Appendix C.1 Construction Health Risk Assessment

HEALTH RISK ASSESSMENT TECHNICAL REPORT

For the Proposed

Harvard-Westlake Parking Improvement Plan
3701 N. Coldwater Canyon Ave
Studio City, CA 91604

***Prepared for*:**

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ACRONYMS AND ABBREVIATIONS

Acronym	Description
ASF	age sensitivity factor
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
Basin	South Coast Air Basin
CARB	California Air Resources Board
CalEEMod	California Emissions Estimator Model
CalEPA	California Environmental Protection Agency
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
City	City of Los Angeles
CPF	Cancer Potency Factor
DEIR	Draft Environmental Impact Report
DPM	diesel exhaust particulate matter
EMFAC	on-road vehicle emissions factor model
FAH	fraction of time at home
HARP	Hotspots Analysis and Reporting Program
hp	horsepower
HRA	Health Risk Assessment
MATES IV	Multiple Air Toxics Exposure Study, May 2015
MEI	Maximum Exposed Individual
MERV	Minimum Efficiency Reporting Value
OEHHA	Office of Environmental Health and Hazard Assessment
PM10	particulate matter
RP-DEIR	Recirculated Portions of the Draft Environmental Impact Report
SCAQMD	South Coast Air Quality Management District
TAC	toxic air contaminants
URF	Unit Risk Factor
USEPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

The purpose of this Health Risk Assessment Technical Report (HRA) is to provide supplemental information regarding potential construction related toxic air contaminants (TACs) with the potential to impact off-site residents (which includes individuals of all ages) and on-site students and staff in close proximity to the proposed Harvard-Westlake Parking Structure (the Project). The Harvard-Westlake School (the Applicant), proposes a parking structure located at 3701 Coldwater Canyon Ave (the Project Site or Site) in the Studio City area of the City of Los Angeles (the City).

The Project Site is located at the Harvard-Westlake campus in Studio City. The Project consists of construction of a new three-story (4-level) 750-space parking structure. Construction of the Project is estimated to take approximately 30 months and would include construction of the parking structure and a pedestrian bridge.

A Draft Environmental Impact Report (DEIR) was prepared for the Project and was made available for public review in October 2013, and a Recirculated Draft EIR was prepared and circulated for public review in February 2016. The air quality sections of the DEIR and RDEIR addressed construction health risk impacts in a qualitative manner, as health risk impacts are typically evaluated based on long-term exposure whereas construction activities are considered short-term. This supplemental quantitative analysis of construction related health risk is being provided to address public comments received on the RDEIR, and to demonstrate compliance with the Office of Environmental Health and Hazard Assessment (OEHHA) March 2015 revised guidelines for performing HRAs as well as new guidance for evaluating short-term exposure. This HRA has been prepared for inclusion as an appendix to the Project FEIR.

The HRA includes three separate components: 1) emissions inventory; 2) dispersion modeling; and 3) health risk calculations. Emissions from the construction of the Project were calculated using the California Emissions Estimator Model (CalEEMod) and emission factors from the California Air Resources Board (CARB) EMFAC model. Dispersion modeling was performed using the US Environmental Protection Agency (USEPA) AERMOD model with meteorological data from the closest South Coast Air Quality Management District (SCAQMD) monitoring station. Sensitive receptors were placed at ground level at off-site residential uses, off-site pre-school and on-site student locations. Cancer risk was calculated using the most recent (March 2015) Office of Environmental Health Hazard Assessment (OEHHA) guidelines for health risk assessments. Although the construction duration for the Project is estimated to be 30 months, for purposes of this analysis a compressed two year construction duration is assumed to address the most conservative exposure for sensitive receptors. Initiation of construction is also set to coincide with a starting age at the 3rd trimester of pregnancy. Student receptors were also conservatively assumed to be exposed for 2 years, but with a starting age of 12. Age sensitivity factors (ASFs) and fraction of time at residence were based on default values provided by OEHHA and within HARP.

Prior to implementation of prescribed mitigation measures, cancer risk at the maximum impacted receptor would be 129 in one million for a child receptor, which would exceed the SCAQMD significance threshold of 10 in one million. However, required mitigation measures would reduce construction diesel particulate emissions resulting in lower cancer risk impacts. As shown in **Table ES-1,** *Construction HRA Results (Off-site Receptors),* below, mitigated cancer risk at the maximum impacted receptor, for all age groups, are below the

SCAQMD significance threshold of 10 in one million. Therefore, consistent with the construction health risk findings in the DEIR and RDEIR, impacts to on-site and off-site receptors would be less than significant.

Table ES-1

Construction HRA Results (Off-site Receptors)
Mitigated Cancer risk (in one million)[a]

Sensitive Receptor Location	Child[b]	Adult[b]	Exceed Threshold?[a]
Residences East of Project Site	8.9	0.2	No
Residences South of Project Site	3.8	0.1	No
Pre-school	1.4	< 0.1	No

[a] *Maximum cancer risk values are less than the threshold of 10 In one million*
[b] *Starting age group for children at residences is 3rd trimester, while pre-school starting age is <1 year old. Adult starting age is 18 years old.*

Source: ESA PCR, 2016

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The Project Site is comprised of the following: Harvard-Westlake Upper School (the Campus), located at 3700 N. Coldwater Canyon Avenue and the Development Site, located at 3701 N. Coldwater Canyon Avenue. The Project Site, shown in **Figure 1**, *Project Site and Surrounding Uses,* is located in the Studio City neighborhood of the City of Los Angeles. The Project Site lies on the east and west sides of Coldwater Canyon Avenue, approximately 0.3 miles south of Ventura Boulevard and 1.3 miles north of Mulholland Drive, in the Sherman Oaks-Studio City-Toluca Lake-Cahuenga Pass Community Plan area of the City of Los Angeles. The Project Site is surrounded by residential uses to the north and south. Residential uses are located further to the west and east. The Sunnyside Preschool (school receptor) is located east of the Project Site, across Coldwater Canyon Avenue.

The Campus is generally hilly, with a topography that slopes inward to form a valley. The Campus currently contains an athletic field, classrooms, swimming pool, a surface parking lot and other improvements, and a small number of ornamental trees. Vehicular access to the Campus is presently provided via three driveways on the east side of Coldwater Canyon Avenue. The Development Site is similarly hilly and sloped, with access provided by two driveways. The Development Site has been previously graded for five homes, of which only one remains. The remainder of the Development Site is generally undisturbed.

The Project Site is approximately 25.83 acres, comprised of two areas: 1) the approximately 19 acre Harvard Westlake Campus, located at 3700 N. Coldwater Canyon Avenue (it includes the following addresses: 3668, 3674, 3680, 3686, 3700, 3704, 3730, 3736, 3742, 3800, 3900 and 3946 N. Coldwater Canyon Avenue and 12749, 12750, 12825, 12835, 12845, 12853, 12871, 12877, 12886 and 12887 West Hacienda Drive, 3908 and 3920 North Avenida Del Sol) and generally bounded by Halkirk Street to the north, Coldwater Canyon Avenue to the west, and Hacienda Drive to the south; and 2) the approximately 6.83-acre Development Site, comprised of an irregularly shaped portion of the Project Site located on the west side of Coldwater Canyon Avenue (3683, 3701, 3703, 3705, 3707, 3717, 3719 and 3801 N. Coldwater Canyon Avenue, 12908, 12916, 12924, 12930 W. Hacienda Drive; and 3666, 3680 N. Potosi Avenue), directly across from the Harvard-Westlake Campus.

The Project would consist of a three-story (4-level), 750-space parking structure with a rooftop (lighted) practice field (the "Parking Structure"), associated retaining walls, and a debris basin. The Parking Structure includes a small (2,562 square feet) enclosed (12 feet tall as measured from field level) structure including restrooms, an equipment storage room and athletic office at the north end of the practice field as well as a catchment fence atop and light poles around the field. The Parking Structure would also include an approximately 289 square foot structure for a security office. In addition, the Project includes a pedestrian bridge crossing over Coldwater Canyon Avenue connecting the Parking Structure to the Harvard-Westlake Campus. The Project also proposes a series of traffic improvements and operational changes that would improve vehicular circulation along Coldwater Canyon Avenue, including but not limited to widening Coldwater Canyon Avenue to add new traffic lanes travelling south on Coldwater Canyon Avenue near the Project Site. The Project also includes changes to the existing entrances and parking configuration on the Harvard-Westlake Campus to improve vehicular circulation and provide for bus parking on-site rather than on Coldwater Canyon Avenue.

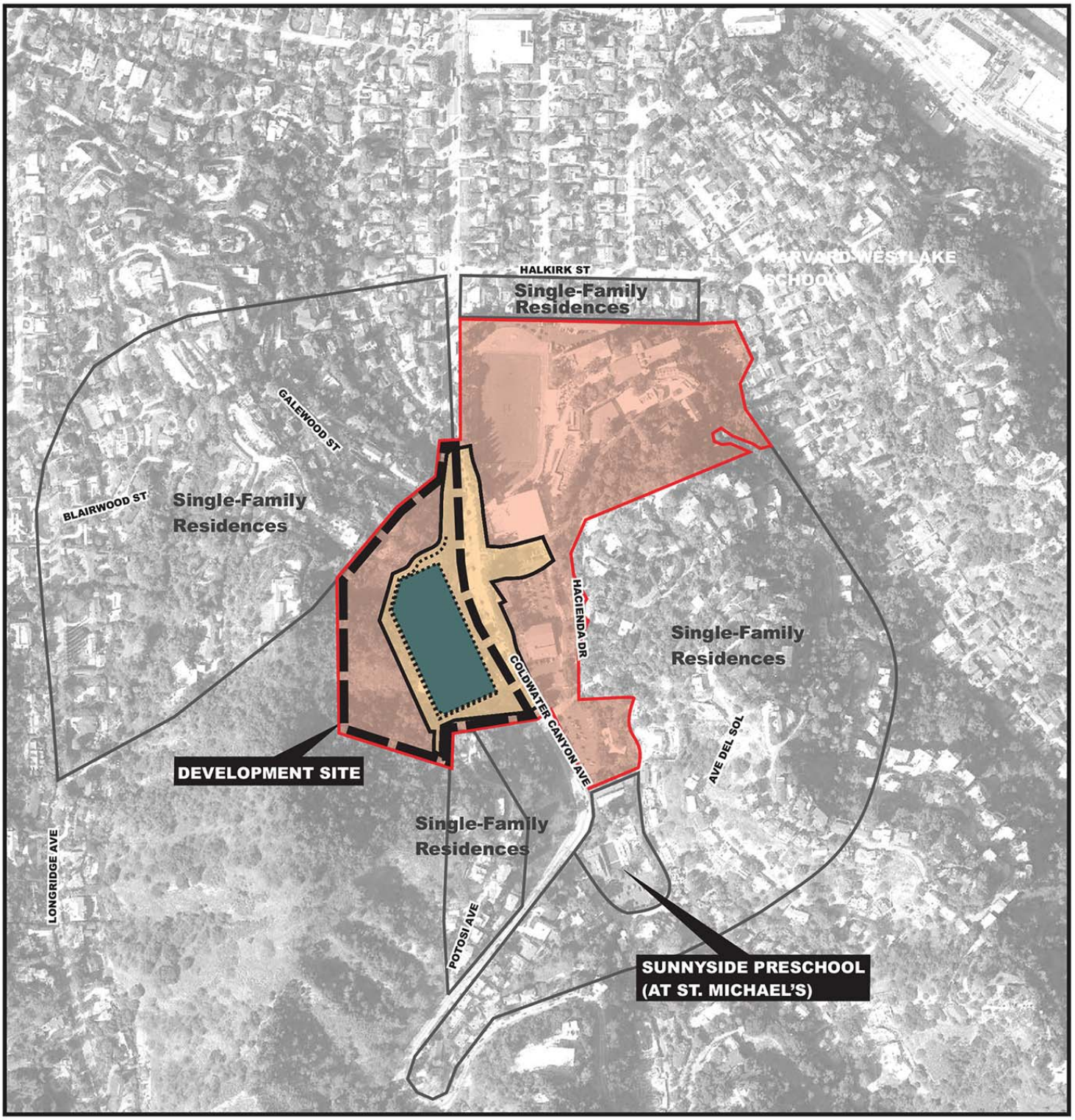
1.2 EXISTING AIR QUALITY CONDITIONS

The SCAQMD has released a draft final South Coast Air Basin (the Basin)-wide air toxics study (MATES IV, Multiple Air Toxics Exposure Study, May 2015). The MATES IV Study represents one of the most comprehensive air toxics studies ever conducted in an urban environment. The Study was aimed at estimating the cancer risk from toxic air contaminant (TAC) emissions throughout the Basin by conducting a comprehensive monitoring program, an updated emissions inventory of TACs, and a modeling effort to fully characterize health risks for those living in the Basin. The Study concluded that the average carcinogenic risk from air pollution in the Basin is approximately 420 in one million when using the same risk estimation method used in the previous MATES III Study. After release of the Draft MATES IV Study, the Office of Environmental Health Hazard Assessment (OEHHA) adopted updated methods for estimating cancer risks in March 2015, which include utilizing higher estimates of cancer potency during early life exposures and changes to the assumptions on breathing rates and length of residential exposures. In order to maintain consistency with previous MATES Studies, the Final MATES IV Study continued to use the previous risk methods. SCAQMD staff estimates that risks for the same inhalation exposure level are about 2.5 times higher using the OEHHA updated methods and that the average risk would be 1,023 in one million.[1] Mobile sources (e.g., cars, trucks, trains, ships, aircraft, etc.) represent the greatest contributors. Approximately 75 percent of the risk is attributed to diesel particulate emissions, approximately 20 percent to other toxics associated with mobile sources (including benzene, butadiene, and formaldehyde), and approximately 5 percent of all carcinogenic risk is attributed to stationary sources (which include industries and other certain businesses, such as dry cleaners and chrome plating operations).

