REDLANDS PASSENGER RAIL PROJECT
Air Quality and Greenhouse Gas Technical Addendum

Cities of San Bernardino, Loma Linda, Redlands
San Bernardino County, California

DRAFT

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Acronyms

$\mu g/m^3$	micrograms per cubic meter
AAQS	ambient air quality standards
AB	Assembly Bill
ACMs	asbestos-containing materials
ADT	average daily trips
APE	area of potential effects
AQMPs	air quality management plans
ARB	California Air Resources Board
BACT	Best Available Control Technology
BNSF	Burlington Northern Santa Fe
CAA	Clean Air Act
CAAQS	California ambient air quality standards
CAFE	Corporate Average Fuel Economy
Cal/EPA	California Environmental Protection Agency
CAPCOA	California Air Pollution Control Officers Association
CCAA	California Clean Air Act
CEQ	Council on Environmental Quality
CH_4	methane
City	City of San Bernardino
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO_2 equivalents
CPUC	California Public Utilities Commission
cy	cubic yards
Depot	San Bernardino Metrolink Station/Santa Fe Depot
DPM	Diesel Particulate Matter
EPA	U.S. Environmental Protection Agency
FHWA	Federal Highway Administration
FR	Federal Register
FTA	Federal Transit Administration
FTIP	Federal Transportation Improvement Program
g/bhp-hr	grams per brake-horsepower-hour
g/gallon	grams per gallon
GHG	greenhouse gas
GVWR	gross vehicle weight rating
H_2S	hydrogen sulfide
HAP	hazardous air pollutants
HC	hydrocarbons

HFCs	hydroflourocarbons
HHDT	heavy-heavy duty trucks
HI	hazard index
HRA	Health Risk Assessment
IEMF	Inland Empire Maintenance Facility
IRIS	Integrated Risk Information System
LOS	level of service
LST	Localized Significance Threshold
MATES III	Multiple Air Toxics Exposure Study III
mg/m^3	milligrams per cubic meter
MICR	maximum individual cancer risk
MP	mile post
mph	miles per hour
MPO	metropolitan planning organization
MSAT	mobile source air toxics
MMT	million metric tons
MT	metric tons
$MTCO_2e$	metric tons of carbon dioxide equivalent
N_2O	nitrous oxide
NAAQS	national ambient air quality standards
NATA	National Air Toxics Assessment
NGOs	nongovernmental organizations
NHTSA	National Highway Traffic Safety Administration
NO	nitric oxide
NO_2	nitrogen dioxide
O_3	ozone
ODCs	ozone-depleting compounds
OEHHA	Office of Environmental Health Hazard Assessment
Pb	lead
PFCs	perfluorocarbons
PM	particulate matter
PM10	particulate matter less than 10 microns in diameter
PM2.5	particulate matter less than 2.5 microns in diameter
ppm	parts per million
PTC	positive train control
RCSP	Redlands Corridor Strategic Plan
RCPG	Regional Comprehensive Plan and Guide
REL	reference exposure level
RfDs	reference doses

ROG	reactive organic gas
RPRP	Redlands Passenger Rail Project
RTC	Rail Traffic Controller
RTIP	Regional Transportation Improvement Program
RTP	regional transportation plan
SANBAG	San Bernardino Associated Governments
SCAB	South Coast Air Basin
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCRRA	Southern California Regional Rail Authority
SF_6	sulfur hexafluoride
SIP	State Implementation Plan
SO_2	sulfur dioxide
SO_X	sulfur oxides
SRA	Source Receptor Area
TACs	toxic air contaminants
TCMs	transportation control measures
TIP	transportation improvement program
USDOT	U.S. Department of Transportation
V/C	vehicle to capacity
VMT	vehicle miles traveled

EXECUTIVE SUMMARY

The San Bernardino Associated Governments (SANBAG) proposes the introduction of passenger rail service along the existing railroad right-of-way (ROW) owned by SANBAG from the City of San Bernardino on the west to the City of Redlands on the east, in southwestern San Bernardino County, California. The Build Alternatives and Design Options would include replacement of rail infrastructure along the easterly most 9-mile section of railroad owned by SANBAG and part of the former Atchison, Topeka and Santa Fe (ATSF) Railroad's Redlands Subdivision—commonly referred to as the "Redlands Spur."

SANBAG is evaluating the operation of a Diesel Multiple Unit (DMU) vehicle-type in addition to the use of diesel-powered locomotive as considered in the Air Quality and Greenhouse Gas Technical Memorandum (ICF 2013). The DMU operations would be identical to the current operational scenario of the Preferred Project. This Addendum for the Air Quality and Greenhouse Gas Technical Memorandum (ICF 2013) specifically evaluates the operation of a DMU vehicle option in association with the Preferred Project.

The analyses findings are as follows:

- The Preferred Project (and design options) is listed in a federally approved Federal Transportation Improvement Program (FTIP) and Regional Transportation Plan (RTP) and the design concept and scope of the proposed action have not changed from what was analyzed for air quality conformity, the Project is therefore considered a conforming transportation project.
- The DMU option would not result in violations of carbon monoxide national ambient air quality standards or California ambient air quality standards during operations. No mitigation is proposed.
- The DMU option would not result in violations of particulate matter national ambient air quality standards (PM2.5 and PM10) during operations. No mitigation is proposed.
- The DMU option would not exceed South Coast Air Quality Management District (SCAQMD) regional significance thresholds for any criteria pollutants during construction activities. No mitigation is proposed.
- The DMU option would not exceed SCAQMD regional significance thresholds for any criteria pollutants during operations. No mitigation is proposed.
- The DMU option would not exceed SCAQMD localized significance thresholds for any criteria pollutants during construction or operational activities. No mitigation is proposed.
- The DMU option would not expose nearby residents, workers, or recreationalists to increased health risks, and estimated cancer and non-cancer health risks are below SCAQMD thresholds. No mitigation is proposed.
- The DMU option would not contribute significantly to climate change, and greenhouse gas emissions would not exceed SCAQMD thresholds or the Council on Environmental Quality (CEQ) reference point. No mitigation is proposed.
- The DMU option would not result in cumulative effects on air quality. No mitigation is proposed.

1.0 INTRODUCTION

This technical addendum addresses air quality and greenhouse gas (GHG)-related impacts associated with the operation of a Diesel Multiple Unit (DMU) vehicle-type for the Redlands Passenger Rail Project (Preferred Project). The San Bernardino Associated Governments (SANBAG) proposes the introduction of passenger rail service along the existing railroad right-of-way (ROW) owned by SANBAG from the City of San Bernardino on the west to the City of Redlands on the east, in southwestern San Bernardino County, California. The Build Alternatives and Design Options would include replacement of rail infrastructure along the easterly most 9-mile section of railroad owned by SANBAG and part of the former Atchison, Topeka and Santa Fe (ATSF) Railroad's Redlands Subdivision—commonly referred to as the "Redlands Spur."

Note that engine emissions are governed by the EPA, which sets maximum emissions rates for different types of diesel equipment. Diesel locomotives are governed by the EPA's Diesel Locomotive standards, while DMUs (which are generally smaller) are governed by the EPA's NONROAD Diesel Engine standards. Otherwise, the regulatory and environmental setting for DMU option is the same as discussed in the Air Quality and Greenhouse Gas Technical Memorandum, and is thus not addressed herein.

2.0 METHODOLOGY

2.1 CRITERIA POLLUTANTS, TAC, AND GHG EMISSIONS

The DMU option only affects the train technology type and does not affect construction nor operational elements associated with the proposed project, so the analysis herein includes only quantification of criteria air pollutant and GHG emissions directly associated with the DMU. Construction and operation of the DMU option would otherwise be similar to the other train options (MP36 and F59 locomotive types) and emissions associated with other operations sources (express train operations, maintenance and layover workers, park and ride motor vehicle trips, displaced trips, and regional VMT on the roadway network) are thus only summarized herein for comparison the thresholds.

With regards to DMU option exhaust, emissions of ozone precursors (volatile organic compounds [VOC] and nitrogen oxides [NO_X]), carbon monoxide (CO), particulate matter less than 10 microns in diameter (PM10), particulate matter less than 2.5 microns in diameter (PM2.5), and sulfur oxides (SO_X) would result from DMU train diesel fuel combustion. Additionally, GHG emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) would result from DMU train diesel fuel combustion. Emissions were estimated based on the net increase in fuel consumption provided by the project engineer, which was based on 1.86 miles per gallon fuel efficiency for the DMU option (NCTD 2013)[1], Metrolink DMU train fleet by tier (as obtained from the project engineer), and default EPA emission factors by engine tier and horsepower rating (EPA 2004). Based on information from the project engineer, it was assumed that the DMUs would likely be powered by 335 kilowatt (kw) (or 449 horsepower [hp]) Tier 4 engines. The hydrocarbon emission factor was converted to a VOC emission factor using the diesel engine type VOC conversion factor of 1.053 (EPA 2010).

Criteria pollutant and GHG emissions were quantified based on fuel consumption. In order to utilize EPA emission factors, which are based on grams per horsepower-hour, train fuel (in gallons) consumed was converted into activity (in horsepower-hours). The conversion assumed that the diesel engines have a brake-specific-fuel-consumption (BSFC) of 0.05 gallons per horsepower-hour, based on a BSFC of 0.367

[1] DMU train fuel efficiency was calculated based on North County Transit District 2013 monthly hours and mileage report by dividing total miles (160,611) by gallons of fuel consumed (86,188).

pounds per horsepower-hour for the horsepower-range (300-600 horsepower range) and an average diesel fuel density of 7.1 pounds per gallon (EPA 2004). The SO_X emission factor was calculated using EPA methodology assuming a 15 ppm sulfur content, consistent with ARB and EPA requirements. CO_2, CH_4, and N_2O emissions were estimated using default emission factors for construction and mining equipment within the most recent General Reporting Protocol default emission factors (The Climate Registry 2013). Maximum daily criteria pollutant emissions were calculated based on a daily train travel distance of 481.65 miles for the DMU option (as obtained from the project engineer) and default EPA emission factors for Tier 4 NONROAD engines (300-600 horsepower range). Annual DPM and GHG emissions were calculated assuming trains operate 365 days per year. Note that all PM10 exhaust was assumed to be DPM.

