation, when electric loads are reduced, is an unlikely occurrence.

The results in Table 27 show the community noise standards for the daytime periods are met at all residential receptors.

Table 28 below shows the summary of the low-frequency noise impact. The area around R3 is the most impacted residential receptor in regard to LFN where preferred LFN target is exceeded by 1.6 dB. This exceedance is considered a marginal. As seen from Table 28, measured LFN content in the ambient sound is considerably lower than the predicted levels. Therefore, ambient sound levels do not affect LFN impact.

Table 28 Summary of Project Low Frequency Noise Effects for Alternative 7 at Residential Locations

Receptor	Predicted LFN from Operations (dB)	Preferred LFN Limit (dB)	Measured Nighttime Ambient LFN (dB)	Cumulative Nighttime LFN (ambient + operations) (dB)
R1	**67.4**	**75.0**	59.7	68.1
R2	**70.2**	**75.0**	61.0	70.7
R3	**75.0**	**75.0**	61.0	75.2

Note:

- The above LFN design targets for operations are derived from information in ANSI 12.9-4
- The ambient sound levels are averages over the measurement period and exclude the contribution from existing Grayson Power operation.
- The Project operates continuously at full power throughout the entire nighttime.

As seen from Table 28, the preferred LFN limit is met at all residential receptors. The predicted LFN levels include the presence of side-branch resonators on the combustion exhaust ducting of engines 1 – 5 between the powerhouse and the respective SCRs.

<u>Residential Noise Levels – Alternative 8</u>

Sound level predictions for the Project operation under Alternative 8 were performed using equipment sound power levels as shown in Table 17 and utilizing the previously described modelling methodology. Noise effects from operation under Alternative 8 are summarized in Tables 29 and 30 for the nighttime and daytime periods respectively. Among the assessed receptors, R3 is the most impacted. The post-construction compliance assessment, if required, can be performed at any of the three locations.

Table 29 Summary of Project Noise Effects for Alternative 8 at Residential Locations During the Nighttime

Receptor	Predicted Operational Noise (dBA)	Operational Noise Design Limit (dBA)	Nighttime Ambient Sound Levels (dBA)		Cumulative Nighttime Operational Noise (dBA)		Community Noise Standard for Nighttime (dBA)
			Measured	Presumed	Measured Ambient	Presumed Ambient	
R1	**49.3**	**53.0**	49.6	49.6	52.5	**52.5**	**54.6**
R2	**52.6**	**53.4**	52.8	50.0	55.7	**54.5**	**55.0**
R3	**53.1**	**53.4**	52.8	50.0	56.0	**54.8**	**55.0**

Note:

- the above noise design targets for operations reflect the City of Glendale Noise Ordinance
- the ambient sound levels are averages over the measurement period and exclude the contribution from existing Grayson Power operation.
- the Project operates continuously at full power throughout the entire nighttime.

Table 30 Summary of Project Noise Effects for Alternative 8 at Residential Locations During the Daytime

Receptor	Predicted Operational Noise (dBA)	Operational Noise Design Limit (dBA)	Daytime Ambient Sound Levels (dBA)		Cumulative Daytime Operational Noise (dBA)		Community Noise Standard for Daytime (dBA)
			Measured	Presumed	Measured Ambient	Presumed Ambient	
R1	**49.3**	**58.1**	54.4	54.4	55.4	**55.4**	**59.6**
R2	**52.6**	**63.3**	64.2	60.0	65.0	**60.7**	**65.0**
R3	**53.1**	**60.4**	57.1	57.1	58.6	**58.6**	**62.1**

Note:

- The above noise design targets for operations reflect the City of Glendale Noise Ordinance

- The ambient sound levels are averages over the measurement period and exclude the contribution from existing Grayson Power operation.
- The Project operates continuously at full power throughout the entire daytime.

The results in Tables 29 and 30 show that noise design targets are met with the equipment noise emissions as shown in Tables 17. Additionally, the community noise standards for the nighttime periods (55 dBA or less) are essentially met with slight potential exceedances at R2 and R3 of 0.7 dB and 1 dB respectively when measured ambient sound levels are used in calculating the cumulative sound level. These potential exceedances are primarily due to the actual ambient sound levels being higher than the maximum permitted presumed ambient sound levels. When the presumed ambient levels are used, compliance with the community noise standards is achieved.