As part of the MATES IV study, the SCAQMD has prepared a series of maps that show regional trends in estimated outdoor inhalation cancer risk from toxic emissions, as part of an ongoing effort to provide insight into relative risks. The maps' estimates represent the number of potential cancers per million people associated with a lifetime of breathing air toxics (24 hours per day outdoors for 70 years) in parts of the area. The MATES IV web interactive map is the most recently available map to represent existing conditions near the Project area. The estimated cancer risk is approximately 639 in one million using the OEHHA updated methods.[2] Page 3.2-17 of the RDEIR reported risks of between 320 to 480 in one million based on the MATES IV Study. The risk of 639 in one million takes into account the general decline in the concentration of air toxics in the Basin since the MATES III Study period and the increase in risk characterization (approximately 2.5 times higher) based on the higher estimates of cancer potency during early life exposures and changes to the assumptions on breathing rates and length of residential exposures in the updated OEHHA methodology. Generally, the risk from air toxics is lower near the coastline; increasing inland, with higher risks concentrated near large diesel sources (e.g., freeways, airports, and ports).

[1] *South Coast Air Quality Management District, Final Report – Multiple Air Toxics Exposure Study IV, (2015) 2-11.*

[2] *South Coast Air Quality Management District, Multiple Air Toxics Exposure Study IV – Model Estimated Cancer Risk, (2015), http://www3.aqmd.gov/webappl/OI.Web/OI.aspx?jurisdictionID=AQMD.gov&shareID=73f55d6b-82cc-4c41-b779-4c48c9a8b15b. Accessed October 12, 2015.*



LEGEND: Project Site | Development Site | Construction Limits | Approximate Structure Footprint

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Project Site and Surrounding Uses

Harvard Westlake HRA

Source: TAHA and Google Earth, 2012.

FIGURE 1

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2.0 REGULATIONS AND SIGNIFICANCE THRESHOLDS

Certain air pollutants have been recognized to cause notable health problems and consequential damage to the environment either directly or in reaction with other pollutants, due to their presence in elevated concentrations in the atmosphere. Such pollutants have been identified and regulated as part of the overall endeavor to prevent further deterioration and facilitate improvement in air quality. The SCAQMD periodically assesses levels of TACs in the Air Basin. A TAC is defined by California Health and Safety Code Section 39655:

> *"Toxic air contaminant" means an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health. A substance that is listed as a hazardous air pollutant pursuant to subsection (b) of Section 112 of the federal act (42 U.S.C. Sec. 7412(b)) is a toxic air contaminant.*

TACs refer to a diverse group of air pollutants that are capable of causing chronic (i.e., of long duration) and acute (i.e., severe but of short duration) adverse effects on human health. TACs include both organic and inorganic chemical substances that may be emitted from a variety of common sources including gasoline stations, motor vehicles, dry cleaners, industrial operations, painting operations, and research and teaching facilities. TACs are different than "criteria" pollutants in that ambient air quality standards have not been established for TACs, largely because there are hundreds of air toxics that tend to be emitted from specific processes, and their effects on health tend to be felt on a local scale rather than on a regional basis.

In 1998, The California Environmental Protection Agency (CalEPA) identified diesel exhaust particulate matter (DPM) as a TAC based on its potential to cause cancer, premature death, and other health problems. The greatest potential for TAC emissions during construction is related to diesel particulate matter emissions associated with heavy-duty equipment. In 2012, additional studies on the cancer-causing potential of diesel exhaust led the International Agency for Research on Cancer (IARC) to list diesel engine exhaust as "carcinogenic to humans".

OEHHA is responsible for developing and revising guidelines for performing HRAs under the State's the Air Toxics Hot Spots Program Risk Assessment (AB 2588) regulation. In March 2015, OEHHA adopted new guidelines[3] which update the previous guidance by incorporating advances in risk assessment with consideration of infants and children using Age Sensitivity Factors (ASF). These changes also take into account different breathing rates and time spent at home. Children have a higher breathing rate compared to adults and would likely spend more time at home resulting in longer exposure durations. On June 5, 2015, SCAQMD incorporated these guidelines into relevant rules designed for permitting of stationary sources.[4]

The City of Los Angeles CEQA Thresholds Guide and the SCAQMD has established that a significant impact would occur if a project would expose sensitive receptors to TACs resulting in an incremental cancer risk impact greater or equal to **10 in one million**.

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[3] *Office of Environmental Health Hazard Assessment, Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, (2015).*

[4] *South Coast Air Quality Management District, Minutes of the June 5, 2015 Meeting, http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2015/2015-Jul10-001.pdf?sfvrsn=8, Accessed September 28, 2015*

3.0 METHODOLOGY

3.1 SOURCE IDENTIFICATION

The sources of air pollutants analyzed in this HRA include heavy equipment usage (bulldozers, backhoes, tractors, and excavators) and trucks idling and travelling to and from the Development Site (i.e., concrete trucks, excavation haul trucks).

3.2 EMISSIONS CALCULATIONS

The emissions calculations in this HRA are based on an assumed mix of construction equipment as presented in the Appendices below. The calculations account for construction-related air quality control measures on the equipment, as specified in MM-AQ-10, of the FEIR. This mitigation measure includes emission control measures for criteria pollutant emissions that also serve to control diesel particulate emissions. Such measures include diesel particulate filters (DPF) or Environmental Protection Agency (EPA) Tier 4 emissions compliant equipment.

Haul truck emission factors were obtained from the CARB EMFAC2014 emissions model. EMFAC was run to identify the average DPM emission factors from heavy-duty diesel trucks travelling to and from the Development Site during construction. Trucks were assumed to be idling a maximum of 15 minutes per trip.

Project-related construction DPM emissions were calculated on an annual basis for health risk calculations. In order to incorporate the latest available emission factors, the construction emissions analysis, as presented in the FEIR, uses EMFAC2014 emission factors for haul, vendor, and concrete truck emissions. As the analysis focuses on impacts to nearby receptors, emissions were calculated for trucks travelling on streets adjacent to the Project.

3.3 DISPERSION MODELING

Dispersion modeling was performed using the AMS/EPA Regulatory Model (AERMOD), version 15181. Meteorological data from the SCAQMD's West Los Angeles monitoring station within Source Receptor Area 2 was used to represent local weather conditions and prevailing winds data. Terrain data from U.S. Geological Survey (USGS) was used to assign elevations to sources and modeling receptors.

Sensitive receptors considered in the RDEIR were also analyzed in this HRA. Sensitive receptors are locations in which a person may reside at for an extended amount of time (e.g. 24-hours). Existing sensitive receptors include the following:

- Pre-school south of the Development Site. Pre-school, approximately 500 feet south of the site.
- Residential uses east of the Development Site. Single family residences along Hacienda Drive, approximately 350 feet east of the site.
- Residential uses north of the Development Site. Single family residences along Van Noord Avenue and Galewood Street which are located approximately 100 feet and 200 feet from the site respectively.

- Residential uses south of the Development Site. Single family residences south of the Development Site along Potosi Avenue, approximately 100 feet south of the Project Site.

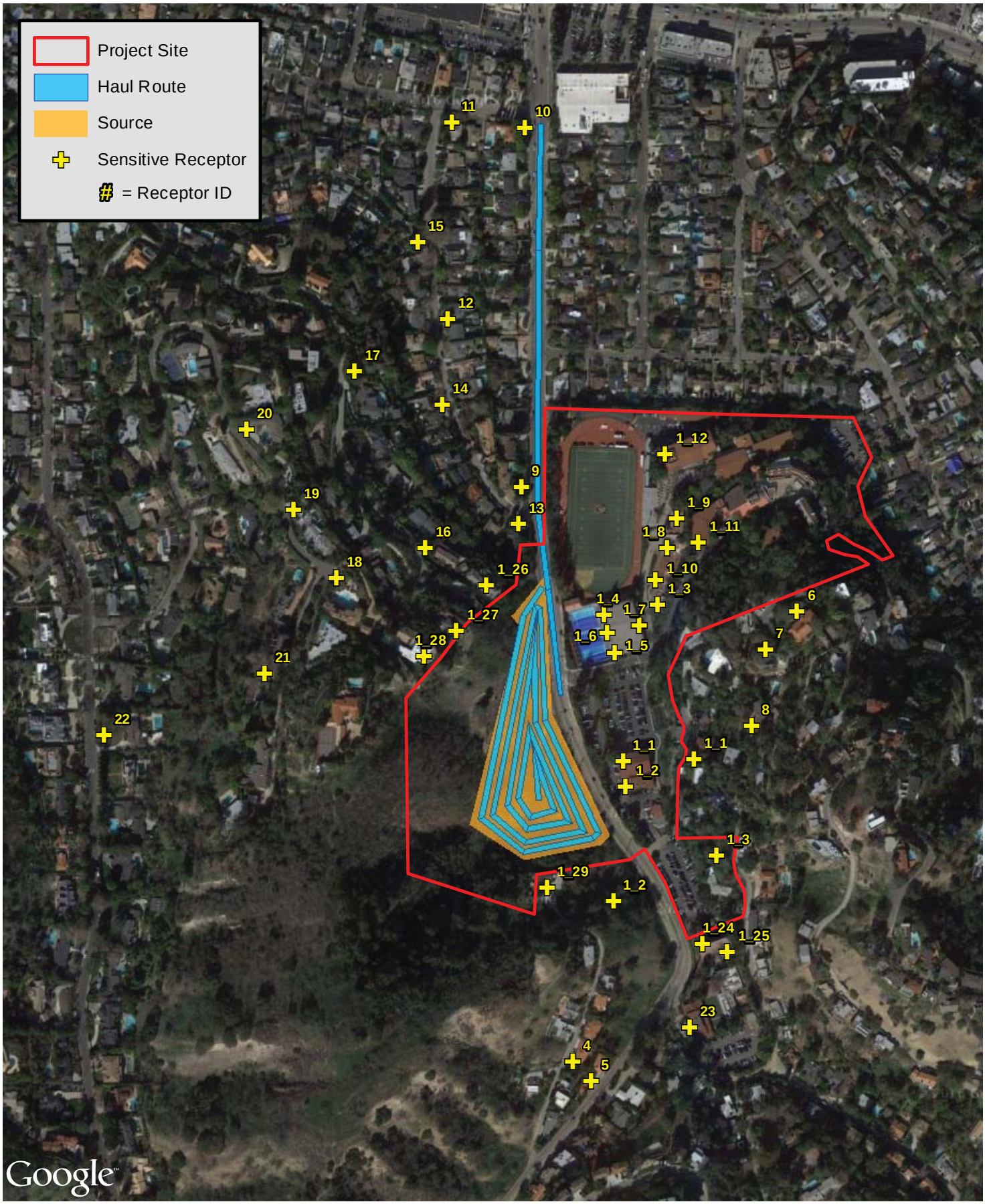
Construction emissions were calculated for the following separate sources categories: (1) Construction of the buildings and associated infrastructure; and (2) Haul, vendor, and concrete truck idling and travel on streets adjacent to the Project. These sources were included into the AERMOD dispersion model separately as volume sources and line volume sources, respectively. Construction activities and associated emissions were assumed to occur during the work day. The dispersion model was refined using variable hourly emissions for construction sources to correspond with the proposed construction hours. Line sources were placed to represent on-site construction equipment, haul truck travel to and from the site, and haul truck idling.

Receptors were placed at nearby sensitive receptors as discussed above and identified in the RDEIR. Receptors represent nearby residential uses and schools. The source-receptor configuration for construction dispersion modeling is shown as **Figure 2,** *Construction Health Risk Assessment Source-Receptor Diagram***.**

3.4 CANCER RISK AND HEALTH RISK CALCULATIONS

Cancer risk for Project-related construction activities was calculated using the CARB's most recent version of HARP (version 2) which was released March 2015. This version of HARP incorporates the most recent OEHHA guidelines for HRAs. The Project includes an estimated construction duration of 30 months. However, the vast majority of the construction-related emissions would occur during the first two years of construction activity. Therefore, in order to provide a conservative and health protective analysis, the health risk calculations were evaluated assuming that all construction emissions would occur during a compressed two-year period rather than a three-year period. This is considered a conservative and health protective assumption because the analysis concentrates more pollutants during the early exposure years when age sensitivity and fraction of time at home risk assessment factors are relatively higher. This assumption provides a slightly overestimated risk level compared to the actual estimated 30 month construction period of the Project. Other exposure parameters, such as breathing rate, were based on recommended values provided by OEHHA and within HARP (which has been updated to account for the most recent OEHHA guidelines for health risk assessments).