2.2 TOXIC AIR CONTAMINANTS

The DMU option would result in the same number of train trips on a daily basis. However, the DMU option would result in DPM emissions of different quantities than previously analyzed in the Air Quality and Greenhouse Gas Technical Memorandum. Therefore, a human health risk assessment (HRA) was conducted to assess the risks to human health associated with the DMU option.

The HRA was conducted using the methodology described in Section 4.3.1 of the Air Quality and Greenhouse Gas Technical Memorandum (ICF 2013). The only difference is the DMU option would result in different quantities of emissions and exhaust characteristics (i.e., stack height, fuel use at idling, etc.).

DMU TAC Inventory

The TAC inventory includes emissions associated DMU train movement and idling. DPM emissions associated with train movement uses the same methodology as the analysis for identifying mass daily criteria pollutant emissions as previously discussed above in Section 2.1. With respect to train idling, DPM exhaust was estimated based on EPA horsepower-specific emission rates for NONROAD engines (EPA 2004), train idling time estimates provided by the project engineers, and train fuel use at idling based on EPA methodology. With respects to train fuel use during idling, DPM emissions were estimated by scaling EMD F59 locomotive assumed for the Preferred Project consumption at idling by the ratio of fuel economy between the F59 locomotive and DMU options. The TAC inventory assumes the DMU trains will be consistent with EPA Tier 4 emission standards.

Air Dispersion Modeling

Similar to the HRA in the Air Quality and Greenhouse Gas Technical Memorandum, the HRA for the DMU option used EPA's AERSCREEN model, which is the screening-level model for AERMOD, to model maximum worst-case 1-hour concentrations at nearby receptors based on a single emissions source that are generally slightly more conservative than the AERMOD model. Modeling inputs were similar to the other locomotives analyzed for the Preferred Project in the Air Quality and Greenhouse Gas Technical Memorandum (ICF 2013) except for the emission rate (in grams per second) and source characteristics (release height, stack diameter, exhaust temperature) that were specific to the DMU option. Similar to the analysis for the Preferred Project presented in the Air Quality and Greenhouse Gas Technical Memorandum, emissions associated with train movement were treated as an elevated area source equal to the size of a 100-meter segment of the project area. Emissions associated with train idling was treated as a point source at each location. Idling times at each location and train fuel consumption associated with movement were obtained from the project engineer.

A complete list of dispersion modeling and risk calculation inputs is provided in Attachment B of this addendum.

3.0 IMPACT DISCUSSION

Effect AQ-1: Included in a Conforming RTP and FTIP
The Preferred Project is listed as project number 20061012 within SCAGs' federally-conforming 2013 FTIP and 2012 RTP. The DMU option would not change the design concept and scope from that analyzed in the Air Quality and Greenhouse Gas Technical Memorandum. Therefore, therefore a new conformity determination is not required. Consequently, no effect is anticipated. No mitigation is required

Effect AQ-2: No Violations of Carbon Monoxide NAAQS or CAAQS
The DMU option would result in similar traffic-related effects analyzed in the Air Quality and Greenhouse Gas Technical Memorandum. Therefore, therefore a new conformity determination is not required. Consequently, no effect is anticipated. No mitigation is required.

Effect AQ-3: No Violations of PM2.5/PM10 NAAQS
The Preferred Project is an extension of diesel regional passenger rail service. The Preferred Project is considered to be a "regionally significant project " under 40 CFR 93.101. As previously indicated, the DMU option would not change the design concept and scope from that analyzed in the Air Quality and Greenhouse Gas Technical Memorandum and would not result in a significant number of diesel vehicles that would congregate at a single location. In addition, dispersion modeling conducted for the DMU option indicates that rail emissions associated with the DMU option would not exceed the PM2.5 nor the PM10 NAAQS (see Table 1). Consequently, the DMU option for the Preferred Project is not considered a POAQC for PM10/PM2.5 and the CAA and 40 CFR 93.116 requirements were met without a hot-spot analysis. Confirmation of this determination will be made during interagency consultation (IAC) with the appropriate local, state, and federal agencies and the final analysis will be identified in the final environmental document.

Table 1. Modeled PM10 and PM2.5 Concentrations at Nearby Receptors

Activity	Receptor Location (meters)	Max 1-hour Concentration ($\mu g/m^3$)	Scaled 24-hour Concentration ($\mu g/m^3$)	Scaled Annual Concentration ($\mu g/m^3$)
Train Idling	18	0.0444	0.0267	0.0044
Train Movement	25	0.0008	0.0005	0.0001
Note: The 24-hour PM10 NAAQS is 150 $\mu g/m^3$, the 24-hour PM2.5 NAAQS is 35$\mu g/m^3$, and the annual PM2.5 NAAQS is 12.0 $\mu g/m^3$. Modeled 24-hour and annual PM concentrations were estimated based on scaling maximum hourly concentrations from AERSCREEN by 0.6 and 0.1, respectively, per the AERSCREEN users guide (March 2011), as well as by the time trains are idling and moving throughout the day and year.				

Effect AQ-4: Emissions below SCAQMD Regional Significance Thresholds during Construction
The DMU option would result in similar construction-related effects as analyzed in the Air Quality and Greenhouse Gas Technical Memorandum. No new construction analysis is required. Consequently, the impact of construction-related emissions from the Preferred Project is considered less than significant and effects are not adverse. No mitigation is proposed.

Effect AQ-5: Emissions below SCAQMD Regional Significance Thresholds during Operations
Operation of the DMU option would change the magnitude of emissions associated with train activity. Emissions of VOC, NO_X, CO, SO_X, PM10, and PM2.5 for existing year (2012), opening year (2018), and

forecast year (2038) with and without project conditions were evaluated with respect to DMU train operations. Emissions associated with Express train operations maintenance and layover workers, park and ride motor vehicle trips, and regional VMT on the roadway network are shown in Air Quality and Greenhouse Gas Technical Memorandum.

Table 2 summarizes the estimated daily emissions for the existing and existing plus project scenarios, which forms the basis of the CEQA impact determination. Table 3 summarizes the estimated daily emissions for the opening year 2018 no project and with-project conditions. Table 4 summarizes the estimated daily emissions for the forecast year 2038 no project and with-project conditions. The differences in emissions between the existing and existing plus project scenarios represent emissions generated directly as a result of implementation of the Preferred Project. The differences in emissions between future year 2018 and 2038 with-project and without-project conditions are similar in that the net change in emissions represents emissions generated directly as a result of implementation of the Preferred Project, albeit with ambient growth in the region between existing and forecast years factored in the scenario totals.

As shown in Table 2, implementation of the Preferred Project would decrease emissions of all criteria air pollutants relative to existing conditions. These decreases are attributable to the removal of single-occupant-vehicle trips from the regional network and subsequent congestion relief, as well as re-distributed trips associated with the park and ride lot that would otherwise drive further without the Project. Table 3 indicates emissions would increase for all criteria air pollutants under opening year conditions, except PM10,which would show a minor decrease. Table 4 indicates emissions would increase for all criteria air pollutants under forecast year conditions, except PM10, which would show a minor decrease. However, these increases would be below SCAQMD's operational thresholds of significance under all scenarios. Therefore, emissions from all scenarios under each analysis year would be under SCAQMD thresholds. There would be no adverse effect. No mitigation is required.

Table 2. Modeled Existing and Existing Plus Project Operational Emissions

Scenario	Project Element	Pounds Per Day					
		VOC	NO_X	CO	SO_X	PM10	PM2.5
Existing	On-Road VMT	122,658.3	606,952.8	1,768,808.8	2,992.8	23,520.5	21,453.7
Existing Plus Project by Source	On-Road VMT	122,638.4	606,895.6	1,768,627.5	2,992.6	23,517.3	21,450.6
	Train Activity (DMU)	1.6	3.3	28.7	0.0	0.1	0.1
	Train Activity (Express Train)	0.1	1.8	2.3	0.0	0.0	0.0
	Layover Operations and Track Maintenance	0.2	0.1	1.0	0.0	0.0	0.4
	Park and Ride Trips (new trips)	0.1	0.4	1.5	0.0	0.2	0.1
	Park and Ride Trips (re-distributed trips)	-2.5	-8.0	-29.0	-0.1	-4.1	-1.3
Existing Plus Project Net Total	DMU w/o Express	122,637.8	606,891.4	1,768,629.7	2,992.5	23,513.5	21,449.9
	DMU w/Express	122,637.9	606,893.2	1,768,632.0	2,992.5	23,513.5	21,449.9
Existing Plus Project Net Minus Existing	DMU w/o Express	-20.5	-61.4	-179.0	-0.3	-7.1	-3.9
	DMU w/Express	-20.4	-59.7	-176.8	-0.3	-7.1	-3.8
SCAQMD Thresholds		55	55	550	150	150	55
Exceed Thresholds?		No	No	No	No	No	No

Note: Values may not add up due to rounding.
Source: ICF emissions modeling 2013, Attachment A.

Table 3. Modeled Opening Year 2018 Operational Emissions

Scenario	Project Element	Pounds Per Day					
		VOC	NO_X	CO	SO_X	PM10	PM2.5
No Project	On-Road VMT	84,629.4	369,784.7	1,154,377.6	3,500.0	20,399.0	18,859.8
With Project By Source	On-Road VMT (no Express Service)	84,634.5	369,794.7	1,154,421.8	3,500.2	20,401.0	18,861.1
	On-Road VMT (with Express Service)	84,654.9	369,808.6	1,154,470.1	3,500.5	20,403.5	18,863.7
	Train Activity (DMU)	1.6	3.3	28.7	0.0	0.1	0.1
	Train Activity (Express Train)	0.1	1.8	2.3	0.0	0.0	0.0
	Layover Operations and Track Maintenance	0.2	0.1	1.0	0.0	0.0	0.4
	Park and Ride Trips (new trips)	0.1	0.4	1.5	0.0	0.2	0.1
	Park and Ride Trips (re-distributed trips)	-2.5	-8.0	-29.0	-0.1	-4.1	-1.3
With Project Net Total	DMU w/o Express	84,633.9	369,790.4	1,154,424.0	3,500.1	20,397.2	18,860.4
	DMU w/Express	84,634.0	369,792.2	1,154,426.3	3,500.1	20,397.2	18,860.4
With Project Net Minus No Project	DMU w/o Express	4.5	5.7	46.5	0.1	-1.7	0.6
	DMU w/Express	4.6	7.5	48.7	0.1	-1.7	0.6
SCAQMD Thresholds		55	55	550	150	150	55
Exceed Thresholds?		No	No	No	No	No	No

Note: Values may not add up due to rounding.
Source: ICF emissions modeling 2013, Attachment A.