As stated earlier, nighttime ambient sound levels vary from hour to hour. At R3, where the 25-hour survey was conducted, the lowest hourly ambient Leq were 48.5 dBA and 48.9 dBA recorded between 2:00 and 3:00 am 3:00 and 4:00 am respectively. The highest hourly nighttime Leq were 56.0 and 56.9 dBA recorded between 10:00 and 11:00 pm 6:00 and 7:00 am, respectively. It is observed, that during the quietest observed nighttime periods, the Project noise contribution under full operating load and under atmospheric conditions favorable to noise propagation, exceeds the observed ambient sound levels by approximately than 4.6 dB. When compared to the overall (9-hour) nighttime period, the Project noise contribution is lower than the measured ambient sound levels at R1 and R2 and exceeds the existing ambient sound level at R3 by only 0.3 dB.

The results in Table 30 show the community noise standards for the daytime periods are met at all residential receptors.

Table 31 below shows the summary of the low-frequency noise impact. The area around R3 is the most impacted residential receptor in regard to LFN. The predicted LFN is below the preferred LFN limit at all receptors. As seen from Table 28, measured LFN content in the ambient sound is considerably lower than the predicted levels. Therefore, ambient sound levels do not affect LFN impact.

Table 31 Summary of Project Low Frequency Noise Effects for Alternative 8 at Residential Locations

Receptor	Predicted LFN from Operations (dB)	Preferred LFN Limit (dB)	Measured Nighttime Ambient LFN (dB)	Cumulative Nighttime LFN (ambient + operations) (dB)
R1	**69.8**	**75.0**	59.7	70.2
R2	**72.0**	**75.0**	61.0	72.4
R3	**73.1**	**75.0**	61.0	73.4

Note:
- The above LFN design targets for operations are derived from information in ANSI 12.9-4

- The ambient sound levels are averages over the measurement period and exclude the contribution from existing Grayson Power operation.
- The Project operates continuously at full power throughout the entire nighttime.

As seen from Table 28, the preferred LFN limit is met at all residential receptors.

Recreational Noise Levels – Alternative 7

R7 represents the most affected recreational receptor at the John Ferraro Athletic Fields and R8 is the recreational receptor at the Confluence Park. Table 32 shows the summary of noise effects at the two receptors under operational Alternative 7.

Table 32 Summary of Project Noise Effects at the Recreational Locations – Alternative 7

Receptor	Predicted Sound Level from Operations (dBA)	Operational Noise Design Limit (dBA)	Cumulative CNEL (ambient + operations) (dB)	Maximum Acceptable CNEL (dB)
R7	**53.8**	**61.1**	66.3	**70.0**
R8	**55.0**	**63.8**	73.2	**75.0**

Note:
- The above design limit for operations is derived from CNEL limit of 70 dB and 75 dB for R7 and R8, respectively.
- The cumulative CNELs for operations combine measured ambient CNEL of 66.0 dB and 73.1 dB at R7 and R8 respectively with the Project only CNELs of 53.8 dB and 55.0 dB at R7 and R8.
- The Project operates continuously at full power and constant noise contribution throughout the entire 24-hour period.

As seen from Table 32, Project's noise emissions are in compliance at the recreational receptors. Post-construction sound survey at the recreational receptor is not required.

Recreational Noise Levels – Alternative 8

Table 33 shows the summary of noise effects at the two receptors under operational Alternative 8.

Table 33 Summary of Project Noise Effects at the Recreational Locations – Alternative 8

Receptor	Predicted Sound Level from Operations (dBA)	Operational Noise Design Limit (dBA)	Cumulative CNEL (ambient + operations) (dB)	Maximum Acceptable CNEL (dB)
R7	**57.5**	**61.1**	66.6	**70.0**
R8	**59.1**	**63.8**	73.3	**75.0**

Note:
- The above design limit for operations is derived from CNEL limit of 70 dB and 75 dB for R7 and R8, respectively.