In performing health risk calculations, carcinogenic compounds are not considered to have threshold levels (i.e., dose levels below which there are no risks). Any exposure, therefore, will have some associated risk. Incremental health risks associated with exposure to carcinogenic compounds is defined in terms of the probability of developing cancer as a result of exposure to a chemical at a given concentration. Under a deterministic approach (i.e., point estimate methodology), the cancer risk probability is determined by multiplying the chemical's annual concentration by its unit risk factor (URF). The URF is a measure of the carcinogenic potential of a chemical when a dose is received through the inhalation pathway. It represents an upper bound estimate of the probability of contracting cancer as a result of continuous exposure to an ambient concentration of one microgram per cubic meter ($\mu g/m^3$) over a 70-year lifetime. The URFs utilized



PCR

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Construction Health Risk Assessment

Source-Receptor Diagram

Harvard-Westlake School Parking Structure

Source: Google Maps, 2015 (Aerial); PCR Services Corporation, 2016.

FIGURE

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in the assessment and the corresponding cancer potency factors (CPF) were obtained principally from OEHHA Guidance.

For the inhalation pathway, the cancer risk characterization procedure requires the incorporation of several discrete variables to effectively quantify dose. Once determined, contaminant dose is multiplied by the CPF in units of inverse dose expressed in milligrams per kilogram per day $(mg/kg/day)^{-1}$ and other exposure factors to derive the cancer risk estimate.

This approach for calculating cancer risk is intended to result in conservative (i.e., health protective) estimates of health impacts and is used for assessing risks to sensitive receptors. The estimation of cancer risk uses the following algorithms:

Risk = Dose inhalation × Inhalation CPF × ASF (Equation 1)

Where:

Dose inhalation = C_{AIR} × DBR × A × EF × ED × FAH / AT (Equation 2)

Inhalation CPF = inhalation cancer potency factor

ASF = age sensitivity factor

Where:

C_{AIR} = concentration of compound in air in micrograms per cubic meter ($\mu g/m^3$)

DBR = breathing rate in liter per kilogram of body weight per day (L/kg-body weight/day)

A = inhalation absorption factor (1 for DPM)

EF = exposure frequency in days per year (day/year)

ED = exposure duration in years (year)

FAH = fraction of time at home

AT = averaging time period over which exposure is averaged in days (day)

The OEHHA recommended values for the parameters listed above were used in the HRA analysis. The daily breathing rate (DBR) used in the analysis was based on OEHHA recommendations which vary depending on age which are shown in **Table 1,** *OEHHA Recommended Residential Daily Breathing Rates for Point Estimate Dose Calculations (L / kg body weight)*. The recommended exposure frequency (EF) is 350 days per year which is equivalent to 0.96 (350 days / 365 days a year). The inhalation absorption factor (A) is assumed to be 1 for inhalation based risk assessment.

Table 1

OEHHA Recommended Residential Daily Breathing Rates for Point Estimate Dose Calculations (L / kg body weight)

	3rd Trimester	0<2 Years	2<9 Years	2<16 Years	16<30 Years
Average	225	658	535	452	210
95th Percentile	361	1090	861	745	335

Source: OEHHA Air Toxics Hot Spots Program Guidance Manual. February 2015.

Once dose is calculated, cancer risk is calculated by accounting for cancer potency of the specific pollutant, age sensitivity, exposure duration, averaging time for lifetime cancer risk, and fraction of time spent at home

(sensitive receptor). The CPF is specific for each pollutant and is determined through peer reviewed scientific studies. OEHHA has determined that DPM has a unit risk factor of 3.0E-4 $(ug/m^3)^{-1}$ and a slope factor of 1.1 $(mg/kg\text{-}day)^{-1}$.[5] The ASF accounts for greater susceptibility in early life, starting from the 3rd trimester of pregnancy to 70 years. The fraction of time at home (FAH) takes into account the time actually residing at the sensitive receptor location. Fraction of time at home also takes into account time spent at home for various age groups. For example, newborns are expected to reside at home for longer periods of time compared to school age children, and the elderly (retirees) are expected to spend more time at home compared to people of working age. As indicated in the equation above, each age group has different exposure parameters which require cancer risk to be calculated separately for each age group. FAH values are presented in **Table 2**, *OEHHA Recommendations for Fraction of Time at Home (FAH) for Evaluating Residential Cancer Risk*.

Table 2

OEHHA Recommendations for Fraction of Time at Home (FAH) for Evaluating Residential Cancer Risk

Age Range	Fraction of Time at Residence
3rd Trimester and 0<2 Years	0.85
2<16 Years	0.72
16-70 Years	0.73

Source: OEHHA Air Toxics Hot Spots Program Guidance Manual. February 2015.

As shown in the equation on Page 12, the incremental increase in cancer risk is the product of the dose and the pollutant-specific CPF values. Cancer risk is calculated by multiplying the inhalation dose by the inhalation cancer potency factor to yield the potential inhalation excess cancer risk.

[5] *OEHHA Hot Spots Unit Risk and Cancer Potency Factors. May 2009.*

4.0 IMPACT ANALYSIS

4.1 HEALTH RISK RESULTS

Cancer risk was calculated using the most recent (March 2015) Office of Environmental Health Hazard Assessment (OEHHA) guidelines for health risk assessments. The most conservative exposure duration for sensitive receptors is two years with the starting age of 3rd trimester of pregnancy, coinciding with the period of construction in which the vast majority of the emissions would occur. As discussed previously, the construction emissions associated with the 30-month construction period were assumed to occur during a two-year period, which concentrates more pollutants during the early exposure years and results in a conservative and health protective risk assessment that slightly overestimates the risk level compared to the actual 30-month construction period of the Project. For off-site residential receptors, the worst-case scenario was assumed with a starting age of 3rd trimester. For pre-school receptors, the start age was assumed to be zero to represent newborns or infants younger than one year. For Harvard-Westlake student receptors, the start age was assumed to be 12 to represent typical incoming students. Adult risk for residences and workers was calculated assuming a start age of 16.

Exposure fraction of time at residence was based on default values provided by OEHHA and within HARP. Health risk impacts (cancer risk) were assessed for off-site sensitive receptors (residential and pre-school uses) and on-site receptors (students and staff).

Health risk impacts were calculated for construction emissions prior to implementation of mitigation measure MM-AQ-10 and MM-AQ-11 (unmitigated). The unmitigated cancer risk impacts from DPM construction emissions would be 129 in one million for child exposure and 2.8 in one million for adult exposure at residential receptors east of the Development Site. The maximum risk at nearby receptors to the south of the Site would be 57 in one million for children and 1.2 in one million for adults. Pre-school health risk is 20 per million for children and 0.4 per million for adults. The most conservative lifetime exposure under OEHHA guidelines takes into account early life (infant and children) exposure, which has a significance threshold of 10 in one million. As the unmitigated cancer risk impacts exceed SCAQMD significance thresholds, mitigation measures were implemented.

Implementation of mitigation measure MM-AQ-10, as provided below, would reduce DPM emissions and health risk impacts to a less than significant level. **Table 3**, *Construction HRA Results (Off-Site Receptors)*, and **Table 4**, *Construction HRA Results (On-site School Receptors)*, summarizes the carcinogenic risk for off-site and on-site sensitive uses respectively.

The mitigated cancer risk from DPM emissions during construction of the Project resulted in a maximum carcinogenic risk of 8.9 per million at residential receptors east of the Development Site. The maximum risk at nearby receptors to the south of the Development Site would be 3.8 in one million. Pre-school health risk is 1.3 per million for students. Risks at more distant sensitive receptors would be less than these values and are not shown in Table 3 below. Cancer risk values for other receptors are presented in Appendix A of this report. Maximum on-site Harvard-Westlake student health impacts due to Project construction occur at the Hamilton Gym with risk of 2.2 per million. As discussed above, the most conservative lifetime exposure under OEHHA guidelines takes into account early life (infant and children) exposure. As shown in **Tables 3 and 4**, risks for adult exposure would be less than these values. Maximum cancer risk impact locations are also presented in **Figure 3,** *Construction Health Risk – Point of Maximum Impact.*

Table 3

Construction HRA Results (Off-site Receptors) – Point of Maximum Impact
Mitigated Cancer risk (in one million)[a]

Sensitive Receptor Location	Child[b]	Adult[b]	Exceed Threshold?[a]
Residences East of Project Site	8.9	0.2	No
Residences South of Project Site	3.8	0.1	No
Pre-school	1.3	< 0.1	No

[a] *Maximum cancer risk values are less than the threshold of 10 In one million*
[b] *Starting age group for children at residences is 3rd trimester, while pre-school starting age is <1 year old. Adult starting age is 18 years old.*

Source: ESA PCR, 2016

Table 4

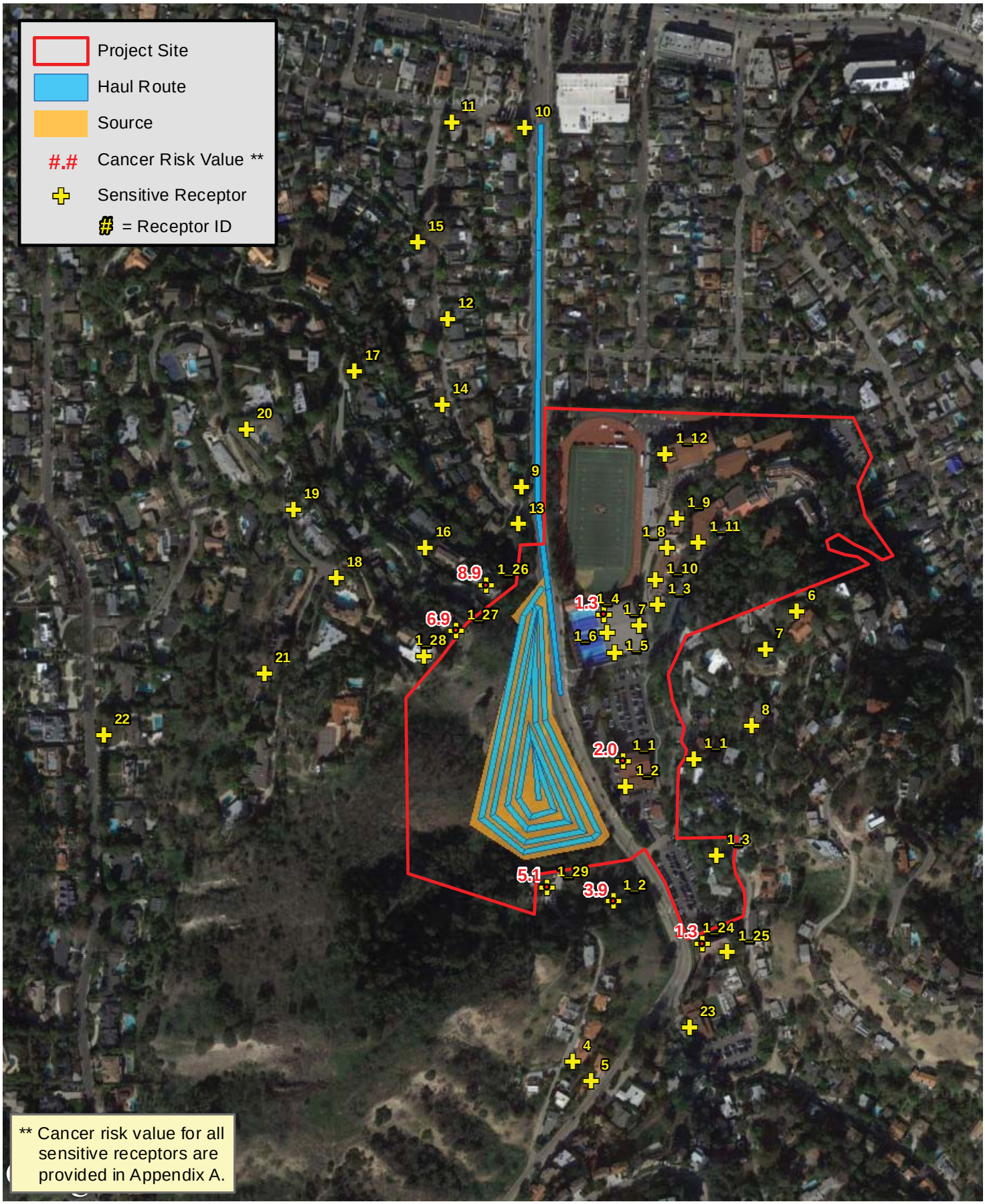
Construction HRA Results (On-site School Receptors)
Mitigated Cancer risk (in one million)[a]

Sensitive Receptor Location	Child[b]	Adult[b]	Exceed Threshold?[a]
Hamilton Gym	2.2	0.2	No
Ted Slavin Athletic Field	1.4	0.2	No

[a] *Maximum cancer risk values are less than the threshold of 10 In one million*
[b] *Starting age group for children (students) is 12 years old. Adult starting age is 18 years old.*
Source: ESA PCR, 2016

It should be noted that the calculated cancer risk assumes sensitive receptors (residential uses and schools) would not have any mitigation such as mechanical filtration, as though the sensitive receptor were outside, or inside with windows open. The use of mechanical air filtration would reduce typical indoor particulate matter (PM_{10}) concentrations by up to 85 percent, depending on the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 52.2 Minimum Efficiency Reporting Value (MERV) rating of the filtration system. Therefore, actual TAC exposure and the resultant cancer risk impacts would likely be lower than those reported in **Tables 3 and 4**.

