APPENDIX A

Air Quality Data

APPENDIX A-1

URBEMIS2007 Output – Operational Worker Trips

Prepared by Impact Sciences, Inc.
August 2008

8/9/2008 8:12:04 PM

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\ddeckman\Application Data\Urbemis\Version9a\Projects\SNGS - Worker Trips.urb924

Project Name: SNGS - Worker Trips

Project Location: Sacramento County AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day, unmitigated)	0.13	0.04	0.82	0.00	0.11

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day, unmitigated)	0.13	0.04	0.82	0.00	0.11

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Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10
General heavy industry	0.13	0.04	0.82	0.00	0.11
TOTALS (lbs/day, unmitigated)	0.13	0.04	0.82	0.00	0.11

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2009 Temperature (F): 95 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
General heavy industry		1.50	1000 sq ft	4.00	6.00	62.70
					6.00	62.70

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	59.5	1.7	97.9	0.4
Light Truck < 3750 lbs	12.5	4.0	88.0	8.0
Light Truck 3751-5750 lbs	28.0	0.9	98.7	0.4
Med Truck 5751-8500 lbs	0.0	1.0	99.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	0.0	0.0	76.2	23.8
Lite-Heavy Truck 10,001-14,000 lbs	0.0	0.0	55.6	44.4

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Med-Heavy Truck 14,001-33,000 lbs	0.0	6.2	18.8	75.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.0	0.0	20.0	80.0
Other Bus	0.0	0.0	0.0	100.0
Urban Bus	0.0	0.0	0.0	0.0
Motorcycle	0.0	71.4	28.6	0.0
School Bus	0.0	0.0	0.0	100.0
Motor Home	0.0	11.1	77.8	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	10.8	7.3	7.3
Rural Trip Length (miles)	15.0	10.0	10.0	15.0	10.0	10.0
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	100.0	0.0	0.0			
% of Trips - Commercial (by land use)						
General heavy industry				90.0	5.0	5.0

8/9/2008 08:13:03 PM

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\ddeckman\Application Data\Urbemis\Version9a\Projects\SNGS - Worker Trips.urb924

Project Name: SNGS - Worker Trips

Project Location: Sacramento County AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day, unmitigated)	0.06	0.07	0.64	0.00	0.11

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day, unmitigated)	0.06	0.07	0.64	0.00	0.11

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Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10
General heavy industry	0.06	0.07	0.64	0.00	0.11
TOTALS (lbs/day, unmitigated)	0.06	0.07	0.64	0.00	0.11

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2009 Temperature (F): 50 Season: Winter

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
General heavy industry		1.50	1000 sq ft	4.00	6.00	62.70
					6.00	62.70

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	59.5	1.7	97.9	0.4
Light Truck < 3750 lbs	12.5	4.0	88.0	8.0
Light Truck 3751-5750 lbs	28.0	0.9	98.7	0.4
Med Truck 5751-8500 lbs	0.0	1.0	99.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	0.0	0.0	76.2	23.8
Lite-Heavy Truck 10,001-14,000 lbs	0.0	0.0	55.6	44.4

Med-Heavy Truck 14,001-33,000 lbs	0.0	6.2	18.8	75.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.0	0.0	20.0	80.0
Other Bus	0.0	0.0	0.0	100.0
Urban Bus	0.0	0.0	0.0	0.0
Motorcycle	0.0	71.4	28.6	0.0
School Bus	0.0	0.0	0.0	100.0
Motor Home	0.0	11.1	77.8	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	10.8	7.3	7.3
Rural Trip Length (miles)	15.0	10.0	10.0	15.0	10.0	10.0
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	100.0	0.0	0.0			
% of Trips - Commercial (by land use)						
General heavy industry				90.0	5.0	5.0

APPENDIX A-2

URBEMIS2007 Output – Operational Emissions under Current Zoning

Prepared by Impact Sciences, Inc.
August 2008

8/9/2008 4:58:00 PM

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\ddeckman\Application Data\Urbemis\Version9a\Projects\SNGS - Existing Zoning FAR 025.urb924

Project Name: Existing Zoning

Project Location: Sacramento County AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day, unmitigated)	0.51	0.82	2.27	0.00	0.00

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day, unmitigated)	4.52	4.18	51.68	0.04	5.72

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day, unmitigated)	5.03	5.00	53.95	0.04	5.72