- The cumulative CNELs for operations combine measured ambient CNEL of 66.0 dB and 73.1 dB at R7 and R8 respectively with the Project only CNELs of 57.5 dB and 59.1 dB at R7 and R8.
- The Project operates continuously at full power and constant noise contribution throughout the entire 24-hour period.

As seen from Table 32, Project's noise emissions are in compliance at the recreational receptors. Post-construction sound survey at the recreational receptor is not required.

1.1.4.3 Level of Significance before Mitigation

Potentially Significant.

1.1.4.4 Mitigation Measures:

NOI-1: Noise Source and Required Noise Control Measures.

Alternative 7

1. **Powerhouse Walls -** Powerhouse walls should be constructed of materials that yield an acoustic performance with a rating of Rw 65.
2. **Powerhouse Roof -** Powerhouse walls should be constructed of materials that yield an acoustic performance with a rating of Rw 54.
3. **Powerhouse Ventilation Inlets -** Inlet silencers on both the generator side and auxiliary side should be implemented to limit noise emissions from the openings to 88 dBA sound power level. This can be accomplished with 600-mm active length silencer as with acoustic performance Rw of 19.
4. **Powerhouse Ventilation Outlets -** Discharge silencers should be implemented downstream of the ventilation fans. 2800-mm active length silencer as with acoustic performance of R_w of 28 should be adequate.
5. **Engine Combustion Exhaust -** Engines exhausts should be equipped with two stages of silencing. The first stage resistive, $R_w = 11$, silencer should be installed inside the powerhouse so that it provides required attenuation for all exterior sources associated with combustion exhaust. The second stage, 45 dB(A), $R_w = 42$, silencer should be installed in the exhaust stacks. Additionally, side branch resonators providing noise reduction of 10 dB in the 16-Hz 1/3 octave band and 6 dB in the 31.5-Hz 1/3 octave band should be installed on exhaust ducting between the powerhouse and the SCRs..
6. **Combustion Exhaust Ducting -** The combustion exhaust ducting should be constructed so as to limit the sound power levels radiated from the duct to 93 dBA per meter of ducting when subjected to unsilenced (bare) exhaust.
7. **Engine Combustion Air Inlet -** Engines should be equipped with combustion air inlet silencers with the acoustic performance $R_w = 33$.
8. **Gas Compressor Compartment Ventilation Inlets -** Inlet silencers on larger and smaller openings should be implemented to limit noise emissions from the openings. 600-mm active length silencers with acoustic performance R_w of 19 should be adequate
9. **Gas Compressor Compartment Ventilation Outlets -** Discharge silencers should be implemented downstream of the ventilation fans. 710-mm active length silencers as with acoustic performance R_w of 18 should be adequate.

10. **Generator Step-up Transformers -** Standard National Electrical Manufacturers Association (NEMA) 80 rated transformers are adequate for the project.
11. **Radiator Coolers -** The total sound power levels from the radiator cooler should be limited to 103 dBA and 114 dBC.