Health risk at student receptors are presented in Table 4. It should be noted that risk values at on-site (school) receptors are presented for informational purposes only.



PCR

Construction Health Risk – Point of Maximum Impact

Harvard-Westlake School Parking Structure

Source: Google Maps, 2015 (Aerial); PCR Services Corporation, 2016.

FIGURE

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4.2 UNCERTAINTIES IN HEALTH RISK ASSESSMENTS

The process of assessing health risks and impacts includes a degree of uncertainty. The level of uncertainty is dependent on the availability of data and the extent to which assumptions are relied upon in cases where the data are incomplete or unknown. All HRAs, including this HRA, rely upon scientific studies in order to reduce the level of uncertainty; however, it is not possible to completely eliminate uncertainty from the analysis. Where assumptions are used to substitute for incomplete or unknown data, it is standard practice to err on the side of health protection in order to avoid underestimating or underreporting the risk to the public. Therefore, as discussed earlier, this HRA used for purposes of the FEIR followed the standard practice of erring on the side of health protection in cases where assumptions were relied upon. In general, sources of uncertainty that may lead to an overestimation or an underestimation of the risk include: (1) extrapolation of toxicity data in animals to humans; (2) uncertainty in the estimation of the emissions; (3) uncertainty in the air dispersion models; and (4) uncertainty in the exposure estimates. These sources of uncertainty, as they relate to the Project, are described in greater detail below. In addition to uncertainty, there exists "a natural range or variability in the human population in such properties as height, weight, and susceptibility to chemical toxicants."[6] As mentioned previously, it is typical to err on the side of health protection by assessing risk on the most sensitive populations, such as children and the elderly. Some examples of uncertainty or overestimation may include:

- Receptor exposure duration: The HRA assumes residents would be exposed to Project-related construction DPM concentrations for almost 20 hours per day, 350 days per year. Although fraction of time at home was taken into consideration, most residents would leave the house during the daytime hours for work, school, or other activities away from home. Residents who leave the home, particularly during the daytime hours when construction activity would be taking place on the Project Site, would experience a substantially lower exposure duration and a substantially lower risk level.
- Emissions estimation: Emissions from diesel powered equipment are assumed to be running continuously during the construction workday. While some equipment may run continuously during each work day, some equipment may sit idle or be used for only a few hours per day. The HRA assumes a worst-case scenario where all equipment would be running during the workday, generating DPM emissions.
- Dispersion modeling parameters: The AERMOD dispersion model is able to account for dust deposition while in transport through the air which would deplete the plume (lower concentration). As an emissions plume travels from the source to the receptor, heavier particles may drop out of the plume resulting in lower concentrations for receptors located farther away from the source. As a worst-case scenario, the dispersion modeling did not account for plume depletion due to deposition as sensitive receptors are located relatively close to the emissions generating activities.

[6] *Office of Environmental Health Hazard Assessment, Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, August 2003.*

5.0 SUMMARY OF RESULTS

Based on an exposure duration of approximately 30 months of Project construction activity (conservatively modeled as a two year duration, which concentrates the pollutants during early exposure years and results in slightly overestimated risk levels), numeric risks of carcinogenic and non-carcinogenic health impacts to off-site and on-site sensitive receptors due to TAC emissions from Project-related construction would be less than significant with implementation of mitigation measures. Receptors located farther away from the Project Site would result in a smaller cancer risk impact.

In summary, the maximally impacted on-site receptors and offsite sensitive land uses would not be exposed to cancer risk in excess of the SCAQMD significance threshold of 10 per one million. As a result, on-site receptors and off-site residential and school uses would be provided an adequate health-based separation distance from sources of Project emissions and would be considered less than significant, consistent with the findings in the RDEIR.

APPENDIX A
HEALTH RISK ASSESSMENT WORKSHEETS AND OUTPUT FILES

A.1 UNMITIGATED WORKSHEETS

Harvard Westlake - Parking Structure

Unmitigated Construction HRA - HARP Output (Results)

On-site Receptors

			Cancer Risk		
Receptor No.	**X (UTM)**	**Y (UTM)**	**Child**	**Adult**	**Location**
2	369739.3	3778387.2	3.17E-05	3.47E-06	Hamilton Gym
1	369737.1	3778411.7	2.97E-05	3.25E-06	Hamilton Gym
5	369730.8	3778514.5	1.98E-05	2.17E-06	Taper Athletic Pavilion
6	369723.8	3778533.6	1.99E-05	2.17E-06	Taper Athletic Pavilion
4	369720.6	3778550.6	1.85E-05	2.02E-06	Taper Athletic Pavilion
7	369753.7	3778541.1	1.23E-05	1.35E-06	Taper Athletic Pavilion
3	369771.7	3778559.7	9.09E-06	9.95E-07	
10	369770.2	3778583.7	7.97E-06	8.72E-07	
8	369780.8	3778613.5	6.09E-06	6.66E-07	
11	369811.1	3778618.3	4.66E-06	5.10E-07	
9	369790.4	3778642.2	4.82E-06	5.27E-07	
12	369780	3778703.4	3.59E-06	3.93E-07	
		Max:	**3.17E-05**	**3.47E-06**	

Off-site Receptors

			Cancer Risk		
Receptor No.	**X (UTM)**	**Y (UTM)**	**Child**	**Adult**	**Location**
26	369609.5	3778580	1.29E-04	2.77E-06	Residences east of the project site
27	369580.4	3778537.3	1.01E-04	2.17E-06	Residences east of the project site
13	369640	3778638	5.82E-05	1.25E-06	Residences north of the site, adjacent to Coldwater Canyon
1	369804.9	3778412.7	4.74E-05	1.02E-06	Residences west of the project site
2	369726.8	3778278.4	5.68E-05	1.22E-06	Residences south of the project site
9	369643.4	3778672.5	3.89E-05	8.38E-07	
28	369549.7	3778513.6	6.86E-05	1.48E-06	Residences east of the project site
29	369664.1	3778293.1	7.60E-05	1.64E-06	Residences south of the project site
16	369551.3	3778615.4	5.17E-05	1.11E-06	
3	369824.9	3778321.7	2.92E-05	6.28E-07	
24	369811.4	3778237.7	1.96E-05	4.39E-07	Pre school
25	369834.7	3778230.4	1.60E-05	3.58E-07	Pre school
18	369467.1	3778588.6	2.82E-05	6.08E-07	
8	369859.7	3778444.6	2.20E-05	4.74E-07	
10	369649.7	3779013.9	5.98E-06	1.29E-07	
14	369569.5	3778751.3	1.90E-05	4.09E-07	
23	369797.9	3778158.5	1.23E-05	2.65E-07	
21	369398.3	3778498.7	1.91E-05	4.12E-07	
19	369426.9	3778653.6	1.81E-05	3.90E-07	
7	369873.5	3778516.4	1.62E-05	3.49E-07	
12	369575.1	3778832.9	1.19E-05	2.56E-07	
17	369486.2	3778783.7	1.35E-05	2.90E-07	
5	369703.6	3778108.8	9.93E-06	2.14E-07	
20	369383	3778730.1	1.14E-05	2.46E-07	
15	369547.4	3778906.1	8.22E-06	1.77E-07	
6	369903.9	3778552.4	1.12E-05	2.41E-07	
4	369687	3778126.8	9.54E-06	2.06E-07	
22	369245.3	3778441.3	8.09E-06	1.74E-07	
11	369580.6	3779019.4	5.43E-06	1.17E-07	

Harvard Westlake - Parking Structure

Unmitigated Construction HRA - Diesel Particulate Matter (DPM) Emissions Summary

All Sources		Notes
Source	**DPM (lbs/year)**	Annual average emissions. Assumes 2-year construction duration, as a conservative assumption.
Construction of Parking Structure	1,064.96	Includes on-site construction equipment.
Water Trucks	1.12	
Off-site Truck Emissions (Travel)	3.44	Conservatively uses the maximum annual emissions from grading trucks during year 1 or the concrete trucks during year 2
Off-site Truck Emissions (Idling)	3.35	Conservatively uses the maximum annual emissions from grading trucks during year 1 or the concrete trucks during year 2

HARP Sources		Notes
Source	**DPM (lbs/year)**	
Construction Site	1,069.44	Includes construction equipment, truck idling, and water truck emissions.
Haul Truck Travel	3.44	Truck travelling emissions only

Harvard Westlake - Parking Structure

Unmitigated Construction HRA - Assumptions

Construction Schedule

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Hauling Truck Number	Offroad Equipment Count	Daily Vendor Truck Number
1	Site Preparation	Site Preparation	6/1/2016	6/28/2016	5	20	0	2	0
2	Grading	Grading	6/29/2016	6/6/2017	5	245	17,640	9	0
3	Soil Nailing	Building Construction	7/14/2016	4/12/2017	5	195	0	6	3
4	Shotcrete	Building Construction	7/28/2016	4/26/2017	5	195	0	4	5
5	Foundation/Structure	Building Construction	6/9/2017	7/19/2018	5	290	0	9	50
6	Tower/Ramp	Building Construction	10/17/2017	3/23/2018	5	114	0		
7	Bridge	Building Construction	3/26/2018	7/17/2018	5	82	0	1	2
8	Sitework	Building Construction	8/15/2018	4/2/2019	5	165	0	5	2
9	Streetwork	Paving	7/18/2018	8/14/2018	5	20	0	2	2

Harvard Westlake - Parking Structure

Unmitigated Construction HRA - Assumptions

Equipment Mix

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Rubber Tired Dozers	1	8	255	0.4
Site Preparation	Tractors/Loaders/Backhoes	1	8	97	0.37
Grading	Excavators	1	8	330	0.38
Grading	Graders	1	8	174	0.41
Grading	Rubber Tired Dozers	1	8	207	0.4
Grading	Scrapers	2	8	185	0.48
Grading	Tractors/Loaders/Backhoes	1	8	349	0.37
Grading	Tractors/Loaders/Backhoes	1	8	84	0.37
Grading	Tractors/Loaders/Backhoes	2	8	96	0.37
Soil Nailing	Air Compressors	2	8	78	0.48
Soil Nailing	Bore/Drill Rigs	2	8	160	0.5
Soil Nailing	Pumps	2	8	84	0.74
Shotcrete	Air Compressors	2	8	78	0.48
Shotcrete	Pumps	2	8	84	0.74
Foundation/Structure	Air Compressors	1	8	78	0.48
Foundation/Structure	Bore/Drill Rigs	1	8	160	0.5
Foundation/Structure	Other Construction Equipment	1	8	171	0.42
Foundation/Structure	Other Construction Equipment	1	8	171	0.42
Foundation/Structure	Pumps	1	8	84	0.74
Foundation/Structure	Tractors/Loaders/Backhoes	1	8	349	0.37
Foundation/Structure	Tractors/Loaders/Backhoes	2	8	84	0.37
Foundation/Structure	Tractors/Loaders/Backhoes	1	8	96	0.37
Bridge	Cranes	1	8	226	0.29
Streetwork	Graders	1	8	174	0.41
Streetwork	Paving Equipment	1	8	130	0.36
Streetwork	Plate Compactors	1	8	8	0.43
Streetwork	Rollers	1	8	80	0.38
Streetwork	Scrapers	1	8	361	0.48
Sitework	Tractors/Loaders/Backhoes	1	8	349	0.37
Sitework	Tractors/Loaders/Backhoes	1	8	84	0.37

Harvard Westlake - Parking Structure

Unmitigated Construction HRA - Diesel Particulate Matter (DPM) Emissions Summary

CalEEMod Output

Phase No.	Phase	Year	Mitigated	On/Off Site	Category	Exhaust PM10
2	Site Preparation	2016	Mitigated	On-site	Total	0.00896
3	Grading	2016	Mitigated	On-site	Total	0.2342
3	Grading	2017	Mitigated	On-site	Total	0.1815
4	Soil Nailing	2016	Mitigated	On-site	Total	0.1033
4	Soil Nailing	2017	Mitigated	On-site	Total	0.0534
5	Shotcrete	2016	Mitigated	On-site	Total	0.0693
5	Shotcrete	2017	Mitigated	On-site	Total	0.0453
6	Foundation/Structure	2017	Mitigated	On-site	Total	0.1728
6	Foundation/Structure	2018	Mitigated	On-site	Total	0.1421
8	Bridge	2018	Mitigated	On-site	Total	0.0118
9	Streetwork	2018	Mitigated	On-site	Total	0.0133
10	0 Sitework	2018	Mitigated	On-site	Total	0.0184
11	0 Sitework	2019	Mitigated	On-site	Total	0.0106

Total Emissions (tons)	1.06496
Total Emissions (lbs)	2,130
Construction Duration (years)	2
Emissions per Year (lbs)	**1,065**

Harvard Westlake - Parking Structure

Unmitigated Construction HRA - Grading Haul Truck (Annual Emissions)

