terms involving non-inhalation pathways, when relevant. In the case of chronic and acute non-cancer impacts, the unit impact or health hazard per unit concentration is normally calculated as 1 divided by the Reference Exposure Level (REL, expressed as a concentration in $\mu g/m^3$) for the TAC.

Exposure concentration is calculated as the product of the actual emission rate (in grams per second) of the TAC times the concentration per unit of emission (i.e., an emission rate of 1 g/s), which is the output from the AERMOD air dispersion modeling calculation. This exposure concentration is the "Unit Concentration."

The way that HARP usually works is for the program to automatically pass the "Unit Concentration" for a given source and receptor into its risk module where it is multiplied by the actual emission rate (in g/s) for each TAC and the "Unit Risk" for the TAC to produce the calculated risk for the TAC. This is done for all TACs emitted by a source and the summed cancer risk, or non-cancer health impact for common toxic endpoints in the case of chronic and acute risk, is the total risk or non-cancer health impact at that receptor from that source. The total cancer risk or non-cancer health impact at a receptor is the sum of the risks or health impacts from all of the sources.

Because HARP is not designed to pass AERMOD "Unit Concentration" outputs to its Risk Module, an alternative procedure can be used. The calculation of cancer risk or non-cancer health impact does not require the variables to be multiplied in any particular order. Therefore, the final result will be the same if, for a given source, the "Unit Risk" for a TAC is multiplied by the actual emissions (g/s) for the TAC, and these products are added together to give a "Source Strength" for the source. The "Source Strength" is then used as the source emission rate in AERMOD.

This special methodology thus uses HARP to calculate the "Unit Risks" for all carcinogenic TACs and unit chronic and acute health impacts for all non-carcinogenic TACs, including all required exposure pathways and toxic endpoints as well as receptor types, including residents and workers. The unit risk or unit health impact for each TAC from a source is multiplied by the emission rate of that TAC from the source. These products are summed for all TACs emitted by the source. This is done for each source. Finally, the resulting "Source Strengths" for each source are used as emission rates in an AERMOD calculation. The resulting risks are reported in the AERMOD output.

It is expected that the District will conclude that the new Diesel fire pump engine satisfies the requirements of toxics Best Available Control Technology, for which the maximum allowable cancer risk is 10 in one million.

13. Final Modeling Submittal

The final modeling analyses will include the following materials:

- Emissions calculations, modeled emission rates, and stack parameters (diameter, height, exit velocity, stack gas temperature, stack base height above sea level);
- Summaries of maximum modeled impacts for each air quality scenario;

- All modeling inputs and outputs (including BPIP-PRIME, ozone data and meteorological files) in electronic format, together with a description of all filenames;
- Plot plan showing emission points, nearby buildings (including dimensions), cross-section lines, property lines, fencelines, roads, and UTM coordinates;
- A table showing building heights used in the modeling analysis; and
- Concentration isopleths maps for each criteria pollutant and averaging time combination.

The HRA results will include AERMOD output files, spreadsheets that show the risk calculation procedures, a figure showing the locations of the maximum acute, chronic and cancer risks from the project, and a detailed description of the methodology.

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Appendix A

Surface Parameters to be used for AERMET Stage 3 Processing

Surface Parameters to be Used for Stage 3 AERMET Processing
Gateway Generating Station

Spring - average

Sector	Land use (met station)	Suface roughness (m)	Land use (application site)	Albedo	Bowen ratio
1. 305^0-40^0	open water with distant shore	0.003	open water with distant shore	0.12	0.10
2. 40^0-90^0	open water	0.001	open water	0.12	0.10
3.90^0-120^0	Industrial (urban)	0.600	Industrial (urban)	0.14	1.00
4.120^0-200^0	Gentle slope with distant residences (grassland)	0.100	Gentle slope with distant residences (grassland)	0.18	0.40
5.200^0-270^0	Industrial (urban)	0.600	Industrial (urban)	0.14	1.00
6.270^0-305^0	open water	0.001	open water	0.12	0.10

Summer - dry

Sector	Land use (met station)	Suface roughness (m)	Land use (application site)	Albedo	Bowen ratio
1. 305^0-40^0	open water with distant shore	0.003	open water with distant shore	0.10	0.10
2. 40^0-90^0	open water	0.001	open water	0.10	0.10
3.90^0-120^0	Industrial (urban)	0.600	Industrial (urban)	0.14	4.00
4.120^0-200^0	Gentle slope with distant residences (grassland)	0.100	Gentle slope with distant residences (grassland)	0.18	2.00
5.200^0-270^0	Industrial (urban)	0.600	Industrial (urban)	0.14	4.00
6.270^0-305^0	open water	0.001	open water	0.10	0.10

Autumn - dry

Sector	Land use (met station)	Suface roughness (m)	Land use (application site)	Albedo	Bowen ratio
1. 305^0-40^0	open water with distant shore	0.003	open water with distant shore	0.14	0.10
2. 40^0-90^0	open water	0.001	open water	0.14	0.10
3.90^0-120^0	Industrial (urban)	0.600	Industrial (urban)	0.14	4.00
4.120^0-200^0	Gentle slope with distant residences (grassland)	0.100	Gentle slope with distant residences (grassland)	0.18	2.00
5.200^0-270^0	Industrial (urban)	0.600	Industrial (urban)	0.14	4.00
6.270^0-305^0	open water	0.001	open water	0.14	0.10

Winter - wet

Sector	Land use (met station)	Suface roughness (m)	Land use (application site)	Albedo	Bowen ratio
1. 305^0-40^0	open water with distant shore	0.003	open water with distant shore	0.20	0.10
2. 40^0-90^0	open water	0.001	open water	0.20	0.10
3.90^0-120^0	Industrial (urban)	0.600	Industrial (urban)	0.14	0.50
4.120^0-200^0	Gentle slope with distant residences (grassland)	0.100	Gentle slope with distant residences (grassland)	0.18	0.50
5.200^0-270^0	Industrial (urban)	0.600	Industrial (urban)	0.14	0.50
6.270^0-305^0	open water	0.001	open water	0.20	0.10

Sources for proposed parameter values:
USER'S GUIDE FOR THE AERMOD METEOROLOGICAL PREPROCESSOR (AERMET)

	Bowen ratio
0.10	Unfrozen water
1.00	Grassland - dry - spring
2.00	Grassland - dry - summer, autumn, winter
2.00	Urban - dry - spring, winter
4.00	Urban - dry - summer, autumn
0.30	Grassland - wet - spring
0.40	Grassland - wet - summer
0.50	Grassland - wet - autumn, winter
0.50	Urban - wet - spring, winter
1.00	Urban - wet - summer, autumn
0.40	Grassland - avg. - spring
0.80	Grassland - avg. - summer
1.00	Grassland - avg. - autumn
1.50	Grassland - avg. - winter
1.00	Urban - avg. - spring
2.00	Urban - avg. - summer, autumn
1.50	Urban - avg. - winter

	Albedo
0.12	Water - spring
0.10	Water - summer
0.14	Water - autumn
0.20	Water - winter
0.14	Urban
0.18	Grassland

from 'An Introduction to Boundary Layer Meteorology' by Roland B. Stull, Fig. 9.6, p. 380.

	Roughness Lengths (m)
0.600	Centers of small towns
0.100	Between 'many hedges' and 'many trees, hedges, and few buildings'
0.001	Approx. Off sea wind in coastal area
0.003	Marginally greater than 'Approx. Off sea wind in coastal area'

Appendix B

Information on CTDMPLUS Model

The CTDMPLUS and CTSCREEN Models

Complex terrain impacts may need to be modeled with more accuracy than that provided by AERMOD. The use of more refined modeling techniques is specifically addressed in EPA's Appendix W[5] modeling guidance, as follows:

> *Since AERMOD treats dispersion in complex terrain, we have merged sections 4 and 5 of appendix W, as proposed in the April 2000 NPR [Notice of Proposed Rulemaking]. And while AERMOD produces acceptable regulatory design concentrations in complex terrain, it does not replace CTDMPLUS for detailed or receptor-oriented complex terrain analysis, as we have made clear in Guideline section 4.2.2. CTDMPLUS remains available for use in complex terrain. [p. 68225]*

> *4.2.2 Refined Analytical Techniques*
> *d. If the modeling application involves a well defined hill or ridge and a detailed dispersion analysis of the spatial pattern of plume impacts is of interest, CTDMPLUS, listed in Appendix A, is available. CTDMPLUS provides greater resolution of concentrations about the contour of the hill feature than does AERMOD through a different plume-terrain interaction algorithm. [p. 68233]*

CTSCREEN is the same basic model as CTDMPLUS, except that meteorological data are handled internally in a simplified manner. As discussed in the CTSCREEN users guide,[6]

> *Since [CTDMPLUS] accounts for the three-dimensional nature of plume and terrain interaction, it requires detailed terrain and meteorological data that are representative of the modeling domain. Although the terrain data may be readily obtained from topographic maps and digitized for use in the CTDMPLUS, the required meteorological data may not be as readily available.*

> *Since the meteorological input requirements of the CTDMPLUS can limit its application, the EPA's Complex-Terrain-Modeling, Technology-Transfer Workgroup developed a methodology to use the advanced techniques of*

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[5] 40 CFR 51 Subpart W, as amended November 9, 2005 at 70 FR 68218, "Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions."