Table 4. Modeled Forecast Year 2038 Operational Emissions

Scenario	Project Element	Pounds Per Day					
		VOC	NO_X	CO	SO_X	PM10	PM2.5
No Project	On-Road VMT	69,358.1	241,575.6	830,910.1	5,327.8	24,526.0	22,598.6
With Project By Source	On-Road VMT (no Express Service)	69,370.6	241,595.2	830,972.6	5,328.1	24,529.5	22,603.5
	On-Road VMT (with Express Service)	69,361.5	241,595.1	830,983.1	5,328.9	24,530.0	22,603.0
	Train Activity (DMU)	1.6	3.3	28.7	0.0	0.1	0.1
	Train Activity (Express Train)	0.1	1.8	2.3	0.0	0.0	0.0
	Layover Operations and Track Maintenance	0.1	0.0	0.5	0.0	0.0	0.4
	Park and Ride Trips (new trips)	0.1	0.2	0.8	0.0	0.2	0.1
	Park and Ride Trips (re-distributed trips)	-1.4	-4.1	-14.5	-0.1	-4.1	-1.3
With Project Net Total	DMU w/o Express	69,371.0	241,594.7	830,988.1	5,328.0	24,525.7	22,602.8
	DMU w/Express	69,371.1	241,596.5	830,990.3	5,328.1	24,525.7	22,602.8
With Project Net Minus No Project	DMU w/o Express	12.9	19.1	78.0	0.2	-0.3	4.1
	DMU w/Express	13.0	20.8	80.3	0.2	-0.3	4.2
SCAQMD Thresholds		55	55	550	150	150	55
Exceed Thresholds?		No	No	No	No	No	No

Note: Values may not add up due to rounding.
Source: ICF emissions modeling 2013, Attachment A.

Effect AQ-6: Emissions below SCAQMD Localized Significance Thresholds during Construction and Operations

Construction of the DMU option would be similar to that analyzed in the Air Quality and Greenhouse Gas Technical Memorandum for the Preferred Project, which found no significant localized impacts associated with construction of the project.

With respects to operations, the only emissions that would occur onsite during long-term operations would be train-related fuel combustion and area source emissions generated at the layover facility (not including worker commute). Other sources of regional operational emissions (motor vehicles operating on the regional network, park and ride lot, and worker commute, specifically) are not included, per SCAQMD guidance, in the Localized Significance Threshold (LST) analysis. As shown in Table 5, localized emissions during operations would not exceed LSTs for the project area. Impacts are less than significant and not adverse and no mitigation is proposed.

Table 5. Modeled Localized Criteria Pollutant Emissions during Operations

Phase	NO_X	CO	PM10[a]	PM2.5[a]
DMU Train Activity	3.3	28.4	0.1	0.1
Layover Activity	0.1	0.0	0.0	0.0
Total On-site Emissions	3.3	28.4	0.1	0.1
Localized Significance Thresholds[b]	270	1,746	4	2
Exceed Threshold?	**No**	**No**	**No**	**No**

Notes:
Emissions calculation worksheets are included in Attachment A of this report.
[b] The project site is located in SCAQMD SRA's No 34 and No 35, and the LSTs shown are the smaller of the LSTs (SRA 34) for the two SRA's. These LSTs are based on the site location SRA, distance to nearest sensitive receptor location from the project site (25 meters), and project area that could be under operation on any given day (five acres).

Effect AQ-7: Expose Sensitive Receptors to Increased Health Risk

The Preferred Project would result in increased diesel-powered Metrolink train activity within the rail corridor. Mass construction- and train-related DPM emissions were quantified using the methodology described in Section 4.2 of the Air Quality and Greenhouse Gas Technical Memorandum. EPA's AERSCREEN dispersion model, as described in the methodology within Section 4.3.1 of the Air Quality and Greenhouse Gas Technical Memorandum, was used to estimate pollutant concentrations at nearby receptor locations due to emission associated with the DMU activity. As shown in Table 6, health risk impacts associated with the sum of short-term construction and long-term operations would be below SCAQMD thresholds for identifying health risk impacts. As such, impacts are considered less than significant and not adverse.

Table 6. Summary of Health Risk Associated with Project Construction and Operations

Project Component	Cancer Risk (in a million)	Chronic Non-Cancer Hazard Index
Train Idling	0.15	9.56 E-05
Train Movement	0.03	1.69 E-05
Project Construction *	1.05	1.53E-02
Sum	*1.23*	*0.0154*

SCAQMD Risk Thresholds	10	1.0
Exceed Risk?	No	No
* Project Construction analyzed in the Air Quality and Greenhouse Gas Technical Memorandum. Source: ICF 2013, Attachment B.		

Effect AQ-8: Significant Contribution of GHG Emissions towards Global Climate Change

Construction and operation of the DMU option would be similar to that analyzed in the Air Quality and Greenhouse Gas Technical Memorandum except for emissions associated with DMU train exhaust. The GHG analysis herein includes calculations associated with the DMU exhaust and summarizes the remainder of the operational sources (express train operations, maintenance and layover workers, park and ride motor vehicle trips, displaced trips, and regional VMT on the roadway network) as quantified within the Air Quality and Greenhouse Gas Technical Memorandum (ICF 2013).

Implementation of the DMU option would increase train activity over existing conditions. DMU operational emissions were calculated using the methodologies in Section 2.1. Annual operational emissions were summed and added to the amortized construction totals summarized in Table 5-9 of the Air Quality and Greenhouse Gas Technical Memorandum (ICF 2013).

As discussed in Section 3.5.4 of the Air Quality and Greenhouse Gas Technical Memorandum, significant and adverse effects with respects to GHG emissions are analyzed only for the cumulative forecast year 2038, as GHG effects are cumulative in nature. GHG emission associated with existing year 2012 and opening year 2018 are presented for informational purposes only.

As shown in Table 7, GHG emissions would decrease with implementation of the Preferred Project under Existing plus Project conditions when compared to Existing conditions. Thus, the Preferred Project would result in a reduction in GHG emissions over existing conditions and would thus result in a net regional benefit. As shown in Table 8, GHG emissions would increase under the 2018 Opening Year with Project conditions when compared to 2018 No Project conditions. As shown in Table 9, GHG emissions would increase with implementation of the Preferred Project during 2038 Forecast Year with Project conditions when compared to 2038 No Project conditions, primarily as a result of increased traffic speeds on the regional network.

GHG emissions under all full buildout scenarios in 2038 would increase over No Project conditions in excess of SCAQMD's adopted and drafted SCAQMD threshold levels of 3,000 MT and 10,000 MT before mitigation. Therefore, this impact is considered significant under CEQA. Further, the net change in emissions under full buildout conditions in 2038 are not in excess of the CEQ reference point of 25,000 $MTCO_2e$/yr. Consequently, there would be no adverse effect under NEPA.

Actions undertaken by the state to reduce GHG emissions (Pavley standard, Advanced Clean Car Standards, and the Low Carbon Fuel Standard) will contribute to project-level GHG reductions. These actions are described in detail in the Air Quality and Greenhouse Gas Technical Memorandum (ICF 2013). Table 10 presents annual GHG emissions with implementation of statewide measures (Pavley standard, Advanced Clean Cars, and Low Carbon Fuel Standard) to reduce mobile source GHG emissions. Statewide actions would reduce project-related emissions by approximately 17%, as motor vehicle sources (regional on-road VMT, employee commute, new park and ride trips, and re-distributed trips) comprise the vast majority of project-related emissions under both scenarios. These statewide measures do not require additional action on the part of the project applicant, but will contribute to GHG emissions reductions compared to business-as-usual conditions. As shown in Table 10, emissions would be reduced under each build alternative and design options relative to the 2038 No Project condition after accounting for statewide reductions. Therefore, emissions would be below SCAQMD's adopted and

drafted SCAQMD threshold levels of 3,000 MT and 10,000 MT when accounting for statewide measures. Consequently, impacts would be less than significant under CEQA. Further, the net change would remain below the CEQ reference point of 25,000 $MTCO_2e$/yr. Consequently, there would be no adverse effect under NEPA.

Note that similar to the other train options, the Preferred Project would improve mobility opportunities for transit-dependent populations in the City of San Bernardino to employment centers in Los Angeles and Orange counties and support local and regional planning goals of SANBAG for the development of transit corridors in the Inland Empire. Both the Preferred Project and DMU option would be consistent with statewide efforts by promoting alternative forms of transportation around existing and planned future transit-oriented development. For example, SB 375 calls on SCAG and other MPO's to integrate land use, housing, and transportation planning efforts to achieve the SB 375 regional GHG targets, consistent with the transportation goals of AB 32. The adopted 2012 RTP/SCS multimodal strategy aims to reduce per capita VMT over the next 25 years, with regional passenger rail serving as a means to achieve VMT reductions. SCAQMD has adopted and drafted numeric mass emissions thresholds as a method to close the gap between emissions reductions from land-use driven sectors that would occur at the state level (including Pavley, low carbon fuel standard, and Renewable Portfolio Standard, among others) and the emission reductions necessary from land use development projects that have a lower carbon intensity within the region, consistent with the goals of AB 32. Future year project-related emissions would be below SCAQMD numeric thresholds that were adopted to help achieve the reduction goals of AB 32. Thus, the DMU option would not conflict with AB 32.