On-Road Haul Truck Idling Emissions

ID	Source	Vechicle Category	Total One-Way Trips	Total Roundtrips	Total Idling Minutes	PM10 (g/hr)	PM10 (lbs/year)
Grading Trucks	Haul Trucks	T7 single construction	39,200	19,600	15	0.3105	**3.3543**

On-Road Haul Truck - Travel Emissions (within 1/4 mile of site)

ID	Source	Vechicle Category	Region	Calendar Year	Model Year	Running Speed (mph)	Total One-Way Trips	Miles per One-Way Trip	PM10 (g/mi)	PM10 (lbs/year)
Grading Trucks	Haul Trucks	T7 single construction	Los Angeles (SC)	2016	Aggregated	30	39,200	0.348	0.1142	**3.4353**

Source: Emission Factors RUNEX and IDLEX (2016 T7)

Harvard Westlake - Parking Structure

Unmitigated Construction HRA - Concrete Haul Truck (Annual Emissions)

On-Road Haul Truck Idling Emissions

ID	Source	Vechicle Category	Total One-Way Trips	Total Roundtrips	Total Idling Minutes	PM10 (g/hr)	PM10 (lbs/year)
Concrete Trucks	Vendor Trucks	T7 single construction	29,000	14,500	15	0.3105	**2.4815**

On-Road Haul Truck - Travel Emissions (within 1/4 mile of site)

ID	Source	Vechicle Category	Region	Calendar Year	Model Year	Running Speed (mph)	Total One-Way Trips	Miles per One-Way Trip	PM10 (g/mi)	PM10 (lbs/year)
Concrete Trucks	Vendor Trucks	T7 single construction	Los Angeles (SC)	2016	Aggregated	30	29,000	0.348	0.1142	**2.5414**

Source: Emission Factors RUNEX and IDLEX (2016 T7)

Harvard Westlake - Parking Structure

Unmitigated Construction HRA - Water Truck Emissions Calculations

Water Truck Trips

Construction Phases	Start	End	Work Days	Overlap with Previous
Grading	6/1/2016	3/1/2017	190	
Foundations	6/9/2017	7/19/2018	282	
Street Work	7/18/2018	8/28/2018	30	2
Sitework	6/12/2018	11/30/2018	120	56

Total Days Water Trucks Present On-Site	**564**
Watering Frequency (/day)	3
Project Total Water Truck Trips	**1,692**

Water Truck Emission Factors

Vechicle Category	Region	Calendar Year	Model Year	Process	Speed (mph)	PM10 EF	Units
T7 single construction	Los Angeles (SC)	2016	Aggregated	Idling	N/A	0.3105	g/hr
T7 single construction	Los Angeles (SC)	2016	Aggregated	Running	15	0.2472	g/mi

Source: Emission Factors RUNEX and IDLEX (2016 T7)

Water Truck Emissions

Process	Total Trips	Idling Minutes per Trip	Total Idling Hours	PM10 EF (g/hr)	PM10 (lbs/year)
Idling	1,692	10	282	0.3105	0.193

Process	Total Trips	Miles per Trip	Total Miles Traveled	PM10 EF (g/mi)	PM10 (lbs/year)
Running	1,692	1.01	1706	0.2472	0.929

Total Water Truck Emissions (lbs/year)	**1.122**

A.2 MITIGATED WORKSHEETS

Harvard Westlake - Parking Structure

Mitigated Construction HRA - HARP Output (Results)

On-site Receptors

			Cancer Risk		
Receptor No.	**X (UTM)**	**Y (UTM)**	**Child**	**Adult**	**Location**
2	369739.3	3778387.2	2.15E-06	2.35E-07	Hamilton Gym
1	369737.1	3778411.7	2.02E-06	2.21E-07	Hamilton Gym
5	369730.8	3778514.5	1.39E-06	1.52E-07	Taper Athletic Pavilion
6	369723.8	3778533.6	1.41E-06	1.54E-07	Taper Athletic Pavilion
4	369720.6	3778550.6	1.32E-06	1.45E-07	Taper Athletic Pavilion
7	369753.7	3778541.1	8.68E-07	9.50E-08	Taper Athletic Pavilion
3	369771.7	3778559.7	6.39E-07	6.99E-08	
10	369770.2	3778583.7	5.66E-07	6.19E-08	
8	369780.8	3778613.5	4.34E-07	4.75E-08	
11	369811.1	3778618.3	3.30E-07	3.61E-08	
9	369790.4	3778642.2	3.46E-07	3.78E-08	
12	369780	3778703.4	2.68E-07	2.93E-08	
		Max:	**2.15E-06**	**2.35E-07**	

Off-site Receptors

			Cancer Risk		
Receptor No.	**X (UTM)**	**Y (UTM)**	**Child**	**Adult**	**Location**
26	369609.5	3778580	8.90E-06	1.92E-07	Residences east of the project site
27	369580.4	3778537.3	6.89E-06	1.48E-07	Residences east of the project site
13	369640	3778638	5.18E-06	1.12E-07	Residences north of the site, adjacent to Coldwater Canyon
1	369804.9	3778412.7	3.24E-06	6.97E-08	Residences west of the project site
2	369726.8	3778278.4	3.85E-06	8.28E-08	Residences south of the project site
9	369643.4	3778672.5	3.69E-06	7.94E-08	
28	369549.7	3778513.6	4.67E-06	1.01E-07	Residences east of the project site
29	369664.1	3778293.1	5.14E-06	1.11E-07	Residences south of the project site
16	369551.3	3778615.4	3.59E-06	7.74E-08	
3	369824.9	3778321.7	1.99E-06	4.28E-08	
24	369811.4	3778237.7	1.33E-06	2.99E-08	Pre school
25	369834.7	3778230.4	1.09E-06	2.44E-08	Pre school
18	369467.1	3778588.6	1.94E-06	4.17E-08	
8	369859.7	3778444.6	1.51E-06	3.26E-08	
10	369649.7	3779013.9	9.75E-07	2.10E-08	
14	369569.5	3778751.3	1.50E-06	3.24E-08	
23	369797.9	3778158.5	8.42E-07	1.81E-08	
21	369398.3	3778498.7	1.30E-06	2.81E-08	
19	369426.9	3778653.6	1.25E-06	2.70E-08	
7	369873.5	3778516.4	1.13E-06	2.42E-08	
12	369575.1	3778832.9	1.04E-06	2.24E-08	
17	369486.2	3778783.7	9.85E-07	2.12E-08	
5	369703.6	3778108.8	6.74E-07	1.45E-08	
20	369383	3778730.1	7.97E-07	1.72E-08	
15	369547.4	3778906.1	7.12E-07	1.53E-08	
6	369903.9	3778552.4	7.83E-07	1.69E-08	
4	369687	3778126.8	6.50E-07	1.40E-08	
22	369245.3	3778441.3	5.54E-07	1.19E-08	
11	369580.6	3779019.4	5.34E-07	1.15E-08	

Harvard Westlake - Parking Structure

Mitigated Construction HRA - Diesel Particulate Matter (DPM) Emissions Summary

All Sources		Notes
Source	**DPM (lbs/year)**	Annual average emissions. Assumes 2-year construction duration, as a conservative assumption.
Construction of Parking Structure	67.69	Includes on-site construction equipment.
Water Trucks	1.12	
Off-site Truck Emissions (Travel)	3.44	Conservatively uses the maximum annual emissions from grading trucks during year 1 or the concrete trucks during year 2
Off-site Truck Emissions (Idling)	3.35	Conservatively uses the maximum annual emissions from grading trucks during year 1 or the concrete trucks during year 2

HARP Sources		Notes
Source	**DPM (lbs/year)**	
Construction Site	72.17	Includes construction equipment, truck idling, and water truck emissions.
Haul Truck Travel	3.44	Truck travelling emissions only

Harvard Westlake - Parking Structure

Mitigated Construction HRA - Assumptions

Construction Schedule

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Hauling Truck Number	Offroad Equipment Count	Daily Vendor Truck Number
1	Site Preparation	Site Preparation	6/1/2016	6/28/2016	5	20	0	2	0
2	Grading	Grading	6/29/2016	6/6/2017	5	245	17,640	9	0
3	Soil Nailing	Building Construction	7/14/2016	4/12/2017	5	195	0	6	3
4	Shotcrete	Building Construction	7/28/2016	4/26/2017	5	195	0	4	5
5	Foundation/Structure	Building Construction	6/9/2017	7/19/2018	5	290	0	9	50
6	Tower/Ramp	Building Construction	10/17/2017	3/23/2018	5	114	0		
7	Bridge	Building Construction	3/26/2018	7/17/2018	5	82	0	1	2
8	Sitework	Building Construction	8/15/2018	4/2/2019	5	165	0	5	2
9	Streetwork	Paving	7/18/2018	8/14/2018	5	20	0	2	2

Harvard Westlake - Parking Structure

Mitigated Construction HRA - Assumptions

Equipment Mix

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Rubber Tired Dozers	1	8	255	0.4
Site Preparation	Tractors/Loaders/Backhoes	1	8	97	0.37
Grading	Excavators	1	8	330	0.38
Grading	Graders	1	8	174	0.41
Grading	Rubber Tired Dozers	1	8	207	0.4
Grading	Scrapers	2	8	185	0.48
Grading	Tractors/Loaders/Backhoes	1	8	349	0.37
Grading	Tractors/Loaders/Backhoes	1	8	84	0.37
Grading	Tractors/Loaders/Backhoes	2	8	96	0.37
Soil Nailing	Air Compressors	2	8	78	0.48
Soil Nailing	Bore/Drill Rigs	2	8	160	0.5
Soil Nailing	Pumps	2	8	84	0.74
Shotcrete	Air Compressors	2	8	78	0.48
Shotcrete	Pumps	2	8	84	0.74
Foundation/Structure	Air Compressors	1	8	78	0.48
Foundation/Structure	Bore/Drill Rigs	1	8	160	0.5
Foundation/Structure	Other Construction Equipment	1	8	171	0.42
Foundation/Structure	Other Construction Equipment	1	8	171	0.42
Foundation/Structure	Pumps	1	8	84	0.74
Foundation/Structure	Tractors/Loaders/Backhoes	1	8	349	0.37
Foundation/Structure	Tractors/Loaders/Backhoes	2	8	84	0.37
Foundation/Structure	Tractors/Loaders/Backhoes	1	8	96	0.37
Bridge	Cranes	1	8	226	0.29
Streetwork	Graders	1	8	174	0.41
Streetwork	Paving Equipment	1	8	130	0.36
Streetwork	Plate Compactors	1	8	8	0.43
Streetwork	Rollers	1	8	80	0.38
Streetwork	Scrapers	1	8	361	0.48
Sitework	Tractors/Loaders/Backhoes	1	8	349	0.37
Sitework	Tractors/Loaders/Backhoes	1	8	84	0.37

Harvard Westlake - Parking Structure

Mitigated Construction HRA - Equipment Mitigation List

GRADING

Equipment Used	Quantity	Hours/Day
Excavator (Komatsu PC400 / PC490)	1	8
Dozer (Caterpiller D6 / D8)	1	8
Loader (Caterpiller 966)	1	8
Blade (Caterpiller 140H)	1	8
Skip Loader (Caterpiller 210)	1	8
Back Hoe (John Deere 410J)	2	8
Scraper (Caterpillar 623 / 637)	2	8
Water Truck (4000 gal)	1	8

SOIL NAILING

Equipment Used	Quantity	Hours/Day
Drill Rig (Soilmec SM-14)	2	8
Compressor	2	8
Concrete pump	2	8

SHOTCRETE

Equipment Used	Quantity	Hours/Day
Compressor	2	8
Concrete pumps	2	8

FOUNDATIONS/STRUCTURE

Equipment Used	Quantity	Hours/Day
Loader (Caterpiller 980)	1	8
Skip Loader (Caterpiller 210)	1	8
Back Hoe (John Deere 410J)	2	8
Water Truck (2000 gal)	1	8
Drill Rig (Soilmec SM-60)	1	8
Gradall	1	8
Bobcat	1	8
Compressor	1	8
Concrete Pump	1	8

TOWER/RAMP

Equipment Used	Quantity	Hours/Day

BRIDGE

Equipment Used	Quantity	Hours/Day
Crane	1	8

STREETWORK

Equipment Used	Quantity	Hours/Day
Compactor	1	8
Roller	1	8
Blade	1	8
Scraper	1	8
Water truck (2000 gal)	1	8
Asphalt screed	1	8

SITEWORK

Equipment Used	Quantity	Hours/Day
Loader (Caterpiller 980)	1	8
Skip Loader (Caterpiller 210)	1	8
Water Truck (2000 gal)	1	8