Alternative 8

1. **Cooling Towers -** The noise emissions from the cooling tower should be limited to 58 dBA at 400 feet (108 dBA sound power level). Mats may be required to limit the water splash noise.
2. **Cooling Tower Fan Motors and Gearboxes -** The sound power levels for cooling tower motors and gearboxes should be limited to 96 dBA combined (83 dBA @ 3') the motors should be placed on the west side of the towers.
3. **Recirculating Water Pumps -** The sound power levels for recirculating water pumps should be limited to 103 dBA.
4. **Steam Turbine Building -** Steam turbine building should be designed to limit the radiated sound power level to 97 dBA and 111 dBC from the building envelope, including doors and ventilation openings.
5. **Boiler Feed Water Pumps -** The sound power levels for boiler feed water pumps should be limited to 105 dBA when placed outside near the Unit 8B/C OTB.
6. **Unit 8A Step-up Transformer -** Standard NEMA 73 rated transformers are adequate for the project.
7. **Units 8B/C Step-up Transformer -** Standard National Electrical Manufacturers Association (NEMA) 76 rated transformers are adequate for the project.
8. **ST Generator Step-up Transformer -** Standard NEMA 73 rated transformers are adequate for the project.
9. **Unit 8A Combustion Exhaust -** The SCR stack for Unit 8A should be fitted with an exhaust silencer to limit the sound power levels from the SCR stack exit to 90 dBA and 116 dBC.
10. **Unit 8A SCR Transition -** The SCR transition casing should be constructed so as to limit the noise breakout to 102 dBA and 120 dBC sound power level.
11. **Unit 8A SCR Body -** The SCR body casing should be constructed so as to limit the noise breakout to 100 dBA and 117 dBC sound power level.
12. **Units 8B/C Combustion Exhaust -** The OTB stack for Units 8B/C should be fitted with an exhaust silencer to limit the sound power levels from the OTB stack exit to 93 dBA and 119 dBC.
13. **Units 8B/C OTB Transition -** The OTB transition casing should be constructed so as to limit the noise breakout to 101 dBA and 122 dBC sound power level.
14. **Unit 8B/C OTB Body -** The SCR body casing should be constructed so as to limit the noise breakout to 103 dBA and 124 dBC sound power level.
15. **Air Cooled Heat Exchanger -** The noise emissions from fin-fan cooler should be limited to 49 dBA at 400 feet (99 dBA sound power level).
16. **Tempering air fans -** The sound power levels for the tempering air fans (for air inlet + casing) used with SCR and OTB should be limited to 95 dBA.
17. **Steam Pipe Rack -** The sound power level for the steam pipe rack should be limited to 83 dBA per meter of piping.

Level of Significance after Mitigation:

Less than Significant with Mitigation Incorporated.

1.1.4.5 Threshold: Exposure of persons to or generation of excessive ground borne vibration or ground borne noise levels

No significant ground-borne noise effects are expected during the construction or operation of the Project. Project vibration levels beyond the Project site boundary during operations are expected to be negligible. The operational vibration levels are expected to be well below the City of Glendale presumed perception limit of 0.01 in/s anywhere outside of the Project site boundary and as such, are not expected to be detectable.

Demolition and construction activities are expected to involve potential sources of ground borne vibration such as pile driving. At the higher end of the diesel pile drivers, the expected vibration amplitude is 1.52 in/s PPV at 25 feet (see Table 21). For demolition activities, the vibration levels equivalent to 1.5-ton ball drop from 10' can be used (3.89 in/s PPV at 25 feet). The nearest commercial structures are located at approximately 330 feet from the expected activities and the nearest residential structure is located at some 440 feet. The construction vibration impact assessment is summarized in Table 34 below and the demolition vibration impact assessment is shown in Table 35.

Table 34 Assessment of Construction Vibration Impacts

Structure	Maximum Expected Construction Vibration PPV (in/s)	Preferred Vibration Limit PPV (in/s)
Nearest Residential Building	0.07	0.20
Nearest Commercial Building	0.09	0.50

Note:

- The predicted values are based on vibration level of 1.52 in/s at 25 feet and using the attenuation exponent of 1.1

Table 35 Assessment of Demolition Vibration Impacts

Structure	Maximum Expected Construction Vibration PPV (in/s)	Preferred Vibration Limit PPV (in/s)
Nearest Residential Building	0.17	0.20
Nearest Commercial Building	0.22	0.50

Note:

- The predicted values are based on vibration level of 3.89 in/s at 25 feet and using the attenuation exponent of 1.1

Predicted maximum demolition and construction vibration levels are below the preferred vibration thresholds. The Project would therefore not result in exposure of persons to, or generation of excessive ground borne vibration or ground borne noise levels nor would damage to the nearby structures would be expected. Potential impacts are less than significant.

Level of Significance before Mitigation:

Less than Significant.

Mitigation Measures:

None necessary.

Level of Significance after Mitigation:

Less than Significant

1.1.4.6 Threshold: A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project

Overall, the Project noise results in a permanent increase in area ambient sound levels of less than 2.5 dB during nighttime hours and less than 1 dB during the daytime hours. The change in the ambient sound level should not be strongly perceptible. Table 4-59 shows the summary of predicted increases in ambient sound levels.

During the ambient sound survey, the existing Grayson facility was substantially in operational with only a handful of pieces of equipment running. Correspondingly, the current ambient sound levels do not reflect the full operation of the facility and are thus understated. It is therefore expected that the actual; change in the area ambient sound levels will be lower than that predicted in Table 4-59.