[6] USEPA, EPA-600/8-90-087, "User's Guide to CTDMPLUS: Volume 2. The Screening Mode (CTSCREEN)," October 1990.

> *CTDMPLUS in situations where on-site meteorological measurements are limited or unavailable. This approach uses CTDMPLUS in a "screening" mode--actual source and terrain characteristics are modeled with an extensive array of predetermined meteorological conditions.*
>
> *This CTDMPLUS screening mode (CTSCREEN) serves several purposes in regulatory applications. When meteorological data are unavailable, CTSCREEN can be used to obtain conservative (safely above those of refined models), yet realistic, impact estimates for particular sources.*

Therefore, the use of the CTSCREEN version of CTDMPLUS is consistent with EPA guidance.

Meteorological Data for CTDMPLUS

The discussion in Section 4 of the protocol addresses meteorological data needed to run AERMOD. As discussed above, an additional model, Complex Terrain Dispersion Model PLUS (CTDMPLUS), may be used in lieu of the model Complex Terrain Screening Model (CTSCREEN) for receptors in the terrain above stack-top height. CTDMPLUS is a USEPA-approved air dispersion model, and is fully supported with user guidance documentation.[7]

CTDMPLUS requires an extensive suite of meteorological data composed of not only wind speed, direction, and temperature, but also horizontal and vertical wind direction standard deviations (sigma theta and sigma phi, respectively), and vertical wind speed standard deviation (sigma w). Many AERMOD-compatible meteorological data sets do not include these non-standard measurements.

It is possible to develop conservative values for the standard deviation parameters sigma theta, sigma phi, and sigma w that are consistent with the available meteorological data, and use them to prepare a meteorological data set that is usable in CTDMPLUS and yields conservative (i.e., high) ground-level concentrations.

If modeling with CTDMPLUS is required, the ISCST3-compatible meteorological data sets for the same four years (1994-1997) that was created for the original modeling analysis for the CC8 project would be used to create the CTDMPLUS-compatible meteorological data set. Because all three of these Gaussian dispersion models—ISCST3, AERMOD, and CTDMPLUS—require upper air data as well as surface data, the upper air data from Oakland would be used as discussed earlier.

The following meteorological parameters are needed for CTDMPLUS and would be taken directly from the AERMET files:

- Observed mixing height, provided as the height of the convective or planetary boundary layer (PBL);

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[7] USEPA. Technology Transfer Network, Support Center for Regulatory Atmospheric Modeling, *http://www.epa.gov/scram001/dispersion_prefrec.htm#ctdmplus*

- Calculated mixing height, provided as the height of the mechanical, or surface, boundary layer (SBL);
- Friction velocity (USTAR);
- Monin-Obukhov length (L); and
- Roughness length (Z_O).

The remaining standard deviations (sigma values) are not available from AERMOD and must be obtained from ISCST3-compatible met data files that were developed for the project. Stability classes determined by MPRM[8] or PCRAMMET[9] from the measured Pittsburg meteorological data would be used to select the most conservative values from the following ranges recommended in USEPA's Meteorological Monitoring Guidance document:[10]

Stability Category	Sigma Phi (σ_Φ)/ Regulatory Range (degrees)	Sigma Theta (σ_θ)/ Regulatory Range (degrees)
A	11.5	22.5
B	10.0 – 11.5	17.5 – 22.5
C	7.8 – 10.0	12.5 – 17.5
D	5.0 – 7.8	7.5 – 12.5
E	2.4 – 5.0	3.8 – 7.5
F	< 2.4	< 3.8

The most conservative values (that is, the values that produce the highest modeled impacts) for sigma theta and sigma phi within each range would be determined by conducting a sensitivity analysis for all combinations of stack conditions to be modeled using CTDMPLUS and receptor locations for which CTDMPLUS would be used (that is, receptors above stack height). The sensitivity analysis would use the upper and lower values of each range for each stability category. For example, for stability category D, four combinations would be evaluated as follows:

[8] The Meteorological Processor for Regulatory Models

[9] EPA meteorological preprocessor

[10] Tables 6-8a and 6-9a in Meteorological Monitoring Guidance for Regulatory Modeling Applications, EPA-454/R-99-005, US EPA Office of Air and Radiation, Office of Air Quality Planning and Standards, February 2000.

σ_Φ	σ_θ
5.0	7.5
5.0	12.5
7.8	7.5
7.8	12.5

For stability category A, maximum values for σ_Φ and σ_θ of 15.0 and 27.0, respectively, would be evaluated. For stability category F, minimum values for σ_Φ and σ_θ of 1.0 and 2.0, respectively, would be evaluated.

Sigma w would be estimated by multiplying sigma-phi (after conversion from degrees to radians) by the horizontal wind speed.

Attachment B-2

Documentation for AERMET Surface Parameters

AERMET Surface Parameters
for Northern Sectors

	Sector 1 321 deg to 53 deg cultivated farmland 50% swamp 10% industrial 3% water 37%					Sector 2 53 deg to 90 deg swamp 10% industrial 20% water 70%					Sector 6 270 deg to 321 deg swamp 34% industrial 5% water 61%				
Month	Suface roughness	Albedo	2004 Bowen ratio	2005 Bowen ratio	2006 Bowen ratio	Suface roughness	Albedo	2004 Bowen ratio	2005 Bowen ratio	2006 Bowen ratio	Suface roughness	Albedo	2004 Bowen ratio	2005 Bowen ratio	2006 Bowen ratio
JAN	0.0400	0.1632	0.457	0.457	0.457	0.2051	0.15	0.480	0.480	0.480	0.0671	0.1488	0.195	0.195	0.195
FEB	0.0400	0.1632	0.457	0.457	0.457	0.2051	0.15	0.480	0.480	0.480	0.0671	0.1488	0.195	0.195	0.195
MAR	0.0650	0.1306	0.617	0.227	0.227	0.2201	0.124	0.490	0.280	0.280	0.1181	0.121	0.229	0.145	0.145
APR	0.0650	0.1306	0.617	0.227	0.162	0.2201	0.124	0.490	0.280	0.180	0.1181	0.121	0.229	0.145	0.12
MAY	0.0650	0.1306	0.617	0.227	0.617	0.2201	0.124	0.490	0.280	0.490	0.1181	0.121	0.229	0.145	0.229
JUN	0.1500	0.1558	0.927	0.357	0.927	0.2201	0.116	0.890	0.480	0.890	0.1181	0.1166	0.329	0.195	0.329
JUL	0.1500	0.1558	0.927	0.927	0.927	0.2201	0.116	0.890	0.890	0.890	0.1181	0.1166	0.329	0.329	0.329
AUG	0.1500	0.1558	0.927	0.927	0.927	0.2201	0.116	0.890	0.890	0.890	0.1181	0.1166	0.329	0.329	0.329
SEP	0.0750	0.1632	1.177	1.177	1.177	0.2201	0.15	0.890	0.890	0.890	0.1181	0.1488	0.329	0.329	0.329
OCT	0.0750	0.1632	0.277	1.177	1.177	0.2201	0.15	0.280	0.890	0.890	0.1181	0.1488	0.145	0.329	0.329
NOV	0.0750	0.1632	0.457	1.177	1.177	0.2201	0.15	0.480	0.890	0.890	0.1181	0.1488	0.195	0.329	0.329
DEC	0.0400	0.1632	0.277	0.277	0.457	0.2051	0.15	0.280	0.280	0.480	0.0671	0.1488	0.145	0.145	0.195
ANN	0.0825	0.1532	0.6445	0.6345	0.7241	0.2163	0.135	0.5858	0.5842	0.6442	0.1053	0.1338	0.2398	0.2342	0.2544