Table 7. Modeled Existing and Existing plus Project GHG Emissions

Project Element		Metric Tons Per Year			
		CO_2	CH_4	N_2O	CO_2e
Existing	On-Road VMT	51,261,617	2,697,980		53,959,597
Existing Plus Project	On-Road VMT	51,255,671	2,697,667		53,953,338
	Train Activity (MP36)	963	0	0	972
	Train Activity (Express Train)	144	0	0	145
	Layover Operations and Track Maintenance	50	1	0	66
	New Park & Ride Lot Trips	53	3		56
	Re-Distributed Park & Ride Lot Trips	-1,013	-53		-1,067
Existing Plus Project Net Total	DMU w/o Express	51,255,725	2,697,617		53,953,365
	DMU w/Express	51,255,869	2,697,617		53,953,510
Existing Plus Project Net Minus Existing	DMU w/o Express	-5,892	-363		-6,231
	DMU w/Express	-5,748	-363		-6,087
SCAQMD Threshold		--	--		3,000/10,000
Exceed Threshold?		--	--		--

Emissions that exceed SCAQMD thresholds are shown in **bold**.
Source: ICF Emissions Modeling 2013 (Attachment A).

Table 8. Modeled Opening Year 2018 No Project and With Project GHG Emissions

Project Element		Metric Tons Per Year			
		CO_2	CH_4	N_2O	CO_2e
No Project	On-Road VMT	61,266,602	3,224,558		64,491,160
With Project By Source	On-Road VMT (no Express Service)	61,268,824	3,224,675		64,493,498
	On-Road VMT (with Express Service)	61,273,069	3,224,898		64,497,968
	Train Activity (DMU)	963	0	0	972
	Train Activity (Express Train)	144	0	0	145
	Layover Operations and Track Maintenance	50	1	0	66
	New Park & Ride Lot Trips	53	3		56
	Re-Distributed Park & Ride Lot Trips	-1,013	-53		-1,067
With Project Total	DMU w/o Express	61,268,877	3,224,625		64,493,526
	DMU w/Express	61,273,272	3,224,849		64,498,161
With Project Net Minus No Project	DMU w/o Express	2,276	67		2,366
	DMU w/Express	6,671	291		7,001
SCAQMD Threshold		--	--	--	3,000/10,000
Exceed Threshold?		--	--	--	--
Emissions that exceed SCAQMD thresholds are shown in **bold**. Source: ICF Emissions Modeling 2013 (Attachment A).					

Table 9. Modeled Forecast Year 2038 No Project and With Project GHG Emissions (Without Statewide Reductions)

Project Element		Metric Tons Per Year			
		CO_2	CH_4	N_2O	CO_2e
No Project	On-Road VMT	92,550,173	4,871,062		97,421,235
With Project By Source	On-Road VMT (no Express Service)	92,560,513	4,871,606		97,432,119
	On-Road VMT (with Express Service)	92,562,856	4,871,729		97,434,585
	Train Activity (DMU)	963	0	0	972
	Train Activity (Express Train)	144	0	0	145
	Layover Operations and Track Maintenance	50	1	0	66
	New Park & Ride Lot Trips	57	3		60
	Re-Distributed Park & Ride Lot Trips	-1,086	-57		-1,143
With Project Net Total	DMU w/o Express	92,560,498	4,871,553		97,432,074
	DMU w/Express	92,562,984	4,871,676		97,434,685

Project Element		Metric Tons Per Year			
		CO_2	CH_4	N_2O	CO_2e
With Project Net Minus No Project	DMU w/o Express	**10,325**	491		**10,839**
	DMU w/Express	**12,811**	614		**13,450**
SCAQMD Threshold		--	--	--	3,000/10,000
Exceed Threshold?		--	--	--	**Yes/Yes**
Emissions that exceed SCAQMD thresholds are shown in **bold**. Source: ICF Emissions Modeling 2013 (Attachment A).					

Table 10. Modeled Forecast Year 2038 No Project and With Project GHG Emissions (With Statewide Reductions)

Project Element		Metric Tons Per Year			
		CO_2	CH_4	N_2O	CO_2e
No Project	On-Road VMT	92,550,173	4,871,062		97,421,235
With Project By Source	On-Road VMT (no Express Service)	77,260,002	4,066,316		81,326,318
	On-Road VMT (with Express Service)	77,261,957	4,066,419		81,328,376
	Train Activity (DMU)	963	0	0	972
	Train Activity (Express Train)	144	0	0	145
	Layover Operations and Track Maintenance	37	1	0	37
	New Park & Ride Lot Trips	48	3		50
	Re-Distributed Park & Ride Lot Trips	-1,265	-67		-1,332
With Project Net Total	DMU w/o Express	77,259,790	4,066,254		81,326,068
	DMU w/Express	77,261,889	4,066,357		81,328,271
With Project Net Minus No Project	DMU w/o Express	-15,290,382	-804,807		-16,095,166
	DMU w/Express	-15,288,284	-804,704		-16,092,963
SCAQMD Threshold		--	--	--	3,000/10,000
Exceed Threshold?		--	--	--	No/No
Emissions that exceed SCAQMD thresholds are shown in **bold**. Source: ICF Emissions Modeling 2013 (Attachment A).					

3.1 CUMULATIVE IMPACTS

Similar to the Cumulative Impact analysis within the Air Quality and Greenhouse Gas Technical Memorandum, the Project is listed in a conforming RTP and FTIP, and is therefore consistent with the AQMP and SIP. Construction-related criteria pollutant emissions would be below both regional and localized SCAQMD thresholds of significance during construction. In addition, operations-related criteria pollutant emissions would be below both regional and localized SCAQMD thresholds of significance during 2018 opening year and 2038 forecast year operations. Emissions associated with construction and

operation of nearby projects listed in the EIS/EIR would potentially overlap with emissions associated with the DMU option, but would be subject to the same SCAQMD rules and regulations that reduced emissions from the Preferred Project below SCAQMD thresholds. Therefore, the option's long-term contribution to cumulative air quality impacts would be less than cumulatively considerable and effects would not be adverse.

With respect to toxic air contaminants, construction and operation of the DMU option would not expose nearby receptors to substantial pollutant concentrations and would not result in significant health risks. Further, following construction, no change in freight service is anticipated as a result of project implementation, as the DMU option does not propose any change that would conflict with freight service. Emissions from nearby projects would be subject to the same SCAQMD rules and regulations.

With respect to GHG and climate change, GHGs and climate change are exclusively cumulative impacts, and there are no non-cumulative GHG emission impacts from a climate change perspective. As such, GHGs and climate change are cumulatively considerable even though the contribution may be individually limited (SCAQMD 2008). SCAQMD methodology and thresholds are thus cumulative in nature. As discussed above, both the Preferred Project and DMU option would be below SCAQMD adopted and drafted thresholds of significance after accounting for statewide reduction measures and would be consistent with adopted plans and regulations that aim to reduce GHG emissions. Therefore, the DMU option would not contribute to a cumulatively significant impact related to air quality and GHGs and effects would not be adverse.

4.0 REFERENCES

The Climate Registry. 2013. 2013 Climate Registry Default Emission Factors. Available: <http://www.theclimateregistry.org/resources/protocols/general-reporting-protocol/>. April 2.

ICF. 2013. Redlands Passenger Rail Project Air Quality and Greenhouse Gas Technical Memorandum. May.

North County Transit District (NCTD). 2013. Sprinter Vehicle Hours / Mileage Monthly Report, June 2013.

U.S. Environmental Protection Agency (EPA). 2004. Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling--Compression-Ignition. EPA 420-P-04-009. April.

———. 2010. Conversion Factors for Hydrocarbon Emission Components. EPA 420-R-10-015. July.