Table 36 Expected Permanent Changes in the Ambient Noise Levels due to Project Alternative 7

Receptor	Predicted Operational Noise (dBA)	Daytime Ambient Sound Levels (dBA)			Nighttime Ambient Sound Levels (dBA)		
		Current	New	Increase	Current	New	Increase
R1	47.6	54.2	55.1	**0.9**	49.6	51.7	**2.1**
R2	50.7	64.7	64.9	**0.2**	52.8	54.9	**2.1**
R3	52.2	57.1	58.3	**1.2**	52.8	55.5	**2.7**
R7	53.8	60.6	61.4	**0.8**	58.8	60.0	**1.2**
R8	55.0	69.6	69.7	**0.1**	65.6	66.0	**0.4**

Note:

- Current ambient sound levels (daytime and nighttime) are averages over the measurement period and exclude the abnormal noise events recorded during the survey. Contribution from existing limited Grayson Power operation was not excluded.

Receptor	Predicted Operational Noise (dBA)	Daytime Ambient Sound Levels (dBA)			Nighttime Ambient Sound Levels (dBA)		
		Current	New	Increase	Current	New	Increase

- New ambient sound levels included the current ambient sound levels less the existing Grayson Power operation plus Project under Alternative 7
- For analysis purposes the Project was assumed to operate continuously at full power throughout the entire daytime.

Table 37 Expected Permanent Changes in the Ambient Noise Levels due to Project Alternative 8

Receptor	Predicted Operational Noise (dBA)	Daytime Ambient Sound Levels (dBA)			Nighttime Ambient Sound Levels (dBA)		
		Current	New	Increase	Current	New	Increase
R1	49.3	54.2	55.4	**1.2**	49.6	52.5	**2.9**
R2	52.6	64.7	65.0	**0.3**	52.8	55.7	**2.9**
R3	53.1	57.1	58.6	**1.5**	52.8	56.0	**3.2**
R7	57.5	60.6	62.3	**1.7**	58.8	61.2	**2.4**
R8	59.1	69.6	70.0	**0.4**	65.6	66.5	**0.9**

Note:

- Current ambient sound levels (daytime and nighttime) are averages over the measurement period and exclude the abnormal noise events recorded during the survey. Contribution from existing limited Grayson Power operation was not excluded.
- New ambient sound levels included the current ambient sound levels less the existing Grayson Power operation plus Project under Alternative 8
- The Project operates continuously at full power throughout the entire daytime.

Level of Significance before Mitigation:

Less than Significant Impact.

Mitigation Measures:

No mitigation is required.

Level of Significance after Mitigation:

Less than Significant Impact.

Threshold: A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project

A substantial temporary increase in ambient noise levels may result from the demolition and construction activities associated with the project. Such increases will fluctuate with changing activities and will thus to a certain extent be intermittent. Some of the noisiest activities, such as pile driving will be relatively short term. Additionally, noise mitigation for pile driving equipment should considered. Most of the noise sources associated with the existing operation will be removed. This should provide a considerable off-set for the construction and demolition noise effects at the nearby residential receptors.

It should be pointed out that the current construction schedule calls for construction work to be done during the daytime hours of 7:00 am to 7:00 pm. Although, as such, construction and demolition noise is exempt from the provisions of the City of Glendale Noise Ordinance, the noise impact assessment performed for construction and demolition suggested that these activities will substantially conform to community noise standard for daytime hours. Overall, the temporary increase in ambient noise levels from demolition and construction actives should have a less than significant impact.

Level of Significance before Mitigation:

Less than Significant Impact.

Mitigation Measures:

No mitigation is required.

Level of Significance after Mitigation:

Less than Significant Impact.

1.1.5 CUMULATIVE IMPACTS

The nearest cumulative project considered in this analysis is located approximately two miles from the Grayson Power Plant. Because of the distance between the Project to the other projects evaluated in this analysis, potential cumulative noise impacts would be less than significant.

Level of Significance before Mitigation:

Less than Significant Impact.

Mitigation Measures:

No mitigation is required.

Level of Significance after Mitigation:

Less than Significant Impact.