AERMET Surface Parameters
for Southern Sectors
Provided by the BAAQMD Staff

	Sector 2: 53 deg to 90 deg					Sector 3: 90 deg to 120 deg					Sector 4: 120 deg to 270 deg				
Month	Surface roughness	Albedo	2004 Bowen ratio	2005 Bowen ratio	2006 Bowen ratio	Surface roughness	Albedo	2004 Bowen ratio	2005 Bowen ratio	2006 Bowen ratio	Surface roughness	Albedo	2004 Bowen ratio	2005 Bowen ratio	2006 Bowen ratio
JANUARY	0.1514	0.1149	0.3322	0.3322	0.3322	0.6651	0.1542	1.1974	1.1974	1.1974	0.6360	0.1687	1.3117	1.3117	1.3117
FEBRUARY	0.1516	0.1147	0.3304	0.3304	0.3304	0.6672	0.1530	1.1931	1.1931	1.1931	0.6346	0.1595	1.2102	1.2102	1.2102
MARCH	0.1516	0.1147	0.5972	0.3304	0.3304	0.6672	0.1530	2.3833	1.1931	1.1931	0.6346	0.1595	2.4578	1.2102	1.2102
APRIL	0.1517	0.1147	0.5995	0.3313	0.2477	0.6691	0.1536	2.3887	1.1952	0.8083	0.6486	0.1643	2.5700	1.2613	0.8622
MAY	0.1517	0.1147	0.5995	0.3313	0.5995	0.6691	0.1536	2.3887	1.1952	2.3887	0.6486	0.1643	2.5700	1.2613	2.5700
JUNE	0.1517	0.1147	0.5995	0.3313	0.5995	0.6691	0.1536	2.3887	1.1952	2.3887	0.6486	0.1643	2.5700	1.2613	2.5700
JULY	0.1515	0.1148	0.6006	0.6006	0.6006	0.6671	0.1539	2.3913	2.3913	2.3913	0.6423	0.1665	2.6244	2.6244	2.6244
AUGUST	0.1515	0.1148	0.6006	0.6006	0.6006	0.6671	0.1539	2.3913	2.3913	2.3913	0.6423	0.1665	2.6244	2.6244	2.6244
SEPTEMBER	0.1515	0.1148	0.6006	0.6006	0.6006	0.6671	0.1539	2.3913	2.3913	2.3913	0.6423	0.1665	2.6244	2.6244	2.6244
OCTOBER	0.1515	0.1148	0.2479	0.6006	0.6006	0.6671	0.1539	0.8088	2.3913	2.3913	0.6423	0.1665	0.8732	2.6244	2.6244
NOVEMBER	0.1514	0.1149	0.3322	0.6018	0.6018	0.6651	0.1542	1.1974	2.3940	2.3940	0.6360	0.1687	1.3117	2.6788	2.6788
DECEMBER	0.1514	0.1149	0.2481	0.2481	0.3322	0.6651	0.1542	0.8094	0.8094	1.1974	0.6360	0.1687	0.8843	0.8843	1.3117
ANNUAL	0.1515	0.1148	0.3315	0.3315	0.3315	0.6671	0.1538	1.1958	1.1958	1.1958	0.6410	0.1653	1.2738	1.2738	1.2738

AERMET Land Use Parameters

Climatology for Bowen Ratio (from BAAQMD)

		2004	2005	2006
Winter	JAN	average	average	average
	FEB	average	average	average
Spring	MAR	dry	average	average
	APR	dry	average	wet
	MAY	dry	average	dry
Summer	JUN	dry	average	dry
	JUL	dry	dry	dry
	AUG	dry	dry	dry
Fall	SEP	dry	dry	dry
	OCT	wet	dry	dry
	NOV	average	dry	dry
Winter	DEC	wet	wet	average
	ANN	average	average	average

ALBEDO OF GROUND COVERS BY LAND-USE AND SEASON

Land-Use	Spring	Summer	Autumn	Winter in this project*	Winter
Water (fresh and sea)	0.12	0.1	0.14	0.14	0.2
Deciduous Forest	0.12	0.12	0.12	0.12	0.5
Coniferous Forest	0.12	0.12	0.12	0.12	0.35
Swamp	0.12	0.14	0.16	0.16	0.3
Cultivated Land	0.14	0.2	0.18	0.18	0.6
Grassland	0.18	0.18	0.2	0.2	0.6
Urban	0.14	0.16	0.18	0.18	0.35
Desert Shrubland	0.3	0.28	0.28	0.28	0.45

* The winter Albedo in the project area is similar to that of autumn because there is no ice season.

AERMET Land Use Parameters

DAYTIME BOWEN RATIO BY LAND USE AND SEASON
DRY CONDITIONS

Land-Use	Spring	Summer	Autumn	Winter in this project*	Winter
Water (fresh and sea)	0.1	0.1	0.1	0.1	2
Deciduous Forest	1.5	0.6	2	2	2
Coniferous Forest	1.5	0.6	1.5	1.5	2
Swamp	0.2	0.2	0.2	0.2	2
Cultivated Land	1	1.5	2	2	2
Grassland	1	2	2	2	2
Urban	2	4	4	4	2
Desert Shrubland	5	6	10	10	10

DAYTIME BOWEN RATIO BY LAND USE AND SEASON
AVERAGE CONDITIONS

Land-Use	Spring	Summer	Autumn	Winter in this project*	Winter
Water (fresh and sea)	0.1	0.1	0.1	0.1	1.5
Deciduous Forest	0.7	0.3	1	1	1.5
Coniferous Forest	0.7	0.3	0.8	0.8	1.5
Swamp	0.1	0.1	0.1	0.1	1.5
Cultivated Land	0.3	0.5	0.7	0.7	1.5
Grassland	0.4	0.8	1	1	1.5
Urban	1	2	2	2	1.5
Desert Shrubland	3	4	6	6	6

DAYTIME BOWEN RATIO BY LAND USE AND SEASON
WET CONDITIONS

Land-Use	Spring	Summer	Autumn	Winter in this project*	Winter
Water (fresh and sea)	0.1	0.1	0.1	0.1	0.3
Deciduous Forest	0.3	0.2	0.4	0.4	0.5
Coniferous Forest	0.3	0.2	0.3	0.3	0.3
Swamp	0.1	0.1	0.1	0.1	0.5
Cultivated Land	0.2	0.3	0.4	0.4	0.5
Grassland	0.3	0.4	0.5	0.5	0.5
Urban	0.5	1	1	1	0.5
Desert Shrubland	1	1.5	2	2	2

* The winter Bowen ratio in the project area are similar to that of autumn, because of the unique seasonal characteristics in Bay Area.

SURFACE ROUGHNESS LENGTH, IN METERS, BY LAND-USE AND SEASON

Land-Use	Spring	Summer	Autumn	Winter
Water (fresh and sea)	0.0001	0.0001	0.0001	0.0001
Deciduous Forest	1	1.3	0.8	0.5
Coniferous Forest	1.3	1.3	1.3	1.3
Swamp	0.2	0.2	0.2	0.05
Cultivated Land	0.03	0.2	0.05	0.01
Grassland	0.05	0.1	0.01	0.001
Urban	1	1	1	1
Desert Shrubland	0.3	0.3	0.3	0.15

** All values extracted from "USER'S GUIDE FOR THE AERMOD METEOROLOGICAL PREPROCESSOR (AERMET)"

Appendix C

Screening Health Risk Assessment

Screening Health Risk Assessment

The screening level health risk assessment has been prepared using CARB's Hotspots Analysis and Reporting Program (HARP) computer program (Version 1.2a, August 26, 2005) and associated guidance in the OEHHA's *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (August 2003). The HARP model was used to assess cancer risk as well as chronic and acute risk impacts. The following paragraphs describe the procedures used to prepare this risk assessment.

Modeling Inputs

The risk assessment module of the HARP model was run using unit ground level impacts to obtain derived cancer risks for each toxic chemical of interest.[1] Cancer risks were obtained for the derived (adjusted) method and the derived (OEHHA) method (for worker exposure) options. The HARP model output was cancer risk by pollutant and route for each type of analysis, based on an exposure of 1.0 $\mu g/m^3$. Individual cancer risks are expressed in units of risk per $\mu g/m^3$ of exposure. To calculate the weighted risk for each source, the annual average emission rate in g/s for each pollutant was multiplied by the individual cancer risk for that pollutant in $(\mu g/m^3)^{-1}$. The resulting weighted cancer risks for each pollutant were then summed for the source. An identical approach was used to determine the acute and chronic health impacts associated with the proposed project. Details of the calculations of risk "rates" for modeling are shown in Tables C-1 through C-4.

Risk Analysis Method

The results of the turbine screening analysis (see Appendix B, Table B-3) were used to determine the worst-case full load operating conditions for modeling for the annual and 1-hour averaging periods, used in determining cancer risk and chronic HHI, and acute HHI, respectively. The total weighted risk "rate" for each source was used in place of emission rates in the modeling analysis. The weighted risk "rates" used for the HRA modeling are summarized in Table C-5. The calculated value was then total cancer risk at each receptor. As discussed in Part III of the application, the screening analysis for the criteria pollutant modeling analysis was performed using the AERMOD model, the 2004 through 2006 Contra Costa meteorological data, specific receptor grids, and the stack parameters for eight operating cases. The exhaust characteristics for the highest full-load 1-hour and annual average unit impacts from the screening analysis, Case 5, was used to model cancer risks from the turbines for the proposed project.