Attachment A

DMU Mass Emission Calculations

RPRP OPERATIONAL EMISSIONS SUMMARY_DMU OPTION

BOLD NET equals emissions over SCAQMD thresholds

	Condition	Pounds per Day						MT/Year							
								No State Reductions				**with State Reductions**			
		ROG	NOX	CO	SO2	PM10	PM2.5	CO2	CH4	N2O	CO2e	CO2	CH4	N2O	CO2e
2011 Existing	VMT	122,658	606,953	1,768,809	2,993	23,521	21,454	51,261,617	2,697,980		53,959,597	51,261,617	2,697,980		53,959,597
Existing Plus Project	VMT	122,638	606,896	1,768,628	2,993	23,517	21,451	51,255,671	2,697,667		53,953,338	51,255,671	2,697,667		53,953,338
	Train Fuel Use (DMU)	2	3	29	0	0	0	963	0	0	972	963	0	0	972
	Train Fuel Use (Express)	0	2	2	0	0	0	144	0	0	145	144	0	0	145
	Employee Commute	0	0	1	0	0	0	44	0	0	45	44	2		47
	Layover Operations	0	0	0	0	0	0	6	1	0	21	6	1	0	21
	Park and Ride Trips new trips	0	0	2	0	0	0	53	3		56	53	3		56
	Park and Ride Trips re-distributed tr	-3	-8	-29	0	-4	-1	-1,013	-53		-1,067	-1,013	-53		-1,067
SUM	DMU w/o Express	122,638	606,891	1,768,630	2,993	23,513	21,450	51,255,725	2,697,617		53,953,365	51,255,725	2,697,619		53,953,368
	DMU w/Express	122,638	606,893	1,768,632	2,993	23,513	21,450	51,255,869	2,697,617		53,953,510	51,255,869	2,697,619		53,953,513
NET OVER EXISTING	DMU w/o Express	-20	-61	-179	-0.31	-7	-4	-5,892	-363		-6,231	-5,892	-360		-6,229
	DMU w/Express	-20	-60	-177	-0.30	-7	-4	-5,748	-363		-6,087	-5,748	-360		-6,084
2018 No Project	VMT	84,629	369,785	1,154,378	3,500	20,399	18,860	61,266,602	3,224,558		64,491,160	61,266,602	3,224,558		64,491,160
2018 With Project	VMT	84,635	369,795	1,154,422	3,500	20,401	18,861	61,268,824	3,224,675		64,493,498	61,268,824	3,224,675		64,493,498
	VMT w/ Express Service	84,655	369,809	1,154,470	3,501	20,403	18,864	61,273,069	3,224,898		64,497,968	61,273,069	3,224,898		64,497,968
	Train Fuel Use (DMU)	2	3	29	0	0	0	963	0	0	972	963	0	0	972
	Train Fuel Use (Express)	0	2	2	0	0	0	144	0	0	145	144	0	0	145
	Employee Commute	0	0	1	0	0	0	44	0		45	44	0		45
	Layover Operations	0	0	0	0	0	0	6	1	0	21	6	1	0	21
	Park and Ride Trips new trips	0	0	2	0	0	0	53	3		56	53	3		56
	Park and Ride Trips re-distributed tr	-3	-8	-29	0	-4	-1	-1,013	-53		-1,067	-1,013	-53		-1,067
SUM	DMU w/o Express	84,634	369,790	1,154,424	3,500	20,397	18,860	61,268,877	3,224,625		64,493,526	61,268,877	3,224,625		64,493,526
	DMU w/Express	84,654	369,806	1,154,475	3,500	20,400	18,863	61,273,272	3,224,849		64,498,161	61,273,272	3,224,849		64,498,161
NET OVER NO PROJECT	DMU w/o Express	4	6	46	0.06	-2	1	2,276	67		2,366	**2,276**	**67**		**2,366**
	DMU w/Express	25	21	97	0.44	1	3	6,671	291		7,001	**6,671**	**291**		**7,001**
2038 No Project	VMT	69,358	241,576	830,910	5,328	24,526	22,599	92,550,173	4,871,062		97,421,235	92,550,173	4,871,062		97,421,235
2038 With Project	VMT	69,371	241,595	830,973	5,328	24,529	22,603	92,560,513	4,871,606		97,432,119	77,260,002	4,066,316		81,326,318
	VMT w/ Express Service	69,361	241,595	830,983	5,329	24,530	22,603	92,562,856	4,871,729		97,434,585	77,261,957	4,066,419		81,328,376
	Train Fuel Use (DMU)	2	3	29	0	0	0	963	0	0	972	963	0	0	972
	Train Fuel Use (Express)	0	2	2	0	0	0	144	0	0	145	144	0	0	145
	Employee Commute	0	0	0	0	0	0	44	0	0	45	37	2		39
	Layover Operations	0	0	0	0	0	0	6	1	0	21	6	1	0	21
	Park and Ride Trips new trips	0	0	1	0	0	0	57	3		60	48	3		50
	Park and Ride Trips re-distributed tr	-1	-4	-14	0	-4	-1	-1,086	-57		-1,143	-1,265	-67		-1,332
SUM	DMU w/o Express	69,371	241,595	830,988	5,328	24,526	22,603	92,560,498	4,871,553		97,432,074	77,259,790	4,066,254		81,326,068
	DMU w/Express	69,362	241,596	831,001	5,329	24,526	22,602	92,562,984	4,871,676		97,434,685	77,261,889	4,066,357		81,328,271
NET OVER NO PROJECT	DMU w/o Express	13	19	78	0.2	-0.3	4	**10,325**	491		**10,839**	-15,290,382	-804,807		-16,095,166
	DMU w/Express	4	21	91	1.0	0.3	4	**12,811**	614		**13,450**	-15,288,284	-804,704		-16,092,963

DMU Mass Emission Calcs

Sources:

335 KW engines, same as Sprinter
http://www.mobility.siemens.com/apps/references/index.cfm?z=1&do=app.detail&referenceID=1721&lID=1

BSFC, Criteria Pollutant emission factors, and Fuel Density from EPA:
http://www.epa.gov/otaq/models/nonrdmdl/nonrdmdl2004/420p04009.pdf

HC to VOC conversion:
http://www.epa.gov/otaq/models/nonrdmdl/p03002.pdf

CO2 (Table 13.1) and CH4 and N2O (Table 13.7), for diesel construction/mining equipment:
http://www.theclimateregistry.org/downloads/2013/04/2013-Climate-Registry-Default-Emissions-Factors.pdf

Train Fuel Economy:
North County Transit District (NCTD), Sprinter Vehicle Hours / Mileage Monthly Report, June 2013 (NCTD 2013)

HP-Hr Calcs

449.2	HP engine size (335 / .07457)
0.367	BSFC, Table A2 of EPA 2004 (300-600 HP)
7.1	Density of diesel fuel (lbs/gallon), from EPA 2004 (pg 13)
0.05	BSFC conversion into gal/hp-hr

Fuel Calcs

1.8635	train mpg, based on NCTD 2013
481.65	daily distance (mi), same distance as other loco types analyzed in the existing RPRP AQ Memo
258.47	daily gallons (daily distance / mpg)

Activity (for calcs)

5,000.29	daily hp-hrs (Daily gallons / gal per hp-hr)

Conversions

335	Siemens Desiro engine size (kw)
0.7456999	kw per hp
0.0022046	g to lb
365	days per year
0.97	PM2.5 ratio
1.053	HC to VOC, Diesel
1000000	g per MT
21	
310	
10.21	co2 kg/ gallon

Emission Rates (from EPA 2004)

		grams per hp-hr								g.gallon		
		HC	NMHC + Nox	CO	Nox	PM10	PM2.5	VOC	SOX	CO2	CH4	N2O
300-600 hp range	Tier 1	1		8.5	6.9	0.4						
	Tier 2		4.8	2.6		0.15						
	Tier 3		3	2.6								
	Tier 4 T	0.14 (50%)			0.3 (50%)	0.01						
	Tier 4 F	0.14		2.6	0.3	0.01	0.0097	0.15	4.88E-05	10210	0.58	0.26

SO2 Calculation for EF's

SO2 = (BSFC * 453.6 * (1-soxcnv)) - HC) * 0.01 * soxdsl * 2 (equation 7, pg 22)

Where:

BSFC = Brake Specific Fuel Consumption	from above	
soxcnv = fraction of fuel sulfur converted to direct PM	0.02247	Page C5
HC = in-use adjusted hc emissons g/hp-hr	from above	
l = episodic weight percent of sulfur in nonroad diesel fuel	0.000015	15 ppm
	453.6	
	0.01	
	2	

Emission Calculations

	CO	NOx	PM10	PM2.5	ROG	SOX	CO2	CH4	N2O	CO2e
grams per day	13,001	1,500.09	50.00	48.50	737.14	0.24	2,638,936	149.91	67.20	
pounds per day	28.66	3.31	0.11	0.11	1.63	0.00	5,817.85	0.33	0.15	
grams per year (for DPM only)			18,251							
metric tons per year							963.21	0.05	0.02	971.96

Attachment B

DMU Health Risk Assessment

HEALTH RISK CALCULATIONS FROM TRAIN IDLING AND TRAIN MOVEMENT_DMU

Methods

DPM through inhalation pathway only
ALL PM10 exhaust from trains assumed to be DPM
Methodology based on Cancer Risk and Hazard Quotient procedures in:
Attachment 1 of CAPCOA, July 2009. Health Risk Assessments for Proposed Land Use Projects
http://www.capcoa.org/wp-content/uploads/downloads/2010/05/CAPCOA_HRA_LU_Guidelines_8-6-09.pdf
Breathing Rates,Exposure Frequency, and Exposure Duration based on:
OEHHA September 2000 Guidance "Technical Support Document for Exposure Assessment and Stochastic Analysis"
http://oehha.ca.gov/air/hot_spots/finalStoc.html

Calculation Methodology:

$$\text{Cancer Risk} = S_i * C_i * DBR * A * EF * ED / AT$$

Where:

S_i =	Cancer Potency Slope Factor for DPM	=	1.1 $(mg/kg\text{-}d)^{-1}$
C_i =	Concentration in the air of DPM	=	0.70 ug/m^3
DBR =	Daily Breathing Rate (default 80th %ile): (Residential Receptors)	=	302 L/kg-day
	(Some districts may require the use of the 95th %ile):	=	393 L/kg-day
A =	Inhalation Absorption Rate	=	1
EF =	Exposure Frequency: (Residential Receptors)	=	350 days
ED =	Exposure Duration: (Residential Receptors)	=	70 years
AT =	Averaging Time (70 years)	=	25,550 days

source: CAPCOA, HRA Guidance, July 2009, page 53 of 75

$$\text{Hazard Quotient} = C_i/REL_i$$

Where:

C_i =	Concentration in the air of substance i
REL_i =	Chronic noncancer Reference Exposure Level for substance i

For multiple substances, the Hazard Index (HI) is calculated. The HI is calculated by summing the HQs from all substances that affect the same organ system. HQs for different organ systems are not added, for example, do not sum respiratory irritation HQs with cardiovascular effects. The following equation is used to calculate the Hazard Index for the eye irritation endpoint:

source: CAPCOA, HRA Guidance, July 2009, page 75 of 75

Health Risk Calculations

TRAIN IDLING

	Risk by Station				Risk by Layover Facility		
	Tippecanoe	New York	Downtown Redlands	University of Redlands	Proposed Layover	Alternative Layover	
Nearest Receptor from Idling (meters)	18	18	18	18	40	75	
Nearest Receptor Type	Residential	Residential	Residential	Residential	Residential	Residential	
1-hr max concentration from AERSCREEN (assuming 1 g/s)	660.66291	660.66291	660.66291	660.66291	396.93577	324.25057	
Metrolink fleet average emission rate (g/s) (Tier 4)	0.000067	0.000067	0.000067	0.000067	0.000067	0.000067	(see "Emission Factor Calculation" sheet)
scaled 1-hr concentration	0.044	0.044	0.044	0.044	0.027	0.022	
1-hour --> annual conversion	0.1	0.1	0.1	0.1	0.1	0.1	
percentage of year idling at location	1.44%	1.44%	1.44%	10.76%	4.17%	4.17%	(see "AERMOD inputs for Train Idling" sheet)
Ci annual concentration (micrograms/meter3)	6.37545E-05	6.37545E-05	6.37545E-05	0.000478158	0.000111207	9.08432E-05	
Maximum Incremental Cancer Risk (per million)	0.02	0.02	0.02	0.15	0.04	0.03	
Chronic Hazard Quotient (noncancer chronic inhalation)	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	