Red Text = Tier 3 + Diesel Particulate Filter

Blue Text = Tier 4

Harvard Westlake - Parking Structure

Mitigated Construction HRA - Diesel Particulate Matter (DPM) Emissions Summary

CalEEMod Output

Phase No.	Phase	Year	Mitigated	On/Off Site	Category	Exhaust PM10
2	Site Preparation	2016	Mitigated	On-site	Total	0.00019
3	Grading	2016	Mitigated	On-site	Total	0.00646
3	Grading	2017	Mitigated	On-site	Total	0.00544
4	Soil Nailing	2016	Mitigated	On-site	Total	0.00755
4	Soil Nailing	2017	Mitigated	On-site	Total	0.00452
5	Shotcrete	2016	Mitigated	On-site	Total	0.00567
5	Shotcrete	2017	Mitigated	On-site	Total	0.0042
6	Foundation/Structure	2017	Mitigated	On-site	Total	0.00833
6	Foundation/Structure	2018	Mitigated	On-site	Total	0.00822
8	Bridge	2018	Mitigated	On-site	Total	0.0118
9	Streetwork	2018	Mitigated	On-site	Total	0.00344
10	0 Sitework	2018	Mitigated	On-site	Total	0.00112
11	0 Sitework	2019	Mitigated	On-site	Total	0.00075

Total Emissions (tons)	0.06769
Total Emissions (lbs)	135.38
Construction Duration (years)	2
Emissions per Year (lbs)	**67.7**

Harvard Westlake - Parking Structure

Mitigated Construction HRA - Grading Haul Truck (Annual Emissions)

On-Road Haul Truck Idling Emissions

ID	Source	Vechicle Category	Total One-Way Trips	Total Roundtrips	Total Idling Minutes	PM10 (g/hr)	PM10 (lbs/year)
Grading Trucks	Haul Trucks	T7 single construction	39,200	19,600	15	0.3105	**3.3543**

On-Road Haul Truck - Travel Emissions (within 1/4 mile of site)

ID	Source	Vechicle Category	Region	Calendar Year	Model Year	Running Speed (mph)	Total One-Way Trips	Miles per One-Way Trip	PM10 (g/mi)	PM10 (lbs/year)
Grading Trucks	Haul Trucks	T7 single construction	Los Angeles (SC)	2016	Aggregated	30	39,200	0.348	0.1142	**3.4353**

Source: Emission Factors RUNEX and IDLEX (2016 T7)

Harvard Westlake - Parking Structure

Mitigated Construction HRA - Concrete Haul Truck (Annual Emissions)

On-Road Haul Truck Idling Emissions

ID	Source	Vechicle Category	Total One-Way Trips	Total Roundtrips	Total Idling Minutes	PM10 (g/hr)	PM10 (lbs/year)
Concrete Trucks	Vendor Trucks	T7 single construction	29,000	14,500	15	0.3105	**2.4815**

On-Road Haul Truck - Travel Emissions (within 1/4 mile of site)

ID	Source	Vechicle Category	Region	Calendar Year	Model Year	Running Speed (mph)	Total One-Way Trips	Miles per One-Way Trip	PM10 (g/mi)	PM10 (lbs/year)
Concrete Trucks	Vendor Trucks	T7 single construction	Los Angeles (SC)	2016	Aggregated	30	29,000	0.348	0.1142	**2.5414**

Source: Emission Factors RUNEX and IDLEX (2016 T7)

Harvard Westlake - Parking Structure

Mitigated Construction HRA - Water Truck Emissions Calculations

Water Truck Trips

Construction Phases	Start	End	Work Days	Overlap with Previous
Grading	6/1/2016	3/1/2017	190	
Foundations	6/9/2017	7/19/2018	282	
Street Work	7/18/2018	8/28/2018	30	2
Sitework	6/12/2018	11/30/2018	120	56

Total Days Water Trucks Present On-Site	**564**
Watering Frequency (/day)	3
Project Total Water Truck Trips	**1,692**

Water Truck Emission Factors

Vechicle Category	Region	Calendar Year	Model Year	Process	Speed (mph)	PM10 EF	Units
T7 single construction	Los Angeles (SC)	2016	Aggregated	Idling	N/A	0.3105	g/hr
T7 single construction	Los Angeles (SC)	2016	Aggregated	Running	15	0.2472	g/mi

Source: Emission Factors RUNEX and IDLEX (2016 T7)

Water Truck Emissions

Process	Total Trips	Idling Minutes per Trip	Total Idling Hours	PM10 EF (g/hr)	PM10 (lbs/year)
Idling	1,692	10	282	0.3105	0.193

Process	Total Trips	Miles per Trip	Total Miles Traveled	PM10 EF (g/mi)	PM10 (lbs/year)
Running	1,692	1.01	1706	0.2472	0.929

Total Water Truck Emissions (lbs/year)	**1.122**

A.3 CALEEMOD UNMITIGATED AND MITIGATED OUTPUT FILE

Harvard Westlake Parking Structure

Los Angeles-South Coast County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Enclosed Parking with Elevator	750.00	Space	1.90	300,000.00	0
User Defined Parking	0.00	User Defined Unit	1.52	59,921.00	0
User Defined Recreational	64,350.00	User Defined Unit	0.00	64,350.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	33
Climate Zone	11			**Operational Year**	2019
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	630.89	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Athletic Field is under land use category of User defined recreational.
Roadways and landscape are under parking- user defined.
Construction Phase - based on equipment mix provided by the constructor

Off-road Equipment - based on equipment mix provided by the constructor

Off-road Equipment -

Off-road Equipment - based on equipment mix provided by the constructor

Off-road Equipment - based on equipment mix provided by the constructor

Off-road Equipment - based on construction plan

Off-road Equipment - based on equipment mix provided by the constructor

Off-road Equipment - based on equipment mix provided by the constructor

Off-road Equipment - based on equipment mix provided by the constructor

Off-road Equipment - based on equipment mix provided by the constructor

Off-road Equipment - based on equipment mix provided by the constructor

Trips and VMT - Overlapping phases: 1) Grading, Soil Nailing, and Shotcrete 2) Foundations/Structure, Tower/Ramp 3) Foundations/Structure, Bridge. Haul trucks assumed to travel 13 miles each way. Soil Nailing and Shotcrete trips assumed to be 6.9 miles one-way.

Grading -

Vechicle Emission Factors -

Vechicle Emission Factors -

Vechicle Emission Factors -

Energy Use - Athlectic field would have 10 light poles. A conservetive assumption that 10 light poles would have 6 light bulb each with each light bulb having rating of 400 W.

Construction Off-road Equipment Mitigation - Details provided by the constructor.

Table Name	Column Name	Default Value	New Value
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	11.00
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 4 Final

tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstructionPhase	NumDays	230.00	195.00
tblConstructionPhase	NumDays	230.00	195.00
tblConstructionPhase	NumDays	230.00	290.00
tblConstructionPhase	NumDays	230.00	114.00
tblConstructionPhase	NumDays	230.00	82.00
tblConstructionPhase	NumDays	230.00	165.00
tblConstructionPhase	NumDays	8.00	245.00
tblConstructionPhase	NumDays	18.00	20.00
tblConstructionPhase	NumDays	5.00	20.00
tblConstructionPhase	PhaseEndDate	3/6/2018	4/12/2017
tblConstructionPhase	PhaseEndDate	1/10/2018	4/26/2017
tblConstructionPhase	PhaseEndDate	6/6/2018	7/19/2018
tblConstructionPhase	PhaseEndDate	12/26/2018	3/23/2018
tblConstructionPhase	PhaseStartDate	6/7/2017	7/14/2016
tblConstructionPhase	PhaseStartDate	4/13/2017	7/28/2016
tblConstructionPhase	PhaseStartDate	4/27/2017	6/9/2017
tblConstructionPhase	PhaseStartDate	7/20/2018	10/17/2017
tblConstructionPhase	PhaseStartDate	3/24/2018	3/26/2018
tblEnergyUse	LightingElect	0.00	3.26
tblEnergyUse	NT24E	0.00	3.26
tblEnergyUse	T24E	0.00	3.26
tblGrading	AcresOfGrading	612.50	450.00
tblGrading	MaterialExported	0.00	140,000.00

tblLandUse	LandUseSquareFeet	0.00	59,921.00
tblLandUse	LandUseSquareFeet	0.00	64,350.00
tblLandUse	LotAcreage	6.75	1.90
tblLandUse	LotAcreage	0.00	1.52
tblOffRoadEquipment	HorsePower	162.00	330.00
tblOffRoadEquipment	HorsePower	255.00	207.00
tblOffRoadEquipment	HorsePower	97.00	349.00
tblOffRoadEquipment	HorsePower	97.00	84.00
tblOffRoadEquipment	HorsePower	97.00	96.00
tblOffRoadEquipment	HorsePower	97.00	349.00
tblOffRoadEquipment	HorsePower	97.00	84.00
tblOffRoadEquipment	HorsePower	97.00	349.00
tblOffRoadEquipment	HorsePower	97.00	84.00
tblOffRoadEquipment	HorsePower	97.00	96.00
tblOffRoadEquipment	HorsePower	205.00	160.00
tblOffRoadEquipment	HorsePower	205.00	160.00
tblOffRoadEquipment	HorsePower	361.00	185.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	1.00
tblOffRoadEquipment	UsageHours	7.00	8.00

tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblProjectCharacteristics	OperationalYear	2014	2019
tblTripsAndVMT	HaulingTripLength	20.00	26.00
tblTripsAndVMT	HaulingTripNumber	17,500.00	17,640.00
tblTripsAndVMT	VendorTripLength	6.90	13.80
tblTripsAndVMT	VendorTripLength	6.90	13.80
tblTripsAndVMT	VendorTripLength	6.90	13.80
tblTripsAndVMT	VendorTripNumber	70.00	3.00
tblTripsAndVMT	VendorTripNumber	70.00	5.00
tblTripsAndVMT	VendorTripNumber	70.00	50.00
tblTripsAndVMT	VendorTripNumber	70.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	70.00	2.00
tblTripsAndVMT	VendorVehicleClass	HDT_Mix	HHDT
tblTripsAndVMT	WorkerTripNumber	23.00	30.00
tblTripsAndVMT	WorkerTripNumber	178.00	30.00
tblTripsAndVMT	WorkerTripNumber	178.00	30.00
tblTripsAndVMT	WorkerTripNumber	178.00	30.00
tblTripsAndVMT	WorkerTripNumber	178.00	30.00
tblTripsAndVMT	WorkerTripNumber	13.00	30.00
tblTripsAndVMT	WorkerTripNumber	178.00	30.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Year	tons/yr															
2016	0.8910	9.3617	5.8607	0.0130	1.2852	0.4434	1.7286	0.5292	0.4195	0.9486						
2017	0.9820	10.4122	7.2304	0.0159	1.2694	0.4838	1.7532	0.5078	0.4551	0.9629						
2018	0.4081	4.2058	3.5622	7.3700e-003	0.1005	0.1958	0.2963	0.0271	0.1829	0.2100						
2019	0.0258	0.2524	0.2265	6.0000e-004	0.0113	0.0108	0.0220	3.0000e-003	9.9000e-003	0.0129						
Total	**2.3069**	**24.2321**	**16.8798**	**0.0368**	**2.6664**	**1.1337**	**3.8001**	**1.0671**	**1.0673**	**2.1344**						

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Year	tons/yr															
2016	0.2437	3.3073	5.9292	0.0130	0.6481	0.0475	0.6956	0.2452	0.0453	0.2905						
2017	0.2914	3.6427	7.5972	0.0159	0.6691	0.0533	0.7224	0.2440	0.0509	0.2949						
2018	0.1567	1.5595	3.9236	7.3700e-003	0.1005	0.0348	0.1353	0.0271	0.0328	0.0599						
2019	9.2600e-003	0.0337	0.2885	6.0000e-004	0.0113	9.1000e-004	0.0122	3.0000e-003	9.0000e-004	3.9000e-003						
Total	**0.7010**	**8.5432**	**17.7386**	**0.0368**	**1.4289**	**0.1365**	**1.5655**	**0.5193**	**0.1299**	**0.6492**						

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Percent Reduction	**69.61**	**64.74**	**-5.09**	**0.00**	**46.41**	**87.96**	**58.80**	**51.34**	**87.83**	**69.59**						

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	6/1/2016	6/28/2016	5	20	
2	Grading	Grading	6/29/2016	6/6/2017	5	245	
3	Soil Nailing	Building Construction	7/14/2016	4/12/2017	5	195	
4	Shotcrete	Building Construction	7/28/2016	4/26/2017	5	195	
5	Foundation/Structure	Building Construction	6/9/2017	7/19/2018	5	290	
6	Tower/Ramp	Building Construction	10/17/2017	3/23/2018	5	114	
7	Bridge	Building Construction	3/26/2018	7/17/2018	5	82	
8	Streetwork	Paving	7/18/2018	8/14/2018	5	20	
9	Sitework	Building Construction	8/15/2018	4/2/2019	5	165	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 450

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Rubber Tired Dozers	1	8.00	255	0.40
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Grading	Excavators	1	8.00	330	0.38
Grading	Graders	1	8.00	174	0.41
Grading	Rubber Tired Dozers	1	8.00	207	0.40
Grading	Scrapers	2	8.00	185	0.48