As shown in Table 13, the cancer risk from the project is slightly above 1 in one million, due to the Diesel particulate matter emissions from the fire pump engine. However, since the fire pump engine particulate emission limit meets Toxics BACT levels and the cancer risk is well below 10 in one million, the project can be approved. In addition, the area where the cancer risk exceeds 1 in one million barely crosses the facility fenceline so it is extremely unlikely that anyone will experience the maximum modeled risk. Finally, the acute and chronic health hazard indices are well below the significance level of one.

[1] Procedure is described in Part B of Topic 8 of the HARP How-To Guides: How to Perform Health Analyses Using a Ground Level Concentration.

The analysis of potential cancer risk described in this section employs extremely conservative methods and assumptions, as follows:

- The analysis includes representative weather data over 3 years to ensure that the least favorable conditions producing the highest ground-level concentration of power plant emissions are included. The analysis then assumes that these worst-case weather conditions, which in reality occurred only once in 3 years, will occur every year for 70 years.
- The analysis assumes that a sensitive individual is at the location of the highest ground-level concentration of power plant emissions continuously over the entire 70-year period. In reality, people rarely live in their homes for 70 years, and even if they do, they leave their homes to attend school, go to work, go shopping, and so on. Further, as described above, the highest ground-level impact occurs near the fenceline of the facility, where there are no residences or other sensitive receptors.

The point of using these unrealistic assumptions is to consciously overstate the potential impacts. No one will experience exposures as great as those assumed for this analysis. By determining that even this highly overstated exposure will not be significant, there is a high degree of confidence that the much lower exposures that actual persons will experience will not result in a significant increase in cancer risk. In short, the analysis ensures that there will not be significant public health impacts at any location, under any weather condition, under any operating condition.

Table C-1

Gateway Generating Station

Calculation of Modeling Inputs for CTG/HRSG Cancer Risk Assessment

		Derived (Adjusted) Method		Worker Exp: Derived (OEHHA) Method	
Compound	Annual Average Emissions Per Engine g/s	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3 per g/s)	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3 per g/s)
Ammonia	3.37E+00	0	0	0	0
Propylene	1.91E-01	0	0	0	0
Acetaldehyde	1.01E-02	2.90E-06	2.93E-02	5.72E-07	5.79E-03
Acrolein	9.15E-04	0	0	0	0
Benzene	8.26E-04	2.90E-05	2.40E-02	5.72E-06	4.72E-03
1,3-Butadiene	1.09E-04	1.74E-04	1.89E-02	3.43E-05	3.73E-03
Ethylbenzene	8.09E-03	0	0	0	0
Formaldehyde	9.10E-02	6.08E-06	5.53E-01	1.20E-06	1.09E-01
Hexane	6.42E-02	0	0	0	0
Naphthalene	4.12E-04	3.48E-05	1.43E-02	6.86E-06	2.82E-03
PAHs (Note 1)	1.13E-05	1.65E-02	1.87E-01	1.47E-02	1.66E-01
Propylene Oxide	7.39E-03	3.76E-06	2.78E-02	7.43E-07	5.49E-03
Toluene	3.30E-02	0	0	0	0
Xylene	1.62E-02	0	0	0	0
			8.55E-01 per ug/m3		2.98E-01 per ug/m3

Notes:

(1) Emission rates for individual PAHs weighted by risk relative to B(a)P. See Table A-6.

Table C-2
Gateway Generating Station
Calculation of Modeling Inputs and HHIs for CTG Acute and Chronic Risk Assessment

Compound	Acute Health Impacts			Chronic Health Impacts		
	Max Hourly Emissions Per Engine g/s	HARP Acute HI (per ug/m3)	Acute HHI Model Input (per ug/m3 per g/s)	Annual Average Emissions, g/s	HARP Chronic HI (per ug/m3)	Chronic HHI Model Input (per ug/m3 per g/s)
Ammonia	3.54E+00	3.13E-04	1.11E-03	3.367	5.00E-03	1.68E-02
Propylene	2.01E-01	--	--	0.191	3.33E-04	6.37E-05
Acetaldehyde	1.06E-02	--	--	1.01E-02	1.11E-01	1.12E-03
Acrolein	9.62E-04	5.26E+00	5.06E-03	9.15E-04	1.67E+01	1.53E-02
Benzene	8.68E-04	7.69E-04	6.68E-07	8.26E-04	1.67E-02	1.38E-05
1,3-Butadiene	1.14E-04	--	--	1.09E-04	5.00E-02	--
Ethylbenzene	8.50E-03	--	--	8.09E-03	5.00E-04	4.04E-06
Formaldehyde	9.57E-02	1.06E-02	1.01E-03	9.10E-02	3.33E-01	3.03E-02
Hexane	6.75E-02	--	--	6.42E-02	1.43E-04	9.19E-06
Naphthalene	4.33E-04	--	--	4.12E-04	1.11E-01	4.57E-05
PAHs	1.19E-05	--	--	1.13E-05	--	--
Propylene Oxide	7.77E-03	3.23E-04	2.51E-06	7.39E-03	3.33E-02	2.46E-04
Toluene	3.47E-02	2.70E-05	9.36E-07	3.30E-02	3.33E-03	1.10E-04
Xylene	1.70E-02	4.55E-05	7.75E-07	1.62E-02	1.43E-03	2.32E-05
		Total =	7.19E-03		Total =	6.41E-02

Table C-3
Gateway Generating Station
Cancer Risk Assessment Modeling Inputs for Other Equipment

Dewpoint Heater

		Derived (Adjusted) Method		Worker Exp: Derived (OEHHA) Method	
Compound	Annual Average Emissions	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3
Ammonia	--	0	0	0	0
Propylene	5.90E-04	0	0	0	0
Acetaldehyde	3.48E-06	2.90E-06	1.01E-05	5.72E-07	1.99E-06
Acrolein	2.18E-06	0	0	0	0
Benzene	6.47E-06	2.90E-05	1.88E-04	5.72E-06	3.70E-05
1,3-Butadiene	--	1.74E-04	0.00E+00	3.43E-05	0.00E+00
Ethylbenzene	7.68E-06	0	0	0	0
Formaldehyde	1.37E-05	6.08E-06	8.36E-05	1.20E-06	1.65E-05
Hexane	5.09E-06	0	0	0	0
Naphthalene	2.43E-07	3.48E-05	8.44E-06	6.86E-06	1.66E-06
PAHs (Note 1)	8.09E-08	1.65E-02	1.33E-03	1.47E-02	1.19E-03
Propylene Oxide	--	3.76E-06	0	7.43E-07	0
Toluene	2.96E-05	0	0	0	0
Xylene	2.20E-05	0	0	0	0
			1.62E-03 per ug/m3		1.25E-03 per ug/m3

Fire Pump Engine

		Derived (Adjusted) Method		Worker Exposure: Derived (OEHHA) Method	
Compound	Annual Average Emissions, g/s	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3 per g/s)	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3 per g/s)
Diesel Exhaust Particulate	5.71E-05	3.19E-04	1.82E-02 per ug/m3	6.29E-05	3.59E-03 per ug/m3

Table C-4
Gateway Generating Station
Calculation of Modeling Inputs and HHIs for Other Equipment Acute and Chronic Risk Assessment

Dewpoint Heater

	Acute Health Impacts			Chronic Health Impacts		
Compound	Max Hourly Emissions, g/s	HARP Acute HI (per ug/m3)	Acute HHI Model Input (per ug/m3 per g/s)	Annual Average Emissions, g/s	HARP Chronic HI (per ug/m3)	Chronic HHI Model Input (per ug/m3 per g/s)
Propylene	5.90E-04	--	--	5.90E-04	3.33E-04	1.97E-07
Acetaldehyde	3.48E-06	--	--	3.48E-06	1.11E-01	3.86E-07
Acrolein	2.18E-06	5.26E+00	1.15E-05	2.18E-06	1.67E+01	3.65E-05
Benzene	6.47E-06	7.69E-04	4.97E-09	6.47E-06	1.67E-02	1.08E-07
1,3-Butadiene	--	--	--	--	5.00E-02	--
Ethylbenzene	7.68E-06	--	--	7.68E-06	5.00E-04	3.84E-09
Formaldehyde	1.37E-05	1.06E-02	1.46E-07	1.37E-05	3.33E-01	4.58E-06
Hexane	5.09E-06	--	--	5.09E-06	1.43E-04	7.29E-10
Naphthalene	2.43E-07	--	--	2.43E-07	1.11E-01	2.69E-08
PAHs	8.09E-08	--	--	8.09E-08	--	--
Propylene Oxide	--	3.23E-04	--	--	3.33E-02	--
Toluene	2.96E-05	2.70E-05	7.99E-10	2.96E-05	3.33E-03	9.86E-08
Xylene	2.20E-05	4.55E-05	1.00E-09	2.20E-05	1.43E-03	3.15E-08
		Total =	1.16E-05		Total =	4.19E-05