TRAIN MOVEMENT

Max Concentration Location Near Track (meters)	25		
Nearest Receptor Type	Residential		
1-hr max concentration from AERSCREEN (assuming 1 g/s)	9272.83486		
Metrolink fleet average emission rate (g/s) (Tier 4 DMU)	2.4114E-05	(see "AERMOD inputs for Train Movement" sheet)	
scaled 1-hr concentration	0.224		
1-hour --> annual conversion	0.1		
percentage of year moving within 100m segment	0.377%		
Ci annual concentration (micrograms/meter3)	8.42778E-05	max 1-hr = 0.000842778	
Maximum Incremental Cancer Risk (per million)	0.0268		
Chronic Hazard Quotient (noncancer chronic inhalation)	0.000017		

fraction of time in segMent calc:

498.65	daily VMT	*(includes Express Train, from project engineers)*
37.6	avg speed, mph	*(from project engineers)*
0.026595745	hour per mile	
1.595744681	mins per mile	
795.7180851	minutes moving , entire project length	
14661.0874	9.11 mi project length, in meters	
100	HRA segment length, in meters	
0.006820776	HRA segment fraction total project	
5.427415194	minutes per day moving within segment	
1440	minutes per day, total	
0.377%	fraction of day/year moving	

Where:	res	comm	rec	
Si	1.1	1.1	1.1	(cancer potency for DPM, from OEHHA)
DBR	302	149	581	(Daily Breathing Rate. 302 for residential (80th %ile), 149 for workers, 581 for schools (95th %ile)
A	1	1	1	(inhalation absorption rate. Default for all)
EF	350	245	180	(Exposure Frequency, Days per Year)
ED	70	40	9	(Exposure Duration, Years)
AT	25550	25550	25550	(Averaging Time)
RELi	5	5	5	(Non Cancer Chronic Inhalation factor for DPM, from OEHHA)

HRA Emission Rates Calculation _DMU

Idling

Emission Factors obtained from: EPA Emission Factors from Locomotives - Technical Highlights. EPA-420-F-09-025. April 2009.
http://www.epa.gov/otaq/models/nonrdmdl/nonrdmdl2004/420p04009.pdf
Fuel use from: EVALUATION OF PERFORMANCE OF FPC FUEL ADDITIVE IN AN EMD F59PH LOCOMOTIVE Feb 2003.
http://fpc1.com/test_reports/public/University/Canada%20ESDC%20tests/Go%20Transit%20ESDC%20report.pdf

Fuel Consumption at Idling for F59PH: ------>	3.353	BSFC lbs/hp-hr at idle	Mean, Table 3 of EMD F59PH study
	8	bhp-hr at idle	Table 2 of EMD F59PH
	26.824	BSFC lbs/hr at idle	*= BSFC lbs/hp-hr at idle (x)bhp-hr at idle*
	7.1	lbs/gallon for diesel fuel	EPA 2004
	3.78	gallons/hr at idle for EMD F59PH locomotive	*= BSFC lbs/hr (/) lbs/gallon for diesel*
Scaling for DMU	0.62	Fuel efficiency for F59	
	1.86	Fuel efficiency for DMU	
	0.33	Scaling factor	
	1.25	Scaled gallons/hr at idle for DMU	

Conversion to grams per second (for modeling)

			source
bhp-hr to gallon conversion	20.8		EPA-420-F-09-025. April 2009
fuel use at idling	1.25	gallons per hour	
	3600	seconds per hour	
fuel use at idling	0.000347561	gallons per second	
PM emission factor	0.193	g/gallon	converted in g/gallon using 20.8 conversion factor from EPA 2009
SCALED DMU grams per second	**0.000067**	converted in g/second based on g/gallon and gallons per second fuel consumption, based on 1.25 gallon/hr fuel consumption converted into gallons/second	

Train Movement

DPM emissions taken from mass emissions modeling for train, Appendix B

Conversion to grams per second (for modeling)

g per lb	*453.59237*
hours per day	*24*
seconds per day	*86400*

	0.11	lbs/day (from mass emissions calculations)
	50.00286048	grams/day
	2.08345252	avg hourly rate
SCALED DMU grams per second	**0.00002411**	**avg per second rate**

Health Risk Assessment

AERMOD inputs for Train Idling_DMU

	input	metric	source
emissions rate	1	g/s	
source type	P		
Stack Height	4.23	m	http://w3.siemens.dk/home/dk/dk/mobility/rullende_materiel/togsaet_vogne/Documents/D
Stack Diameter	0.1	m	SJVAPCD HRA Guidance for truck idling
stack gas exity temp (K)	366		SJVAPCD HRA Guidance for truck idling
Option	1		
stack gas exit velocity	51.71	m/s	SJVAPCD HRA Guidance for truck idling
urban/rural setting?	U		
urban pop	2,015,355		http://www.aqmd.gov/smog/metdata/AERMOD_ModelingGuidance.html
min distance to ambient air	1m		default
No NO2 chem	1		
building downash?	N		
terrain heights	N		
max distance to probe	default (5000m)		
use discrete receptors?	N		
flagpole receptors	N		
min temp (K)	269.20		Average of SCAQMD Met Data for Redlands And San Bernardino
max temp (K)	315.40		Average of SCAQMD Met Data for Redlands And San Bernardino
min wind speed (m/s)	0.28		Average of SCAQMD Met Data for Redlands And San Bernardino
anemometer height (m)	8.11		Average of SCAQMD Met Data for Redlands And San Bernardino
Surface characteristics			
single user specified values:			
albedo	0.64		Average of SCAQMD Met Data for Redlands And San Bernardino
Bowen Ratio	1.0		Average of SCAQMD Met Data for Redlands And San Bernardino
surface roughness	0.408		Average of SCAQMD Met Data for Redlands And San Bernardino

Train Activity:

E St and Univ Redlands	Tipp, NY, and Dtown Redlands	
5	0.67	minutes per idle. 5 mins at ends of project. 40 seconds at middle stations.
31	31	trains per day
155	20.66666667	minutes per day of idling
1440	1440	minutes per day total
11%	1%	fraction of time idling

Proposed Layover	Alternative Layover	
		minutes of idle per train. 20 mins in the morning, 10 mins in the evening,
30	30	each train, 2 trains per day, 365 days per year
2	2	trains per day
60	60	minutes per day
21900	21900	minutes per year
525600	525600	minutes per year total
4.2%	4.2%	fraction of time idling

```
**BEE-Line Software: BEEST for Windows (Version 10.07) data input file
**  Model: AERMOD.EXE     Input File Creation Date: 7/10/2013  Time: 2:39:08 PM
** ECHO


CO STARTING
CO TITLEONE DMU HRA
CO MODELOPT CONC FLAT SCREEN
CO AVERTIME 1
CO URBANOPT 2015355.
CO POLLUTID OTHER
CO RUNORNOT RUN
CO FINISHED

SO STARTING
SO ELEVUNIT METERS
SO LOCATION SOURCE POINT 0.0 0.0 0.0
SO SRCPARAM SOURCE 1. 4.23 366. 51.71 0.1
SO URBANSRC SOURCE
SO SRCGROUP ALL
SO FINISHED

RE STARTING
RE DISCCART 1. 0.
RE DISCCART 2. 0.
RE DISCCART 3. 0.
RE DISCCART 4. 0.
RE DISCCART 5. 0.
RE DISCCART 6. 0.
RE DISCCART 7. 0.
RE DISCCART 8. 0.
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RE DISCCART 12. 0.
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RE DISCCART 14. 0.
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RE DISCCART 26. 0.
RE DISCCART 27. 0.
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RE DISCCART 28. 0.
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RE DISCCART 66. 0.
RE DISCCART 67. 0.
RE DISCCART 68. 0.
RE DISCCART 69. 0.
RE DISCCART 70. 0.
RE DISCCART 71. 0.
RE DISCCART 72. 0.
RE DISCCART 73. 0.
RE DISCCART 74. 0.
RE DISCCART 75. 0.
RE FINISHED
```

```
ME STARTING
ME SURFFILE "C:\Users\19551\Desktop\AQ models\AERSCREEN.SFC" FREE
ME PROFFILE "C:\Users\19551\Desktop\AQ models\AERSCREEN.PFL" FREE
ME SURFDATA  11111 2010 SCREEN
ME UAIRDATA  22222 2010 SCREEN
ME PROFBASE 0.0 METERS
ME FINISHED

OU STARTING
OU RECTABLE 1 FIRST
OU MAXTABLE 1 50
OU PLOTFILE 1 ALL FIRST "C:\Users\19551\Desktop\AQ models\DMU_2010_OTHER.GRF" 31
OU RANKFILE 1         10        "C:\Users\19551\Desktop\AQ models\AERSCREEN.FIL"
OU SUMMFILE "C:\Users\19551\Desktop\AQ models\DMU_2010_OTHER.SUM"
OU FILEFORM EXP
OU FINISHED


  BEE-Line AERMOD "BEEST" Version ****


  Input File - C:\Users\19551\Desktop\AQ models\DMU_2010_OTHER.DTA

 Output File - C:\Users\19551\Desktop\AQ models\DMU_2010_OTHER.LST

    Met File - C:\Users\19551\Desktop\AQ models\AERSCREEN.SFC



  *** Message Summary For AERMOD Model Setup ***

  --------- Summary of Total Messages --------

 A Total of            0 Fatal Error Message(s)
 A Total of            1 Warning Message(s)
 A Total of            0 Informational Message(s)


    ******** FATAL ERROR MESSAGES ********
               ***  NONE  ***


    ********   WARNING MESSAGES   ********
 SO W320      18  PPARM:Input Parameter May Be Out-of-Range for Parameter           VS

 ************************************
 *** SETUP Finishes Successfully ***
 ************************************
```

```
**MODELOPTs:  NonDFAULT CONC                                  FLAT                                  NOCHKD
    SCREEN

                                        ***     MODEL SETUP OPTIONS SUMMARY       ***
- - - -
```

```
         NOTE: Option for EXPonential format used in formatted output result files (FILEFORM Keyword)

**NOTE:  The Following Flags May Appear Following CONC Values:  c for Calm Hours
                                                                m for Missing Hours
                                                                b for Both Calm and Missing Hours

**Misc. Inputs:  Base Elev. for Pot. Temp. Profile (m MSL) =     0.00 ;  Decay Coef. =    0.000     ;  Rot. Angle =     0.0
                 Emission Units = GRAMS/SEC                                ;  Emission Rate Unit Factor =   0.10000E+07
                 Output Units   = MICROGRAMS/M**3

**Approximate Storage Requirements of Model =      3.5 MB of RAM.

**Input Runstream File:          DMU_2010_OTHER.DTA
**Output Print File:             DMU_2010_OTHER.LST

**File for Summary of Results:   C:\Users\19551\Desktop\AQ models\DMU_2010_OTHER.SUM
```