Grading	Tractors/Loaders/Backhoes	1	8.00	349	0.37
Grading	Tractors/Loaders/Backhoes	1	8.00	84	0.37
Grading	Tractors/Loaders/Backhoes	2	8.00	96	0.37
Soil Nailing	Air Compressors	2	8.00	78	0.48
Soil Nailing	Bore/Drill Rigs	2	8.00	160	0.50
Soil Nailing	Pumps	2	8.00	84	0.74
Shotcrete	Air Compressors	2	8.00	78	0.48
Shotcrete	Pumps	2	8.00	84	0.74
Foundation/Structure	Air Compressors	1	8.00	78	0.48
Foundation/Structure	Bore/Drill Rigs	1	8.00	160	0.50
Foundation/Structure	Other Construction Equipment	1	8.00	171	0.42
Foundation/Structure	Other Construction Equipment	1	8.00	171	0.42
Foundation/Structure	Pumps	1	8.00	84	0.74
Foundation/Structure	Tractors/Loaders/Backhoes	1	8.00	349	0.37
Foundation/Structure	Tractors/Loaders/Backhoes	2	8.00	84	0.37
Foundation/Structure	Tractors/Loaders/Backhoes	1	8.00	96	0.37
Bridge	Cranes	1	8.00	226	0.29
Streetwork	Graders	1	8.00	174	0.41
Streetwork	Paving Equipment	1	8.00	130	0.36
Streetwork	Plate Compactors	1	8.00	8	0.43
Streetwork	Rollers	1	8.00	80	0.38
Streetwork	Scrapers	1	8.00	361	0.48
Sitework	Tractors/Loaders/Backhoes	1	8.00	349	0.37
Sitework	Tractors/Loaders/Backhoes	1	8.00	84	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	2	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	9	30.00	0.00	17,640.00	14.70	6.90	26.00	LD_Mix	HDT_Mix	HHDT

Soil Nailing	6	30.00	3.00	0.00	14.70	13.80	20.00	LD_Mix	HDT_Mix	HHDT
Shotcrete	4	30.00	5.00	0.00	14.70	13.80	20.00	LD_Mix	HDT_Mix	HHDT
Foundation/Structure	9	30.00	50.00	0.00	14.70	13.80	20.00	LD_Mix	HHDT	HHDT
Tower/Ramp	0			0.00	14.70	6.90				
Bridge	1	30.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Streetwork	5	30.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Sitework	2	30.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use DPF for Construction Equipment

Water Exposed Area

Clean Paved Roads

3.2 Site Preparation - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Fugitive Dust					0.0602	0.0000	0.0602	0.0331	0.0000	0.0331						
Off-Road	0.0158	0.1713	0.1290	1.2000e-004		8.9600e-003	8.9600e-003		8.2400e-003	8.2400e-003						
Total	**0.0158**	**0.1713**	**0.1290**	**1.2000e-004**	**0.0602**	**8.9600e-003**	**0.0692**	**0.0331**	**8.2400e-003**	**0.0413**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						

Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Worker	2.2000e-004	3.2000e-004	3.3300e-003	1.0000e-005	5.5000e-004	1.0000e-005	5.5000e-004	1.5000e-004	0.0000	1.5000e-004						
Total	**2.2000e-004**	**3.2000e-004**	**3.3300e-003**	**1.0000e-005**	**5.5000e-004**	**1.0000e-005**	**5.5000e-004**	**1.5000e-004**	**0.0000**	**1.5000e-004**						

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Fugitive Dust					0.0235	0.0000	0.0235	0.0129	0.0000	0.0129						
Off-Road	1.4600e-003	6.3200e-003	0.0630	1.2000e-004		1.9000e-004	1.9000e-004		1.9000e-004	1.9000e-004						
Total	**1.4600e-003**	**6.3200e-003**	**0.0630**	**1.2000e-004**	**0.0235**	**1.9000e-004**	**0.0237**	**0.0129**	**1.9000e-004**	**0.0131**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Worker	2.2000e-004	3.2000e-004	3.3300e-003	1.0000e-005	5.5000e-004	1.0000e-005	5.5000e-004	1.5000e-004	0.0000	1.5000e-004						
Total	**2.2000e-004**	**3.2000e-004**	**3.3300e-003**	**1.0000e-005**	**5.5000e-004**	**1.0000e-005**	**5.5000e-004**	**1.5000e-004**	**0.0000**	**1.5000e-004**						

3.3 Grading - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						

Category	tons/yr															
Fugitive Dust					0.9842	0.0000	0.9842	0.4325	0.0000	0.4325						
Off-Road	0.4205	4.7591	2.0928	3.9400e-003		0.2342	0.2342		0.2155	0.2155						
Total	**0.4205**	**4.7591**	**2.0928**	**3.9400e-003**	**0.9842**	**0.2342**	**1.2184**	**0.4325**	**0.2155**	**0.6479**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.1043	1.8090	1.1913	4.6200e-003	0.1742	0.0258	0.2000	0.0458	0.0237	0.0696						
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Worker	8.7100e-003	0.0127	0.1327	2.8000e-004	0.0219	2.1000e-004	0.0221	5.8100e-003	1.9000e-004	6.0000e-003						
Total	**0.1130**	**1.8218**	**1.3240**	**4.9000e-003**	**0.1961**	**0.0260**	**0.2221**	**0.0517**	**0.0239**	**0.0756**						

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Fugitive Dust					0.3839	0.0000	0.3839	0.1687	0.0000	0.1687						
Off-Road	0.0484	0.2099	2.0814	3.9400e-003		6.4600e-003	6.4600e-003		6.4600e-003	6.4600e-003						
Total	**0.0484**	**0.2099**	**2.0814**	**3.9400e-003**	**0.3839**	**6.4600e-003**	**0.3903**	**0.1687**	**6.4600e-003**	**0.1751**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.1043	1.8090	1.1913	4.6200e-003	0.1742	0.0258	0.2000	0.0458	0.0237	0.0696						
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Worker	8.7100e-003	0.0127	0.1327	2.8000e-004	0.0219	2.1000e-004	0.0221	5.8100e-003	1.9000e-004	6.0000e-003						
Total	**0.1130**	**1.8218**	**1.3240**	**4.9000e-003**	**0.1961**	**0.0260**	**0.2221**	**0.0517**	**0.0239**	**0.0756**						

3.3 Grading - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Fugitive Dust					0.9842	0.0000	0.9842	0.4325	0.0000	0.4325						
Off-Road	0.3310	3.7057	1.7039	3.3100e-003		0.1815	0.1815		0.1670	0.1670						
Total	**0.3310**	**3.7057**	**1.7039**	**3.3100e-003**	**0.9842**	**0.1815**	**1.1657**	**0.4325**	**0.1670**	**0.5994**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0832	1.3982	0.9670	3.8900e-003	0.1701	0.0198	0.1900	0.0444	0.0183	0.0626						
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Worker	6.5700e-003	9.7000e-003	0.1009	2.3000e-004	0.0184	1.7000e-004	0.0186	4.8900e-003	1.6000e-004	5.0500e-003						
Total	**0.0897**	**1.4079**	**1.0679**	**4.1200e-003**	**0.1886**	**0.0200**	**0.2086**	**0.0492**	**0.0184**	**0.0677**						

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Fugitive Dust					0.3839	0.0000	0.3839	0.1687	0.0000	0.1687						
Off-Road	0.0408	0.1768	1.7528	3.3100e-003		5.4400e-003	5.4400e-003		5.4400e-003	5.4400e-003						
Total	**0.0408**	**0.1768**	**1.7528**	**3.3100e-003**	**0.3839**	**5.4400e-003**	**0.3893**	**0.1687**	**5.4400e-003**	**0.1741**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0832	1.3982	0.9670	3.8900e-003	0.1701	0.0198	0.1900	0.0444	0.0183	0.0626						
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Worker	6.5700e-003	9.7000e-003	0.1009	2.3000e-004	0.0184	1.7000e-004	0.0186	4.8900e-003	1.6000e-004	5.0500e-003						
Total	**0.0897**	**1.4079**	**1.0679**	**4.1200e-003**	**0.1886**	**0.0200**	**0.2086**	**0.0492**	**0.0184**	**0.0677**						

3.4 Soil Nailing - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	0.1907	1.6072	1.2981	2.1300e-003		0.1033	0.1033		0.1011	0.1011						
Total	**0.1907**	**1.6072**	**1.2981**	**2.1300e-003**		**0.1033**	**0.1033**		**0.1011**	**0.1011**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	2.2300e-003	0.0299	0.0262	8.0000e-005	2.2400e-003	4.9000e-004	2.7300e-003	6.4000e-004	4.5000e-004	1.0900e-003						
Worker	7.9900e-003	0.0117	0.1217	2.6000e-004	0.0201	1.9000e-004	0.0203	5.3300e-003	1.8000e-004	5.5000e-003						
Total	**0.0102**	**0.0415**	**0.1479**	**3.4000e-004**	**0.0223**	**6.8000e-004**	**0.0230**	**5.9700e-003**	**6.3000e-004**	**6.5900e-003**						

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	0.0361	0.6320	1.4299	2.1300e-003		7.5500e-003	7.5500e-003		7.5500e-003	7.5500e-003						
Total	**0.0361**	**0.6320**	**1.4299**	**2.1300e-003**		**7.5500e-003**	**7.5500e-003**		**7.5500e-003**	**7.5500e-003**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	2.2300e-003	0.0299	0.0262	8.0000e-005	2.2400e-003	4.9000e-004	2.7300e-003	6.4000e-004	4.5000e-004	1.0900e-003						
Worker	7.9900e-003	0.0117	0.1217	2.6000e-004	0.0201	1.9000e-004	0.0203	5.3300e-003	1.8000e-004	5.5000e-003						

Total	**0.0102**	**0.0415**	**0.1479**	**3.4000e-004**	**0.0223**	**6.8000e-004**	**0.0230**	**5.9700e-003**	**6.3000e-004**	**6.5900e-003**						

3.4 Soil Nailing - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	0.1012	0.8507	0.7707	1.2800e-003		0.0534	0.0534		0.0523	0.0523						
Total	**0.1012**	**0.8507**	**0.7707**	**1.2800e-003**		**0.0534**	**0.0534**		**0.0523**	**0.0523**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	1.2300e-003	0.0162	0.0148	5.0000e-005	1.3400e-003	2.6000e-004	1.6000e-003	3.8000e-004	2.4000e-004	6.2000e-004						
Worker	4.2800e-003	6.3200e-003	0.0658	1.5000e-004	0.0120	1.1000e-004	0.0121	3.1900e-003	1.0000e-004	3.2900e-003						
Total	**5.5100e-003**	**0.0225**	**0.0805**	**2.0000e-004**	**0.0133**	**3.7000e-004**	**0.0137**	**3.5700e-003**	**3.4000e-004**	**3.9100e-003**						

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	0.0216	0.3781	0.8556	1.2800e-003		4.5200e-003	4.5200e-003		4.5200e-003	4.5200e-003						

Total	**0.0216**	**0.3781**	**0.8556**	**1.2800e-003**		**4.5200e-003**	**4.5200e-003**		**4.5200e-003**	**4.5200e-003**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	1.2300e-003	0.0162	0.0148	5.0000e-005	1.3400e-003	2.6000e-004	1.6000e-003	3.8000e-004	2.4000e-004	6.2000e-004						
Worker	4.2800e-003	6.3200e-003	0.0658	1.5000e-004	0.0120	1.1000e-004	0.0121	3.1900e-003	1.0000e-004	3.2900e-003						
Total	**5.5100e-003**	**0.0225**	**0.0805**	**2.0000e-004**	**0.0133**	**3.7000e-004**	**0.0137**	**3.5700e-003**	**3.4000e-004**	**3.9100e-003**						

3.5 Shotcrete - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	0.1299	0.9041	0.7139	1.1800e-003		0.0693	0.0693		0.0693	0.0693						
Total	**0.1299**	**0.9041**	**0.7139**	**1.1800e-003**		**0.0693**	**0.0693**		**0.0693**	**0.0693**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															

Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	3.4100e-003	0.0457	0.0401	1.2000e-004	3.4300e-003	7.5000e-004	4.1800e-003	9.8000e-004	6.9000e-004	1.6700e-003						
Worker	7.3400e-003	0.0107	0.1117	2.3000e-004	0.0184	1.8000e-004	0.0186	4.8900e-003	1.6000e-004	5.0500e-003						
Total	**0.0108**	**0.0564**	**0.1518**	**3.5000e-004**	**0.0218**	**9.3000e-004**	**0.0228**	**5.8700e-003**	**8.5000e-004**	**6.7200e-003**						

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	0.0236	0.5391	0.7280	1.1800e-003		5.6700e-003	5.6700e-003		5.6700e-003	5.6700e-003						
Total	**0.0236**	**0.5391**	**0.7280**	**1.1800e-003**		**5.6700e-003**	**5.6700e-003**		**5.6700e-003**	**5.6700e-003**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	3.4100e-003	0.0457	0.0401	1.2000e-004	3.4300e-003	7.5000e-004	4.1800e-003	9.8000e-004	6.9000e-004	1.6700e-003						
Worker	7.3400e-003	0.0107	0.1117	2.3000e-004	0.0184	1.8000e-004	0.0186	4.8900e-003	1.6000e-004	5.0500e-003						
Total	**0.0108**	**0.0564**	**0.1518**	**3.5000e-004**	**0.0218**	**9.3000e-004**	**0.0228**	**5.8700e-003**	**8.5000e-004**	**6.7200e-003**						