Fire Pump Engine

Compound	Max Hourly Emissions for Em Gen. g/s	HARP Acute HI (per ug/m3)	Acute HHI Model Input (per ug/m3 per g/s)	Annual Average Emissions, g/s	HARP Chronic HI (per ug/m3)	Chronic HHI Model Input (per ug/m3 per g/s)
Particulate Em from Diesel-Fueled Engines	1.00E-02	n/a	n/a	5.71E-05	2.00E-01	1.14E-05
					Total =	1.14E-05

Table C-5
Gateway Generating Station
Summary of Modeling Input Values for Screening HRA

Unit	Derived (Adjusted) Method Cancer Risk (Res)	Derived (OEHHA) Method Cancer Risk (Worker)	Chronic HHI Model Input (per ug/m3)	Acute HHI Model Input (per ug/m3)
CTGs (each)	8.547E-01	2.983E-01	6.407E-02	7.187E-03
Dewpoint Heater	1.624E-03	1.246E-03	4.189E-05	1.164E-05
Diesel fire pump engine	1.821E-02	3.590E-03	1.142E-05	-

All modeling input values are in units of per ug/m3

Stack Parameters				
	Stack Diam (m)	Stack Ht (m)	Exhaust Temp (deg K)	Exhaust Velocity (m/s)
CTGs (each)	5.108	59.436	355.222	19.923
Dewpoint Heater	0.203	4.715	422.039	28.719
Diesel fire pump engine	0.154	3.251	683.150	44.058

Appendix D

Revised Permit Conditions

Gateway Generating Station Permit Conditions

Definitions:

1-hour period: Any continuous 60-minute period beginning on the hour.

Calendar Day: Any continuous 24-hour period beginning at 12:00 AM or 0000 hours.

Year: Any consecutive twelve-month period of time

Heat Input: All heat inputs refer to the heat input at the higher heating value fuel, in Btu/scf.

Rolling 3-hour period: Any three-hour period that begins on the hour and does not include start-up or shutdown periods.

Firing Hours: Period of time during which fuel is flowing to a unit, measured in fifteen-minute increments.

MM Btu: million British thermal units

Gas Turbine Start-up Mode: The lesser of the first 360 minutes of continuous fuel flow to the Gas Turbine after fuel flow is initiated or the period of time from Gas Turbine fuel flow initiation until the Gas Turbine achieves two consecutive CEM data points in compliance with the emission concentration limits of conditions 20(b) and 20(d).

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Gas Turbine Shutdown Mode: The lesser of the 60 minute period immediately prior to the termination of fuel flow to the Gas Turbine or the period of time from non-compliance with any requirement listed in Conditions 20(a) through 20(d) until termination of fuel flow to the Gas Turbine.

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Specified PAHs: The polycyclic aromatic hydrocarbons listed below shall be considered to Specified PAHs for these permit conditions. Any emission limits for Specified PAHs refer to the sum of the emissions for all six of the following compounds.

Benzo[a]anthracene

Benzo[b]fluoranthene

Benzo[k]fluoranthene

Benzo[a]pyrene

Dibenzo[a,h]anthracene

Indeno[1,2,3-cd]pyrene

Corrected Concentration: The concentration of any pollutant (generally NOx, CO, or NH3) corrected to a standard stack gas oxygen concentration. For emission point P-11 (combined exhaust of S-41 Gas Turbine and S-42 HRSG duct burners) and emission point P-12 (combined exhaust of S-43 Gas Turbine and S-44 HRSG duct burners) the standard stack gas oxygen concentration is 15% O2 by volume on a dry basis.

Commissioning Activities: All testing, adjustment, tuning, and calibration activities recommended by the equipment manufacturers and the GGS construction contractor to insure safe and reliable steady state

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operation of the gas turbines, heat recovery steam generators, steam turbine, and associated electrical delivery systems.

Commissioning Period: The Period shall commence when all mechanical, electrical, and control systems are installed and individual system start-up has been completed, or when a gas turbine is first fired, whichever occurs first. The period shall terminate when the plant has completed performance testing and is available for commercial operation.

Combustor Tuning Activities: All testing, adjustment, tuning, and calibration activities recommended by the gas turbine manufacturer or an independent qualified contractor to insure safe and reliable steady state operation of the gas turbines following replacement of the combustor. This includes, but is not limited to, adjusting the amount of fuel distributed between the combustion turbine's staged fuel systems to simultaneously minimize NOx and CO production while minimizing combustor dynamics and ensuring combustor stability.

Combustor Tuning Period: The period, not to exceed 360 minutes, during which gas turbine combustor tuning activities are taking place.

Precursor Organic Compounds (POCs): Any compound of carbon, excluding methane, ethane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate

CEC CPM: California Energy Commission Compliance Program Manager

GGS: Gateway Generating Station

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Conditions for the Commissioning Period

1. The owner/operator of the GGS shall minimize emissions of carbon monoxide and nitrogen oxides from S-41 and S-43 Gas Turbines and S-42 and S-44 Heat Recovery Steam Generators (HRSGs) to the maximum extent possible during the commissioning period. Conditions 1 through 12 shall only apply during the commissioning period as defined above. Unless otherwise indicated, Conditions 13 through 47 shall apply after the commissioning period has ended.

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2. At the earliest feasible opportunity in accordance with the recommendations of the equipment manufacturers and the construction contractor, the S-41 & S-43 Gas Turbine combustors and S-42 & S-44 Heat Recovery Steam Generator duct burners shall be tuned to minimize the emissions of carbon monoxide and nitrogen oxides.

3. At the earliest feasible opportunity, in accordance with the recommendations of the equipment manufacturers and the construction contractor, the A-11 and A-13 SCR Systems and A-12 and A-14 CO Oxidation Catalyst Systems shall be installed, adjusted, and operated to minimize the emissions of carbon monoxide and nitrogen oxides from S-41 & S-43 Gas Turbines and S-42 & S-44 Heat Recovery Steam Generators.

4. Coincident with the as designed operation of A-11 & A-13 SCR Systems, pursuant to conditions 3, 10, 11, and 12, the Gas Turbines (S-41 & S-43) and the HRSGs (S-42 & S-44) shall comply with the NOx and CO emission limitations specified in conditions 20(a) through 20(d).

5. The owner/operator of the GGS shall submit a plan to the District Permit Services Division and the CEC CPM at least four weeks prior to first firing of S-41 or S-43 Gas

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Turbines describing the procedures to be followed during the commissioning of the gas turbines, HRSGs and gas-fired dewpoint heater. The plan shall include a description of each commissioning activity, the anticipated duration of each activity in hours, and the purpose of the activity. The activities described shall include, but not be limited to, the tuning of the Dry-Low-NOx combustors, the installation and operation of the SCR systems and oxidation catalysts, the installation, calibration, and testing of the CO and NOx continuous emission monitors, and any activities requiring the firing of the Gas Turbines (S-41 & S-43) and HRSGs (S-42 & S-44) without abatement by their respective SCR and CO Catalyst Systems.

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6. During the commissioning period, the owner/operator of the GGS shall demonstrate compliance with conditions 8 through 11 through the use of properly operated and maintained continuous emission monitors and data recorders for the following parameters:

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- firing hours for each gas turbine and each HRSG
- fuel flow rates to each train
- stack gas nitrogen oxide emission concentrations at P-11 and P-12
- stack gas carbon monoxide emission concentrations P-11 and P-12
- stack gas carbon dioxide or oxygen concentrations P-11 and P-12

The monitored parameters shall be recorded at least once every 15 minutes (excluding normal calibration periods or when the monitored source is not in operation) for the Gas Turbines (S-41 & S-43) and HRSGs (S-42 & S-44). The owner/operator shall use District-approved methods to calculate heat input rates, NOx mass emission rates, carbon monoxide mass emission rates, and NOx and CO emission concentrations, summarized for each clock hour and each calendar day. All records shall be retained on site for at least 5 years from the date of entry and made available to District personnel upon request.