**MODELOPTs: NonDFAULT CONC FLAT NOCHKD
SCREEN

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR	EMIS RATE SCALAR VARY BY
SOURCE	0	0.10000E+01	0.0	0.0	0.0	4.23	366.00	51.71	0.10	NO	YES	NO	

**MODELOPTs: NonDFAULT CONC FLAT NOCHKD
SCREEN

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
ALL	SOURCE ,

**MODELOPTs: NonDFAULT CONC FLAT NOCHKD
SCREEN

*** DISCRETE CARTESIAN RECEPTORS ***
(X-COORD, Y-COORD, ZELEV, ZHILL, ZFLAG)
(METERS)

(1.0,	0.0,	0.0,	0.0,	0.0);	(2.0,	0.0,	0.0,	0.0,	0.0);
(3.0,	0.0,	0.0,	0.0,	0.0);	(4.0,	0.0,	0.0,	0.0,	0.0);
(5.0,	0.0,	0.0,	0.0,	0.0);	(6.0,	0.0,	0.0,	0.0,	0.0);
(7.0,	0.0,	0.0,	0.0,	0.0);	(8.0,	0.0,	0.0,	0.0,	0.0);
(9.0,	0.0,	0.0,	0.0,	0.0);	(10.0,	0.0,	0.0,	0.0,	0.0);
(11.0,	0.0,	0.0,	0.0,	0.0);	(12.0,	0.0,	0.0,	0.0,	0.0);
(13.0,	0.0,	0.0,	0.0,	0.0);	(14.0,	0.0,	0.0,	0.0,	0.0);
(15.0,	0.0,	0.0,	0.0,	0.0);	(16.0,	0.0,	0.0,	0.0,	0.0);
(17.0,	0.0,	0.0,	0.0,	0.0);	(18.0,	0.0,	0.0,	0.0,	0.0);
(19.0,	0.0,	0.0,	0.0,	0.0);	(20.0,	0.0,	0.0,	0.0,	0.0);
(21.0,	0.0,	0.0,	0.0,	0.0);	(22.0,	0.0,	0.0,	0.0,	0.0);
(23.0,	0.0,	0.0,	0.0,	0.0);	(24.0,	0.0,	0.0,	0.0,	0.0);
(25.0,	0.0,	0.0,	0.0,	0.0);	(26.0,	0.0,	0.0,	0.0,	0.0);
(27.0,	0.0,	0.0,	0.0,	0.0);	(28.0,	0.0,	0.0,	0.0,	0.0);
(29.0,	0.0,	0.0,	0.0,	0.0);	(30.0,	0.0,	0.0,	0.0,	0.0);
(31.0,	0.0,	0.0,	0.0,	0.0);	(32.0,	0.0,	0.0,	0.0,	0.0);
(33.0,	0.0,	0.0,	0.0,	0.0);	(34.0,	0.0,	0.0,	0.0,	0.0);
(35.0,	0.0,	0.0,	0.0,	0.0);	(36.0,	0.0,	0.0,	0.0,	0.0);
(37.0,	0.0,	0.0,	0.0,	0.0);	(38.0,	0.0,	0.0,	0.0,	0.0);
(39.0,	0.0,	0.0,	0.0,	0.0);	(40.0,	0.0,	0.0,	0.0,	0.0);
(41.0,	0.0,	0.0,	0.0,	0.0);	(42.0,	0.0,	0.0,	0.0,	0.0);
(43.0,	0.0,	0.0,	0.0,	0.0);	(44.0,	0.0,	0.0,	0.0,	0.0);
(45.0,	0.0,	0.0,	0.0,	0.0);	(46.0,	0.0,	0.0,	0.0,	0.0);
(47.0,	0.0,	0.0,	0.0,	0.0);	(48.0,	0.0,	0.0,	0.0,	0.0);
(49.0,	0.0,	0.0,	0.0,	0.0);	(50.0,	0.0,	0.0,	0.0,	0.0);
(51.0,	0.0,	0.0,	0.0,	0.0);	(52.0,	0.0,	0.0,	0.0,	0.0);
(53.0,	0.0,	0.0,	0.0,	0.0);	(54.0,	0.0,	0.0,	0.0,	0.0);
(55.0,	0.0,	0.0,	0.0,	0.0);	(56.0,	0.0,	0.0,	0.0,	0.0);
(57.0,	0.0,	0.0,	0.0,	0.0);	(58.0,	0.0,	0.0,	0.0,	0.0);
(59.0,	0.0,	0.0,	0.0,	0.0);	(60.0,	0.0,	0.0,	0.0,	0.0);
(61.0,	0.0,	0.0,	0.0,	0.0);	(62.0,	0.0,	0.0,	0.0,	0.0);
(63.0,	0.0,	0.0,	0.0,	0.0);	(64.0,	0.0,	0.0,	0.0,	0.0);
(65.0,	0.0,	0.0,	0.0,	0.0);	(66.0,	0.0,	0.0,	0.0,	0.0);
(67.0,	0.0,	0.0,	0.0,	0.0);	(68.0,	0.0,	0.0,	0.0,	0.0);
(69.0,	0.0,	0.0,	0.0,	0.0);	(70.0,	0.0,	0.0,	0.0,	0.0);
(71.0,	0.0,	0.0,	0.0,	0.0);	(72.0,	0.0,	0.0,	0.0,	0.0);
(73.0,	0.0,	0.0,	0.0,	0.0);	(74.0,	0.0,	0.0,	0.0,	0.0);
(75.0,	0.0,	0.0,	0.0,	0.0);					

**MODELOPTs: NonDFAULT CONC FLAT NOCHKD
SCREEN

*** METEOROLOGICAL DAYS SELECTED FOR PROCESSING ***
(1=YES; 0=NO)

```
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1
```

NOTE: METEOROLOGICAL DATA ACTUALLY PROCESSED WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.

*** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

**MODELOPTs: NonDFAULT CONC FLAT NOCHKD
SCREEN

*** UP TO THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

Surface file: AERSCREEN.SFC Met Version: SCREEN
Profile file: AERSCREEN.PFL
Surface format: FREE
Profile format: FREE
Surface station no.: 11111 Upper air station no.: 22222
Name: SCREEN Name: SCREEN
Year: 2010 Year: 2010

First 24 hours of scalar data

YR	MO	DY	JDY	HR	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS	WD	HT	REF TA	HT
10	01	01	1	01	-0.3	0.019	-9.000	0.020	-999.	6.	1.9	0.41	1.00	0.64	0.28	270.	8.1	269.2	2.0
10	01	02	2	01	-0.3	0.019	-9.000	0.020	-999.	29.	1.9	0.41	1.00	0.64	0.28	270.	8.1	269.2	2.0
10	01	03	3	01	-0.3	0.019	-9.000	0.020	-999.	59.	1.9	0.41	1.00	0.64	0.28	270.	8.1	269.2	2.0
10	01	04	4	01	-0.3	0.019	-9.000	0.020	-999.	6.	2.1	0.41	1.00	0.64	0.28	270.	8.1	269.2	2.0
10	01	05	5	01	-0.3	0.019	-9.000	0.020	-999.	29.	2.1	0.41	1.00	0.64	0.28	270.	8.1	269.2	2.0
10	01	06	6	01	-0.3	0.019	-9.000	0.020	-999.	59.	2.1	0.41	1.00	0.64	0.28	270.	8.1	269.2	2.0
10	01	07	7	01	-0.1	0.019	-9.000	0.020	-999.	6.	6.1	0.41	1.00	0.64	0.28	270.	8.1	269.2	2.0
10	01	08	8	01	-0.1	0.019	-9.000	0.020	-999.	29.	6.1	0.41	1.00	0.64	0.28	270.	8.1	269.2	2.0
10	01	09	9	01	-0.1	0.019	-9.000	0.020	-999.	59.	6.1	0.41	1.00	0.64	0.28	270.	8.1	269.2	2.0
10	01	10	10	01	-0.3	0.019	-9.000	0.020	-999.	6.	2.1	0.41	1.00	0.64	0.28	270.	8.1	315.4	2.0
10	01	11	11	01	-0.3	0.019	-9.000	0.020	-999.	29.	2.1	0.41	1.00	0.64	0.28	270.	8.1	315.4	2.0
10	01	12	12	01	-0.3	0.019	-9.000	0.020	-999.	59.	2.1	0.41	1.00	0.64	0.28	270.	8.1	315.4	2.0
10	01	13	13	01	-0.3	0.019	-9.000	0.020	-999.	6.	2.3	0.41	1.00	0.64	0.28	270.	8.1	315.4	2.0
10	01	14	14	01	-0.3	0.019	-9.000	0.020	-999.	29.	2.3	0.41	1.00	0.64	0.28	270.	8.1	315.4	2.0
10	01	15	15	01	-0.3	0.019	-9.000	0.020	-999.	59.	2.3	0.41	1.00	0.64	0.28	270.	8.1	315.4	2.0
10	01	16	16	01	-0.1	0.019	-9.000	0.020	-999.	6.	6.6	0.41	1.00	0.64	0.28	270.	8.1	315.4	2.0
10	01	17	17	01	-0.1	0.019	-9.000	0.020	-999.	29.	6.6	0.41	1.00	0.64	0.28	270.	8.1	315.4	2.0
10	01	18	18	01	-0.1	0.019	-9.000	0.020	-999.	59.	6.6	0.41	1.00	0.64	0.28	270.	8.1	315.4	2.0
10	01	19	19	01	-0.2	0.019	-9.000	0.020	-999.	6.	2.7	0.41	1.00	0.64	0.28	270.	8.1	269.2	2.0
10	01	20	20	01	-0.2	0.019	-9.000	0.020	-999.	29.	2.7	0.41	1.00	0.64	0.28	270.	8.1	269.2	2.0
10	01	21	21	01	-0.2	0.019	-9.000	0.020	-999.	59.	2.7	0.41	1.00	0.64	0.28	270.	8.1	269.2	2.0
10	01	22	22	01	-0.2	0.019	-9.000	0.020	-999.	6.	2.9	0.41	1.00	0.64	0.28	270.	8.1	269.2	2.0
10	01	23	23	01	-0.2	0.019	-9.000	0.020	-999.	29.	2.9	0.41	1.00	0.64	0.28	270.	8.1	269.2	2.0
10	01	24	24	01	-0.2	0.019	-9.000	0.020	-999.	59.	2.9	0.41	1.00	0.64	0.28	270.	8.1	269.2	2.0