3.5 Shotcrete - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						

Category	tons/yr																	
Off-Road	0.0865	0.6180	0.5248	8.7000e-004		0.0453	0.0453		0.0453	0.0453								
Total	**0.0865**	**0.6180**	**0.5248**	**8.7000e-004**		**0.0453**	**0.0453**		**0.0453**	**0.0453**								

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total								
Category	tons/yr																	
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000								
Vendor	2.3200e-003	0.0307	0.0280	9.0000e-005	2.5400e-003	5.0000e-004	3.0400e-003	7.2000e-004	4.6000e-004	1.1800e-003								
Worker	4.8700e-003	7.1900e-003	0.0748	1.7000e-004	0.0136	1.3000e-004	0.0138	3.6200e-003	1.2000e-004	3.7400e-003								
Total	**7.1900e-003**	**0.0379**	**0.1028**	**2.6000e-004**	**0.0162**	**6.3000e-004**	**0.0168**	**4.3400e-003**	**5.8000e-004**	**4.9200e-003**								

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total								
Category	tons/yr																	
Off-Road	0.0175	0.3995	0.5395	8.7000e-004		4.2000e-003	4.2000e-003		4.2000e-003	4.2000e-003								
Total	**0.0175**	**0.3995**	**0.5395**	**8.7000e-004**		**4.2000e-003**	**4.2000e-003**		**4.2000e-003**	**4.2000e-003**								

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	2.3200e-003	0.0307	0.0280	9.0000e-005	2.5400e-003	5.0000e-004	3.0400e-003	7.2000e-004	4.6000e-004	1.1800e-003						
Worker	4.8700e-003	7.1900e-003	0.0748	1.7000e-004	0.0136	1.3000e-004	0.0138	3.6200e-003	1.2000e-004	3.7400e-003						
Total	**7.1900e-003**	**0.0379**	**0.1028**	**2.6000e-004**	**0.0162**	**6.3000e-004**	**0.0168**	**4.3400e-003**	**5.8000e-004**	**4.9200e-003**						

3.6 Foundation/Structure - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	0.3019	3.0518	2.1526	3.6000e-003		0.1728	0.1728		0.1622	0.1622						
Total	**0.3019**	**3.0518**	**2.1526**	**3.6000e-003**		**0.1728**	**0.1728**		**0.1622**	**0.1622**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	0.0503	0.7052	0.6957	1.9000e-003	0.0431	9.6100e-003	0.0528	0.0118	8.8400e-003	0.0207						
Worker	8.5700e-003	0.0126	0.1316	3.1000e-004	0.0240	2.2000e-004	0.0242	6.3700e-003	2.0000e-004	6.5800e-003						
Total	**0.0589**	**0.7178**	**0.8273**	**2.2100e-003**	**0.0671**	**9.8300e-003**	**0.0770**	**0.0182**	**9.0400e-003**	**0.0273**						

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	0.0502	0.5022	2.3709	3.6000e-003		8.3300e-003	8.3300e-003		8.3300e-003	8.3300e-003						
Total	**0.0502**	**0.5022**	**2.3709**	**3.6000e-003**		**8.3300e-003**	**8.3300e-003**		**8.3300e-003**	**8.3300e-003**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	0.0503	0.7052	0.6957	1.9000e-003	0.0431	9.6100e-003	0.0528	0.0118	8.8400e-003	0.0207						
Worker	8.5700e-003	0.0126	0.1316	3.1000e-004	0.0240	2.2000e-004	0.0242	6.3700e-003	2.0000e-004	6.5800e-003						
Total	**0.0589**	**0.7178**	**0.8273**	**2.2100e-003**	**0.0671**	**9.8300e-003**	**0.0770**	**0.0182**	**9.0400e-003**	**0.0273**						

3.6 Foundation/Structure - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	0.2558	2.5528	2.0430	3.5400e-003		0.1421	0.1421		0.1335	0.1335						
Total	**0.2558**	**2.5528**	**2.0430**	**3.5400e-003**		**0.1421**	**0.1421**		**0.1335**	**0.1335**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	0.0483	0.6469	0.6721	1.8700e-003	0.0426	9.4700e-003	0.0520	0.0117	8.7100e-003	0.0204						
Worker	7.5800e-003	0.0113	0.1175	3.0000e-004	0.0237	2.1000e-004	0.0239	6.2900e-003	2.0000e-004	6.4800e-003						
Total	**0.0559**	**0.6583**	**0.7897**	**2.1700e-003**	**0.0662**	**9.6800e-003**	**0.0759**	**0.0180**	**8.9100e-003**	**0.0269**						

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	0.0495	0.4953	2.3384	3.5400e-003		8.2200e-003	8.2200e-003		8.2200e-003	8.2200e-003						
Total	**0.0495**	**0.4953**	**2.3384**	**3.5400e-003**		**8.2200e-003**	**8.2200e-003**		**8.2200e-003**	**8.2200e-003**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	0.0483	0.6469	0.6721	1.8700e-003	0.0426	9.4700e-003	0.0520	0.0117	8.7100e-003	0.0204						
Worker	7.5800e-003	0.0113	0.1175	3.0000e-004	0.0237	2.1000e-004	0.0239	6.2900e-003	2.0000e-004	6.4800e-003						

Total	**0.0559**	**0.6583**	**0.7897**	**2.1700e-003**	**0.0662**	**9.6800e-003**	**0.0759**	**0.0180**	**8.9100e-003**	**0.0269**						

3.7 Tower/Ramp - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Worker					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Total					**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Worker					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Total					**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**						

3.7 Tower/Ramp - 2018

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															

Hauling					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Worker					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Total					**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Worker					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Total					**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**						

3.8 Bridge - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	0.0229	0.2736	0.1012	2.3000e-004		0.0118	0.0118		0.0109	0.0109						
Total	**0.0229**	**0.2736**	**0.1012**	**2.3000e-004**		**0.0118**	**0.0118**		**0.0109**	**0.0109**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						

Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	6.3000e-004	6.2800e-003	8.8500e-003	2.0000e-005	5.0000e-004	9.0000e-005	6.0000e-004	1.4000e-004	9.0000e-005	2.3000e-004						
Worker	4.3200e-003	6.4400e-003	0.0669	1.7000e-004	0.0135	1.2000e-004	0.0136	3.5800e-003	1.1000e-004	3.6900e-003						
Total	**4.9500e-003**	**0.0127**	**0.0758**	**1.9000e-004**	**0.0140**	**2.1000e-004**	**0.0142**	**3.7200e-003**	**2.0000e-004**	**3.9200e-003**						

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	0.0229	0.2736	0.1012	2.3000e-004		0.0118	0.0118		0.0109	0.0109						
Total	**0.0229**	**0.2736**	**0.1012**	**2.3000e-004**		**0.0118**	**0.0118**		**0.0109**	**0.0109**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	6.3000e-004	6.2800e-003	8.8500e-003	2.0000e-005	5.0000e-004	9.0000e-005	6.0000e-004	1.4000e-004	9.0000e-005	2.3000e-004						
Worker	4.3200e-003	6.4400e-003	0.0669	1.7000e-004	0.0135	1.2000e-004	0.0136	3.5800e-003	1.1000e-004	3.6900e-003						
Total	**4.9500e-003**	**0.0127**	**0.0758**	**1.9000e-004**	**0.0140**	**2.1000e-004**	**0.0142**	**3.7200e-003**	**2.0000e-004**	**3.9200e-003**						

3.9 Streetwork - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	0.0249	0.2763	0.1795	2.8000e-004		0.0133	0.0133		0.0122	0.0122						
Paving	0.0000					0.0000	0.0000		0.0000	0.0000						
Total	**0.0249**	**0.2763**	**0.1795**	**2.8000e-004**		**0.0133**	**0.0133**		**0.0122**	**0.0122**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	1.5000e-004	1.5300e-003	2.1600e-003	0.0000	1.2000e-004	2.0000e-005	1.5000e-004	4.0000e-005	2.0000e-005	6.0000e-005						
Worker	1.0500e-003	1.5700e-003	0.0163	4.0000e-005	3.2900e-003	3.0000e-005	3.3200e-003	8.7000e-004	3.0000e-005	9.0000e-004						
Total	**1.2000e-003**	**3.1000e-003**	**0.0185**	**4.0000e-005**	**3.4100e-003**	**5.0000e-005**	**3.4700e-003**	**9.1000e-004**	**5.0000e-005**	**9.6000e-004**						

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	7.9100e-003	0.0649	0.1602	2.8000e-004		3.4400e-003	3.4400e-003		3.2000e-003	3.2000e-003						
Paving	0.0000					0.0000	0.0000		0.0000	0.0000						
Total	**7.9100e-003**	**0.0649**	**0.1602**	**2.8000e-004**		**3.4400e-003**	**3.4400e-003**		**3.2000e-003**	**3.2000e-003**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	1.5000e-004	1.5300e-003	2.1600e-003	0.0000	1.2000e-004	2.0000e-005	1.5000e-004	4.0000e-005	2.0000e-005	6.0000e-005						
Worker	1.0500e-003	1.5700e-003	0.0163	4.0000e-005	3.2900e-003	3.0000e-005	3.3200e-003	8.7000e-004	3.0000e-005	9.0000e-004						
Total	**1.2000e-003**	**3.1000e-003**	**0.0185**	**4.0000e-005**	**3.4100e-003**	**5.0000e-005**	**3.4700e-003**	**9.1000e-004**	**5.0000e-005**	**9.6000e-004**						

3.10 Sitework - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	0.0365	0.4136	0.2631	6.8000e-004		0.0184	0.0184		0.0169	0.0169						
Total	**0.0365**	**0.4136**	**0.2631**	**6.8000e-004**		**0.0184**	**0.0184**		**0.0169**	**0.0169**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	7.6000e-004	7.5800e-003	0.0107	2.0000e-005	6.1000e-004	1.1000e-004	7.2000e-004	1.7000e-004	1.0000e-004	2.8000e-004						
Worker	5.2100e-003	7.7800e-003	0.0808	2.1000e-004	0.0163	1.5000e-004	0.0164	4.3200e-003	1.3000e-004	4.4600e-003						
Total	**5.9700e-003**	**0.0154**	**0.0915**	**2.3000e-004**	**0.0169**	**2.6000e-004**	**0.0171**	**4.4900e-003**	**2.3000e-004**	**4.7400e-003**						

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	8.3900e-003	0.0364	0.3484	6.8000e-004		1.1200e-003	1.1200e-003		1.1200e-003	1.1200e-003						
Total	**8.3900e-003**	**0.0364**	**0.3484**	**6.8000e-004**		**1.1200e-003**	**1.1200e-003**		**1.1200e-003**	**1.1200e-003**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	7.6000e-004	7.5800e-003	0.0107	2.0000e-005	6.1000e-004	1.1000e-004	7.2000e-004	1.7000e-004	1.0000e-004	2.8000e-004						
Worker	5.2100e-003	7.7800e-003	0.0808	2.1000e-004	0.0163	1.5000e-004	0.0164	4.3200e-003	1.3000e-004	4.4600e-003						
Total	**5.9700e-003**	**0.0154**	**0.0915**	**2.3000e-004**	**0.0169**	**2.6000e-004**	**0.0171**	**4.4900e-003**	**2.3000e-004**	**4.7400e-003**						

3.10 Sitework - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	0.0221	0.2430	0.1702	4.5000e-004		0.0106	0.0106		9.7400e-003	9.7400e-003						
Total	**0.0221**	**0.2430**	**0.1702**	**4.5000e-004**		**0.0106**	**0.0106**		**9.7400e-003**	**9.7400e-003**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	4.8000e-004	4.6600e-003	6.8900e-003	1.0000e-005	4.1000e-004	7.0000e-005	4.8000e-004	1.2000e-004	7.0000e-005	1.8000e-004						
Worker	3.1900e-003	4.7600e-003	0.0494	1.4000e-004	0.0109	9.0000e-005	0.0109	2.8800e-003	9.0000e-005	2.9700e-003						
Total	**3.6700e-003**	**9.4200e-003**	**0.0562**	**1.5000e-004**	**0.0113**	**1.6000e-004**	**0.0114**	**3.0000e-003**	**1.6000e-004**	**3.1500e-003**						

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Off-Road	5.5900e-003	0.0242	0.2323	4.5000e-004		7.5000e-004	7.5000e-004		7.5000e-004	7.5000e-004						
Total	**5.5900e-003**	**0.0242**	**0.2323**	**4.5000e-004**		**7.5000e-004**	**7.5000e-004**		**7.5000e-004**	**7.5000e-004**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total						
Category	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Vendor	4.8000e-004	4.6600e-003	6.8900e-003	1.0000e-005	4.1000e-004	7.0000e-005	4.8000e-004	1.2000e-004	7.0000e-005	1.8000e-004						
Worker	3.1900e-003	4.7600e-003	0.0494	1.4000e-004	0.0109	9.0000e-005	0.0109	2.8800e-003	9.0000e-005	2.9700e-003						

Total	**3.6700e-003**	**9.4200e-003**	**0.0562**	**1.5000e-004**	**0.0113**	**1.6000e-004**	**0.0114**	**3.0000e-003**	**1.6000e-004**	**3.1500e-003**						