7. The District-approved continuous emission monitors specified in condition 6 shall be installed, calibrated, and operational prior to first firing of the Gas Turbines (S-41 & S-43) and Heat Recovery Steam Generators (S-42 & S-44). After first firing of the turbines, the detection range of these continuous emission monitors shall be adjusted as necessary to accurately measure the resulting range of CO and NOx emission concentrations. The type, specifications, and location of these monitors shall be subject to District review and approval.

8. The total number of firing hours of S-41 Gas Turbine and S-42 Heat Recovery Steam Generator without abatement of nitrogen oxide emissions by A-11 SCR System and/or A-12 Oxidation Catalyst System shall not exceed 500 hours during the commissioning period. Such operation of S-41 Gas Turbine and S-42 HRSG without abatement shall be limited to discrete commissioning activities that can only be properly executed without the SCR or Oxidation Catalyst Systems fully operational. Upon completion of these activities, the owner/operator shall provide written notice to the District Permit Services and Enforcement Divisions and the unused balance of the 500 firing hours without abatement shall expire.

9. The total number of firing hours of S-43 Gas Turbine and S-44 Heat Recovery Steam Generator without abatement of nitrogen oxide emissions by A-13 SCR System and/or A-14 Oxidation Catalyst System shall not exceed 500 hours during the commissioning period. Such operation of S-43 Gas Turbine and S-44 HRSG without abatement shall be limited to discrete commissioning activities that can only be properly executed without the SCR or Oxidation Catalyst Systems fully operational. Upon completion of these activities, the owner/operator shall provide written notice to the

District Permit Services and Enforcement Divisions and the unused balance of the 500 firing hours without abatement shall expire.

10. The total mass emissions of nitrogen oxides, carbon monoxide, precursor organic compounds, PM10, and sulfur dioxide that are emitted by the Gas Turbines (S-41 & S-43) and Heat Recovery Steam Generators (S-42 & S-44) during the commissioning period shall accrue towards the consecutive twelve-month emission limitations specified in condition 24.

11. Combined pollutant mass emissions from the Gas Turbines (S-41 & S-43) and Heat Recovery Steam Generators (S-42 & S-44) shall not exceed the following limits during the commissioning period. These emission limits shall include emissions resulting from the start-up and shutdown of the Gas Turbines (S-41 & S-43).

NOx (as NO2)	8,400 pounds/calendar day	400 pounds/hour
CO	40,000 pounds/calendar day	4,000 pounds/hour
POC(as CH4)	1,600 pounds/calendar day	
PM10	432 pounds/calendar day	
SO2	297 pounds/calendar day	

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12. Prior to the end of the Commissioning Period, the Owner/Operator shall conduct a District and CEC approved source test using external continuous emission monitors to determine compliance with condition 21. The source test shall determine NOx, CO, and POC emissions during start-up and shutdown of the gas turbines. The POC emissions shall be analyzed for methane and ethane to account for the presence of unburned natural gas. The source test shall include a minimum of three start-up and three shutdown periods. No later than twenty working days before the execution of the source tests, the Owner/Operator shall submit to the District and the CEC Compliance Program Manager (CPM) a detailed source test plan designed to satisfy the requirements of this condition. The District and the CEC CPM will notify the Owner/Operator of any necessary modifications to the plan within 20 working days of receipt of the plan; otherwise, the plan shall be deemed approved. The Owner/Operator shall incorporate the District and CEC CPM comments into the test plan. The Owner/Operator shall notify the District and the CEC CPM within seven (7) working days prior to the planned source testing date. Source test results shall be submitted to the District and the CEC CPM within 30 days of the source testing date.

Conditions for the Gas Turbines (S-41 & S-43) and the Heat Recovery Steam Generators (HRSGs; S-42 & S-44)

13. The Gas Turbines (S-41 and S-43) and HRSG Duct Burners (S-42 and S-44) shall be fired exclusively on natural gas. (BACT for SO2 and PM10)

14. The combined heat input rate to each power train consisting of a Gas Turbine and its associated HRSG (S-41 & S-42 and S-43 & S-44) shall not exceed 2,094.4 MM Btu per hour, averaged over any rolling 3-hour period. (PSD for NOx)

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15. The combined heat input rate to each power train consisting of a Gas Turbine and its associated HRSG (S-41 & S-42 and S-43 & S-44) shall not exceed 49,950 MM Btu per calendar day. (PSD for PM10)

16. The combined cumulative heat input rate for the Gas Turbines (S-41 & S-43) and the HRSGs (S-42 & S-44) shall not exceed 34,900,000 MM Btu per year. (Offsets)

17. The HRSG duct burners (S-42 and S-44) shall not be fired unless its associated Gas Turbine (S-41 and S-43, respectively) is in operation. (BACT for NOx)

18. Except as provided in Condition No. 8, S-41 Gas Turbine and S-42 HRSG shall be abated by the properly operated and properly maintained A-11 Selective Catalytic Reduction (SCR) System whenever fuel is combusted at those sources and the A-11 catalyst bed has reached minimum operating temperature. (BACT for NOx)

19. Except as provided in Condition No. 9, S-43 Gas Turbine and S-44 HRSG shall be abated by the properly operated and properly maintained A-13 Selective Catalytic Reduction (SCR) System whenever fuel is combusted at those sources and the A-13 catalyst bed has reached minimum operating temperature. (BACT for NOx)

20. The Gas Turbines (S-41 & S-43) and HRSGs (S-42 & S- 44) shall comply with requirements (a) through (h) under all operating scenarios, including duct burner firing mode. Requirements (a) through (h) do not apply during a gas turbine start-up or shutdown. (BACT, PSD, and Toxic Risk Management Policy)

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(a) Nitrogen oxide mass emissions (calculated in accordance with District approved methods as NO_2) at P-11 (the combined exhaust point for the S-41 Gas Turbine and the S-42 HRSG after abatement by A-11 SCR System) shall not exceed 15.2 pounds per hour or 0.0072 lb./MM Btu (HHV) of natural gas fired. Nitrogen oxide mass emissions (calculated in accordance with District approved methods as NO_2) at P-12 (the combined exhaust point for the S-43 Gas Turbine and the S-44 HRSG after abatement by A-13 SCR System) shall not exceed 15.2 pounds per hour or 0.0072 lb./MM Btu (HHV) of natural gas fired. (PSD for NOx)

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(b) The nitrogen oxide emission concentration at emission points P-11 and P-12 each shall not exceed 2.0 ppmv, on a dry basis, corrected to 15% O_2, averaged over any 1-hour period. (BACT for NOx)

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(c) Carbon monoxide mass emissions at P-11 and P-12 each shall not exceed 0.0088 lb./MM Btu (HHV) of natural gas fired or 18.5 pounds per hour, averaged over any rolling 3-hour period. (PSD for CO)

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(d) The carbon monoxide emission concentration at P-11 and P-12 each shall not exceed 4 ppmv, on a dry basis, corrected to 15% O_2, averaged over any rolling 3-hour period. (BACT for CO)

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(e) Ammonia (NH_3) emission concentrations at P-11 and P-12 each shall not exceed 10 ppmv, on a dry basis, corrected to 15% O_2, averaged over any rolling 3-hour period. This ammonia emission concentration shall be verified by the continuous recording of the ammonia injection rate to A-11 and A-13 SCR Systems. The correlation between the gas turbine and HRSG heat input rates, A-11 and A-13 SCR System ammonia injection rates, and corresponding ammonia emission concentration at emission points P-11 and P-12 shall be determined in accordance with permit condition #29. (TRMP for NH_3)

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(f) Precursor organic compound (POC) mass emissions (as CH_4) at P-11 and P-12 each shall not exceed 5.3 pounds per hour or 0.0025 lb./MM Btu of natural gas fired. (BACT)

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(g) Sulfur dioxide (SO_2) mass emissions at P-11 and P-12 each shall not exceed 5.92 pounds per hour or 0.0028 lb./MM Btu of natural gas fired. (BACT)

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(h) Particulate matter (PM10) mass emissions at P-11 and P-12 each shall not exceed 11 pounds per hour or 0.0095 lb./MM Btu of natural gas fired when the HRSG duct burners are not in operation. Particulate matter (PM10) mass emissions at P-11 and P-12 each shall not exceed 12 pounds per hour or 0.0065 lb./MM Btu of natural gas fired when the HRSG duct burners are in operation. (BACT)

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(i) Compliance with the hourly NOx emission limitations specified in condition 20(a) and 20(b) shall not be required during short-term excursions limited to a cumulative total of 10 hours per rolling 12-month period. Short-term excursions are defined as 15-minute periods designated by the owner/operator that are the direct result of transient load conditions, not to exceed four consecutive 15-minute periods, when the 15-minute average NOx concentration exceeds 2.0 ppmv, dry @ 15% O2. Examples of transient load conditions include, but are not limited to the following:

(1) Initiation/shutdown of combustion turbine inlet air cooling

(2) Rapid combustion turbine load changes

(3) Initiation/shutdown of HRSG duct burners

The maximum 1-hour average NOx concentration for periods that include short-term excursions shall not exceed 30 ppmv, dry @ 15% O2. All emissions during short-term excursions shall be included in all calculations of hourly, daily, and annual mass emission rates as required by this permit.