First hour of profile data

YR	MO	DY	HR	HEIGHT	F	WDIR	WSPD	AMB_TMP	sigmaA	sigmaW	sigmaV
10	01	01	01	8.1	1	270.	0.28	269.2	99.0	-99.00	-99.00

F indicates top of profile (=1) or below (=0)

**MODELOPTs: NonDFAULT CONC FLAT NOCHKD
SCREEN

*** THE 1ST HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): SOURCE ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF OTHER IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
1.00	0.00	1.35599	(10012812)	2.00	0.00	17.91630	(10012812)
3.00	0.00	72.82320	(10012812)	4.00	0.00	169.01750	(10012812)
5.00	0.00	284.24985	(10012812)	6.00	0.00	392.41211	(10012812)
7.00	0.00	478.11426	(10012812)	8.00	0.00	537.34993	(10012812)
9.00	0.00	572.54391	(10012812)	10.00	0.00	588.55055	(10012812)
11.00	0.00	590.42847	(10012812)	12.00	0.00	583.89865	(10012812)
13.00	0.00	574.09066	(10012812)	14.00	0.00	578.75922	(10061301)
15.00	0.00	616.93208	(10060701)	16.00	0.00	643.12573	(10060701)
17.00	0.00	656.84738	(10060701)	18.00	0.00	660.66291	(10060701)
19.00	0.00	656.86375	(10060701)	20.00	0.00	647.38167	(10060701)
21.00	0.00	635.96464	(10052601)	22.00	0.00	630.98838	(10052601)
23.00	0.00	622.36767	(10052601)	24.00	0.00	611.01484	(10052601)
25.00	0.00	597.67090	(10052601)	26.00	0.00	582.92993	(10052601)
27.00	0.00	567.26304	(10052601)	28.00	0.00	551.04017	(10052601)
29.00	0.00	534.54902	(10052601)	30.00	0.00	518.01103	(10052601)
31.00	0.00	501.59469	(10052601)	32.00	0.00	485.42633	(10052601)
33.00	0.00	469.59892	(10052601)	34.00	0.00	454.17918	(10052601)
35.00	0.00	439.21325	(10052601)	36.00	0.00	424.73117	(10052601)
37.00	0.00	410.75054	(10052601)	38.00	0.00	404.38034	(10052001)
39.00	0.00	400.88399	(10052001)	40.00	0.00	396.93577	(10052001)
41.00	0.00	392.61096	(10052001)	42.00	0.00	387.97570	(10052001)
43.00	0.00	383.08792	(10052001)	44.00	0.00	380.56142	(10051501)
45.00	0.00	377.72057	(10051501)	46.00	0.00	374.57991	(10051501)
47.00	0.00	371.18284	(10051501)	48.00	0.00	367.56816	(10051501)
49.00	0.00	369.60887	(10050201)	50.00	0.00	370.99056	(10050201)
51.00	0.00	371.42501	(10050201)	52.00	0.00	371.50837	(10050201)
53.00	0.00	371.26800	(10050201)	54.00	0.00	370.73176	(10050201)
55.00	0.00	369.92563	(10050201)	56.00	0.00	368.87385	(10050201)
57.00	0.00	367.59896	(10050201)	58.00	0.00	366.12189	(10050201)
59.00	0.00	364.46207	(10050201)	60.00	0.00	362.63745	(10050201)
61.00	0.00	360.66468	(10050201)	62.00	0.00	358.55911	(10050201)
63.00	0.00	356.33491	(10050201)	64.00	0.00	354.00517	(10050201)
65.00	0.00	351.58191	(10050201)	66.00	0.00	349.07622	(10050201)
67.00	0.00	346.49829	(10050201)	68.00	0.00	343.85749	(10050201)
69.00	0.00	341.16241	(10050201)	70.00	0.00	338.42095	(10050201)

71.00	0.00	335.64032	(10050201)	72.00	0.00	332.82717	(10050201)
73.00	0.00	329.98754	(10050201)	74.00	0.00	327.12699	(10050201)
75.00	0.00	324.25057	(10050201)				

**MODELOPTs: NonDFAULT CONC FLAT NOCHKD
SCREEN

*** THE MAXIMUM 50 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): SOURCE ,

** CONC OF OTHER IN MICROGRAMS/M**3 **

RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR)		OF TYPE	RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR)		OF TYPE
1.	660.66291	(10060701)	AT (	18.00,	0.00)	DC	26.	630.98838	(10052601)	AT (	22.00,	0.00)	DC
2.	660.66291	(10060801)	AT (	18.00,	0.00)	DC	27.	630.82772	(10052701)	AT (	19.00,	0.00)	DC
3.	660.66291	(10060901)	AT (	18.00,	0.00)	DC	28.	630.36150	(10052601)	AT (	19.00,	0.00)	DC
4.	656.86375	(10060701)	AT (	19.00,	0.00)	DC	29.	629.81067	(10060101)	AT (	19.00,	0.00)	DC
5.	656.86375	(10060801)	AT (	19.00,	0.00)	DC	30.	629.81067	(10060201)	AT (	19.00,	0.00)	DC
6.	656.86375	(10060901)	AT (	19.00,	0.00)	DC	31.	629.81067	(10060301)	AT (	19.00,	0.00)	DC
7.	656.84738	(10060701)	AT (	17.00,	0.00)	DC	32.	627.64228	(10052701)	AT (	22.00,	0.00)	DC
8.	656.84738	(10060801)	AT (	17.00,	0.00)	DC	33.	627.16390	(10052801)	AT (	19.00,	0.00)	DC
9.	656.84738	(10060901)	AT (	17.00,	0.00)	DC	34.	626.96065	(10060101)	AT (	21.00,	0.00)	DC
10.	647.38167	(10060701)	AT (	20.00,	0.00)	DC	35.	626.96065	(10060201)	AT (	21.00,	0.00)	DC
11.	647.38167	(10060801)	AT (	20.00,	0.00)	DC	36.	626.96065	(10060301)	AT (	21.00,	0.00)	DC
12.	647.38167	(10060901)	AT (	20.00,	0.00)	DC	37.	625.75832	(10052801)	AT (	20.00,	0.00)	DC
13.	643.12573	(10060701)	AT (	16.00,	0.00)	DC	38.	622.36767	(10052601)	AT (	23.00,	0.00)	DC
14.	643.12573	(10060801)	AT (	16.00,	0.00)	DC	39.	622.01534	(10052801)	AT (	18.00,	0.00)	DC
15.	643.12573	(10060901)	AT (	16.00,	0.00)	DC	40.	621.54478	(10060101)	AT (	18.00,	0.00)	DC
16.	636.19169	(10052601)	AT (	20.00,	0.00)	DC	41.	621.54478	(10060201)	AT (	18.00,	0.00)	DC
17.	635.96464	(10052601)	AT (	21.00,	0.00)	DC	42.	621.54478	(10060301)	AT (	18.00,	0.00)	DC
18.	635.20321	(10052701)	AT (	20.00,	0.00)	DC	43.	620.42014	(10052701)	AT (	18.00,	0.00)	DC
19.	633.78658	(10060701)	AT (	21.00,	0.00)	DC	44.	619.31621	(10052801)	AT (	21.00,	0.00)	DC
20.	633.78658	(10060801)	AT (	21.00,	0.00)	DC	45.	618.65522	(10060101)	AT (	22.00,	0.00)	DC
21.	633.78658	(10060901)	AT (	21.00,	0.00)	DC	46.	618.65522	(10060201)	AT (	22.00,	0.00)	DC
22.	633.70633	(10052701)	AT (	21.00,	0.00)	DC	47.	618.65522	(10060301)	AT (	22.00,	0.00)	DC
23.	631.10845	(10060101)	AT (	20.00,	0.00)	DC	48.	618.10452	(10052701)	AT (	23.00,	0.00)	DC
24.	631.10845	(10060201)	AT (	20.00,	0.00)	DC	49.	617.78993	(10052601)	AT (	18.00,	0.00)	DC
25.	631.10845	(10060301)	AT (	20.00,	0.00)	DC	50.	617.32250	(10060701)	AT (	22.00,	0.00)	DC

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR

**MODELOPTs: NonDFAULT CONC FLAT NOCHKD
SCREEN

*** THE SUMMARY OF HIGHEST 1-HR RESULTS ***

** CONC OF OTHER IN MICROGRAMS/M**3 **

GROUP ID	AVERAGE CONC	DATE (YYMMDDHH)	RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG)	OF TYPE	NETWORK GRID-ID
ALL HIGH 1ST HIGH VALUE IS	660.66291	ON 10060701:	AT (18.00, 0.00, 0.00, 0.00, 0.00)	DC	

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR

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**MODELOPTs:  NonDFAULT CONC                                  FLAT                                  NOCHKD
    SCREEN

*** Message Summary : AERMOD Model Execution ***

 --------- Summary of Total Messages --------

A Total of            0 Fatal Error Message(s)
A Total of            1 Warning Message(s)
A Total of            0 Informational Message(s)

A Total of          694 Hours Were Processed

A Total of            0 Calm Hours Identified

A Total of            0 Missing Hours Identified (  0.00 Percent)


   ******** FATAL ERROR MESSAGES ********
              ***  NONE  ***


   ********   WARNING MESSAGES   ********
SO W320      18  PPARM:Input Parameter May Be Out-of-Range for Parameter           VS

   ************************************
   *** AERMOD Finishes Successfully ***
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