21. The regulated air pollutant mass emission rates from each of the Gas Turbines (S-41 and S-43) during a start- up or a shutdown or during a combustor tuning period shall not exceed the limits established below. (PSD)

	Start-Up or Combustor Tuning Period (lb./period)	Startup/Shutdown (lb./hr)
Oxides of Nitrogen (as NO2)	600	160
Carbon Monoxide (CO)	5,400	900
Precursor Organic Compounds (as CH4)	96	16

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22. The Gas Turbines (S-41 and S-43) shall not be in start-up mode simultaneously. (PSD)

23. Total combined emissions from the Gas Turbines and HRSGs (S-41, S-42, S-43, and S-44), including emissions generated during Gas Turbine start-ups, shutdowns and combustor tuning periods shall not exceed the following limits during any calendar day:

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(a) 1,994 pounds of NOx (as NO2) per day (CEQA)

(b) 11,470 pounds of CO per day (PSD)

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(c) 468 pounds of POC (as CH4) per day (CEQA)

(d) 577 pounds of PM10 per day (PSD)

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(e) 297 pounds of SO2 per day (BACT)

24. Cumulative combined emissions from the Gas Turbines and HRSGs (S-41, S-42, S-43, and S-44) and the Dewpoint Heater (S-45) and the Diesel Fire Pump Engine (S-48), including emissions generated during gas turbine start-ups, shutdowns and combustor tuning periods shall not exceed the following limits during any consecutive twelve-month period:

Deleted: Fuel Gas Preheater
Deleted: Cooling Tower
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(a) 174.3 tons of NOx (as NO2) per year (Offsets, PSD)

(b) 555.4 tons of CO per year (Cumulative Increase)

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(c) 46.6 tons of POC (as CH4) per year (Offsets)

(d) 101.7 tons of PM10 per year (Offsets, PSD)

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(e) 37.0 tons of SO2 per year (Cumulative Increase)

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25. Toxic and HAP Emission Limits

25.1. The maximum projected annual toxic air contaminant emissions (per condition 28) from the Gas Turbines and HRSGs combined (S-41, S-42, S-43, and S-44) shall not exceed the following limits:

12,656 pounds of formaldehyde per year

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115 pounds of benzene per year

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6.2 pounds of Specified polycyclic aromatic hydrocarbons (PAHs) per year

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unless the following requirement is satisfied:

The owner/operator shall perform a health risk assessment using the emission rates determined by source test and the most current Bay Area Air Quality Management District approved procedures and unit risk factors in effect at the time of the analysis. This risk analysis shall be submitted to the District and the CEC CPM within 60 days of the source test date. The owner/operator may request that the District and the CEC CPM revise the carcinogenic compound emission limits specified above. If the owner/operator demonstrates to the satisfaction of the APCO that these revised emission limits will result in a cancer risk of not more than 10.0 in one million, the District and the CEC CPM may, at their discretion, adjust the carcinogenic compound emission limits listed above. (TRMP)

25.2. The maximum projected annual Hazardous Air Pollutant (HAP) emissions from the Gas Turbines and HRSGs combined (S-41, S-42, S-43, and S-44) shall not exceed the following limit:

20,000 pounds of hexane per year (US-CAA, Section 112(g))

Conformance with this limit shall be verified by the source testing in condition 32.

26. The owner/operator shall demonstrate compliance with conditions 14 through 17, 20(a) through 20(d), 21, 23(a), 23(b), 24(a), and 24(b) by using properly operated and maintained continuous monitors (during all hours of operation including equipment Start-up, Shutdown and Combustor Tuning periods) for all of the following parameters:

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(a) Firing Hours and Fuel Flow Rates for each of the following sources: S-41 & S-42 combined and S-43 & S-44 combined.

(b) Carbon Dioxide (CO2) or Oxygen (O2) concentrations, Nitrogen Oxides (NOx) concentrations, and Carbon Monoxide (CO) concentrations at each of the following exhaust points: P-11 and P-12.

(c) Ammonia injection rate at A-11 and A-13 SCR Systems

(d) Steam injection rate at S-41 & S-43 Gas Turbine Combustors

The owner/operator shall record all of the above parameters every 15 minutes (excluding normal calibration periods) and shall summarize all of the above parameters for each clock hour. For each calendar day, the owner/operator shall calculate and record the total firing hours, the average hourly fuel flow rates, and average hourly pollutant emission concentrations.

The owner/operator shall use the parameters measured above and District-approved calculation methods to calculate the following parameters:

(e) Heat Input Rate for each of the following sources: S-41 & S-42 combined and S-43 & S-44 combined.

(f) Corrected NOx concentrations, NOx mass emissions (as NO2), corrected CO concentrations, and CO mass emissions at each of the following exhaust points: P-11 and P-12.

Applicable to emission points P-11 and P-12, the owner/operator shall record the parameters specified in conditions 26(e) and 26(f) at least once every 15 minutes (excluding normal calibration periods). As specified below, the owner/operator shall calculate and record the following data:

(g) total Heat Input Rate for every clock hour and the average hourly Heat Input Rate for every rolling 3-hour period.

(h) on an hourly basis, the cumulative total Heat Input Rate for each calendar day for the following: each Gas Turbine and associated HRSG combined and all four sources (S-41, S-42, S-43, and S-44) combined.

(i) the average NOx mass emissions (as NO2), CO mass emissions, and corrected NOx and CO emission concentrations for every clock hour and for every rolling 3-hour period.

(j) on an hourly basis, the cumulative total NOx mass emissions (as NO2) and the cumulative total CO mass emissions, for each calendar day for the following: each Gas Turbine and associated HRSG combined, and all four sources (S-41, S-42, S-43, and S-44) combined.

(k) For each calendar day, the average hourly Heat Input Rates, Corrected NOx emission concentrations, NOx mass emissions (as NO2), corrected CO emission concentrations, and CO mass emissions for each Gas Turbine and associated HRSG combined.

(l) on a daily basis, the cumulative total NOx mass emissions (as NO2) and cumulative total CO mass emissions, for the previous consecutive twelve month period for all four sources (S-41, S-42, S-43, and S-44) combined.

(1-520.1, 9-9-501, BACT, Offsets, NSPS, PSD, Cumulative Increase)

27. To demonstrate compliance with conditions 20(f), 20(g), 20(h), 23(c) through 23(e), and 24(c) through 24(e), the owner/operator shall calculate and record on a daily basis, the Precursor Organic Compound (POC) mass emissions, Fine Particulate Matter (PM10) mass emissions (including condensable particulate matter), and Sulfur Dioxide (SO2) mass emissions from each power train. The owner/operator shall use the actual Heat Input Rates calculated pursuant to condition 26, actual Gas Turbine Start-up Times, actual Gas Turbine Shutdown Times, and CEC and District-approved emission factors to calculate these emissions. The calculated emissions shall be presented as follows:

(a) For each calendar day, POC, PM10, and SO2 emissions shall be summarized for: each power train (Gas Turbine and its respective HRSG combined) and all four sources (S-41, S-42, S-43, and S-44) combined.

(b) on a daily basis, the 365 day rolling average cumulative total POC, PM10, and SO2 mass emissions, for all four sources (S-41, S-42, S-43, and S-44) combined.

(Offsets, PSD, Cumulative Increase)

28. To demonstrate compliance with Condition 25, the owner/operator shall calculate and record on an annual basis the maximum projected annual emissions of Formaldehyde, Benzene, and Specified PAHs. Maximum projected annual emissions shall be calculated using the maximum Heat Input Rate of 34,900,000 MM Btu/year and the highest emission factor (pounds of pollutant per MM Btu of Heat Input) determined by any source test of the S-41 & S-43 Gas Turbines and/or S-42 & S-44 Heat Recovery Steam Generators. If this calculation method results in an unrealistic mass emission rate (the highest emission factor occurs at a low firing rate) the applicant may use an alternate calculation, subject to District approval. (TRMP)

29. Within 60 days of start-up of the GGS, the owner/operator shall conduct a District-approved source est on exhaust point P-11 or P-12 to determine the corrected ammonia (NH3) emission concentration to determine compliance with condition 20(e). The source test shall determine the correlation between the heat input rates of the gas turbine and associated HRSG, A-11 or A-13 SCR System ammonia injection rate, and the corresponding NH3 emission concentration at emission point P-11 or P-12. The source test shall be conducted over the expected operating range of the turbine and HRSG (including, but not limited to minimum, 70%, 85%, and 100% load) to establish the range of ammonia injection rates necessary to achieve NOx emission reductions while maintaining ammonia slip levels. Continuing compliance with condition 20(e) shall be demonstrated through calculations of corrected ammonia concentrations based upon the source test correlation and continuous records of ammonia injection rate. (TRMP)

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30. Within 60 days of start-up of the GGS and on an annual basis thereafter, the owner/operator shall conduct a District-approved source test on exhaust points P-11 and P-12 while each Gas Turbine and associated Heat Recovery Steam Generator are operating at maximum load to determine compliance with Conditions 20(a), (b), (c), (d), (f), (g), and (h), while each Gas Turbine and associated Heat Recovery Steam Generator are operating at minimum load to determine compliance with Conditions 20(c) and (d), and to verify the accuracy of the continuous emission monitors required in condition 26. The owner/operator shall test for (as a minimum): water content, stack gas flow rate, oxygen concentration, precursor organic compound concentration and mass emissions, nitrogen oxide concentration and mass emissions (as NO2), carbon monoxide concentration and mass emissions, sulfur dioxide concentration and mass emissions, methane, ethane, and particulate matter (PM10) emissions including condensable particulate matter. (BACT, offsets)

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31. The owner/operator shall obtain approval for all source test procedures from the District's Source Test Section and the CEC CPM prior to conducting any tests. The owner/operator shall comply with all applicable testing requirements for continuous emission monitors as specified in Volume V of the District's Manual of Procedures. The owner/operator shall notify the District's Source Test Section and the CEC CPM in writing of the source test protocols and projected test dates at least 7 days prior to the testing date(s). As indicated above, the Owner/Operator shall measure the contribution of condensable PM (back half) to the total PM10 emissions. However, the Owner/Operator may propose alternative measuring techniques to measure condensable PM such as the use of a dilution tunnel or other appropriate method used

to capture semi-volatile organic compounds. Source test results shall be submitted to the District and the CEC CPM within 60 days of conducting the tests. (BACT)

32. Within 60 days of start-up of the GGS and on a biennial basis (once every two years) thereafter, the owner/operator shall conduct a District-approved source test on exhaust point P-11 or P-12 while the Gas Turbine and associated Heat Recovery Steam Generator are operating at maximum allowable operating rates to demonstrate compliance with Condition 25. If three consecutive biennial source tests demonstrate that the annual emission rates calculated pursuant to condition 28 for any of the compounds listed below are less than the BAAQMD Toxic Risk Management Policy trigger levels shown, then the owner/operator may discontinue future testing for that pollutant:

Benzene	less than or equal	26.8 pounds/year
Formaldehyde	less than or equal	132 pounds/year
Specified PAHs	less than or equal	0.18 pounds/year

(TRMP)

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33. The owner/operator of the GGS shall submit all reports (including, but not limited to monthly CEM reports, monitor breakdown reports, emission excess reports, equipment breakdown reports, etc.) as required by District Rules or Regulations and in accordance with all procedures and time limits specified in the Rule, Regulation, Manual of Procedures, or Enforcement Division Policies & Procedures Manual. (Regulation 2-6-502)

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34. The owner/operator of the GGS shall maintain all records and reports on site for a minimum of 5 years. These records shall include but are not limited to: continuous monitoring records (firing hours, fuel flows, emission rates, monitor excesses, breakdowns, etc.), source test and analytical records, natural gas sulfur content analysis results, emission calculation records, records of plant upsets and related incidents. The owner/operator shall make all records and reports available to District and the CEC CPM staff upon request. (Regulation 2-6-501)

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35. The owner/operator of the GGS shall notify the District and the CEC CPM of any violations of these permit conditions. Notification shall be submitted in a timely manner, in accordance with all applicable District Rules, Regulations, and the Manual of Procedures. Notwithstanding the notification and reporting requirements given in any District Rule, Regulation, or the Manual of Procedures, the owner/operator shall submit written notification (facsimile is acceptable) to the Enforcement Division within 96 hours of the violation of any permit condition. (Regulation 2-1-403)

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36. The stack height of emission points P-11 and P-12 shall each be at least 195 feet above grade level at the stack base. (PSD, TRMP)

37. The Owner/Operator of GGS shall provide adequate stack sampling ports and platforms to enable the performance of source testing. The location and configuration of the stack sampling ports shall be subject to BAAQMD review and approval. (Regulation 1-501)

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38. Within 180 days of the issuance of the Authority to Construct for the GGS, the Owner/Operator shall contact the BAAQMD Technical Services Division regarding requirements for the continuous monitors, sampling ports, platforms, and source tests required by conditions 26, 29, 30 and 32. All source testing and monitoring shall be conducted in accordance with the BAAQMD Manual of Procedures. (Regulation 1-501)

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39. Prior to the issuance of the BAAQMD Authority to Construct for the GGS, the Owner/Operator shall demonstrate that valid emission reduction credits in the amount of

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200.5 tons/year of Nitrogen Oxides, 53.6 tons/year of Precursor Organic Compounds or equivalent (as defined by District Regulations 2-2-302.1 and 2-2-302.2), and 101.7 tons of Particulate Matter less than 10 microns are under their control through enforceable contracts, option to purchase agreements, or equivalent binding legal documents. (Offsets)

40. Prior to the start of construction of the GGS, the Owner/Operator shall provide to the District valid emission reduction credit banking certificates in the amount of 200.5 tons/year of Nitrogen Oxides, 53.6 tons/year of Precursor Organic Compounds or equivalent as defined by District Regulations 2-2-302.1 and 2-2-302.2 and 101.7 tons of Particulate Matter less than 10 microns. (Offsets)

41. Pursuant to BAAQMD Regulation 2, Rule 6, section 404.3, the owner/operator of the GGS shall submit an application to the BAAQMD for a significant revision to the Major Facility Review Permit prior to commencing operation. (Regulation 2-6-404.3)

42. Pursuant to 40 CFR Part 72.30(b)(2)(ii) of the Federal Acid Rain Program, the owner/operator of the CCPP Unit 8 shall not operate either of the gas turbines until either: 1) a Title IV Operating Permit has been issued; 2) 24 months after a Title IV Operating Permit Application has been submitted, whichever is earlier. (Regulation 2, Rule 7)

43. The GGS shall comply with the continuous emission monitoring requirements of 40 CFR Part 75. (Regulation 2, Rule 7)

44. The owner/operator shall take quarterly samples of the natural gas combusted at the GGS. The samples shall be analyzed for sulfur content using District- approved laboratory methods or the owner/operator shall obtain certified analytical results from the gas supplier. The sulfur content test results shall be retained on site for a minimum of five years from the test date and shall be utilized to satisfy the requirements of 40 CFR Part 60, subpart GG. Sulfur content of each individual sample shall be no more than 1.0 grains/100 scf. Average sulfur content of four quarterly samples shall be no more than 0.75 grains/100 scf. (cumulative increase)

45. [deleted]46. [deleted]e47. The Dewpoint Heater (S-45) shall not be fired more than 156 MMBtu/day. (BACT)

Conditions for S-48 Emergency Fire Pump Engine

48. Operation of S-48 for reliability-related activities is limited to 50 hours per year. (Stationary Diesel Engine ATCM)

49. The owner/operator shall operate engine S-48 only for the following purposes: to mitigate emergency conditions, for emission testing to demonstrate compliance with a District, state or Federal emission limit, or for reliability-related activities (maintenance and other testing, but excluding emission testing). Operating hours while mitigating emergency conditions or while emission testing to show compliance with District, state or Federal emission limits is not limited. (Stationary Diesel Engine ATCM)

50. The owner/operator shall operate engine S-48 only when a non-resettable totalizing meter (with a minimum display capability of 9,999 hours) that measures the hours of operation for the engine is installed, operated and properly maintained. (Stationary Diesel Engine ATCM)

51. Records: The owner/operator shall maintain the following monthly records in a District-approved log for at least 36 months from the date of entry. Log entries shall be

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Deleted: The owner/operator shall perform a visual inspection

Deleted: f the cooling tower drift eliminators at least once per calendar year, and repair or replace any drift eliminator components which are broken or missing. Prior to the initial operation of the CCPP Unit 8, the owner/operator shall have the cooling tower vendor's field representative inspect the cooling tower drift eliminators and certify that the installation was performed in a satisfactory manner. The CEC CPM may, in years 5 and 15 of cooling tower operation, require the owner/operator to perform a source test to determine the PM10 emission rate from the cooling tower to verify compliance with the vendor-guaranteed drift rate specified in condition 45. (PSD) ¶

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