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Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10
Natural Gas	0.06	0.80	0.67	0.00	0.00
Hearth					
Landscape	0.13	0.02	1.60	0.00	0.00
Consumer Products					
Architectural Coatings	0.32				
TOTALS (lbs/day, unmitigated)	0.51	0.82	2.27	0.00	0.00

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10
Industrial park	4.52	4.18	51.68	0.04	5.72
TOTALS (lbs/day, unmitigated)	4.52	4.18	51.68	0.04	5.72

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2009 Temperature (F): 95 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

8/9/2008 4:58:00 PM

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Industrial park		6.96	1000 sq ft	54.45	378.97	3,316.95
					378.97	3,316.95

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	47.7	1.7	97.9	0.4
Light Truck < 3750 lbs	10.0	4.0	88.0	8.0
Light Truck 3751-5750 lbs	22.5	0.9	98.7	0.4
Med Truck 5751-8500 lbs	10.1	1.0	99.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	2.1	0.0	76.2	23.8
Lite-Heavy Truck 10,001-14,000 lbs	0.9	0.0	55.6	44.4
Med-Heavy Truck 14,001-33,000 lbs	1.6	6.2	18.8	75.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.5	0.0	20.0	80.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.0	0.0	0.0	0.0
Motorcycle	3.5	71.4	28.6	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	0.9	11.1	77.8	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	10.8	7.3	7.3

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Rural Trip Length (miles)	15.0	10.0	10.0	15.0	10.0	10.0
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Industrial park				41.5	20.8	37.8

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Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\ddeckman\Application Data\Urbemis\Version9a\Projects\SNGS - Existing Zoning FAR 025.urb924

Project Name: Existing Zoning

Project Location: Sacramento County AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day, unmitigated)	0.38	0.80	0.67	0.00	0.00

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day, unmitigated)	3.92	6.30	44.21	0.03	5.72

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day, unmitigated)	4.30	7.10	44.88	0.03	5.72

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Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10
Natural Gas	0.06	0.80	0.67	0.00	0.00
Hearth					
Landscaping - No Winter Emissions					
Consumer Products					
Architectural Coatings	0.32				
TOTALS (lbs/day, unmitigated)	0.38	0.80	0.67	0.00	0.00

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10
Industrial park	3.92	6.30	44.21	0.03	5.72
TOTALS (lbs/day, unmitigated)	3.92	6.30	44.21	0.03	5.72

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2009 Temperature (F): 50 Season: Winter

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

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Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Industrial park		6.96	1000 sq ft	54.45	378.97	3,316.95
					378.97	3,316.95

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	47.7	1.7	97.9	0.4
Light Truck < 3750 lbs	10.0	4.0	88.0	8.0
Light Truck 3751-5750 lbs	22.5	0.9	98.7	0.4
Med Truck 5751-8500 lbs	10.1	1.0	99.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	2.1	0.0	76.2	23.8
Lite-Heavy Truck 10,001-14,000 lbs	0.9	0.0	55.6	44.4
Med-Heavy Truck 14,001-33,000 lbs	1.6	6.2	18.8	75.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.5	0.0	20.0	80.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.0	0.0	0.0	0.0
Motorcycle	3.5	71.4	28.6	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	0.9	11.1	77.8	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	10.8	7.3	7.3

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Rural Trip Length (miles)	15.0	10.0	10.0	15.0	10.0	10.0
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Industrial park				41.5	20.8	37.8

8/9/2008 4:53:24 PM

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\ddeckman\Application Data\Urbemis\Version9a\Projects\SNGS - Existing Zoning FAR 050.urb924

Project Name: Existing Zoning

Project Location: Sacramento County AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day, unmitigated)	0.83	0.82	2.27	0.00	0.00

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day, unmitigated)	9.05	8.36	103.35	0.07	11.44

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day, unmitigated)	9.88	9.18	105.62	0.07	11.44

8/9/2008 4:53:24 PM

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10
Natural Gas	0.06	0.80	0.67	0.00	0.00
Hearth					
Landscape	0.13	0.02	1.60	0.00	0.00
Consumer Products					
Architectural Coatings	0.64				
TOTALS (lbs/day, unmitigated)	0.83	0.82	2.27	0.00	0.00

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10
Industrial park	9.05	8.36	103.35	0.07	11.44
TOTALS (lbs/day, unmitigated)	9.05	8.36	103.35	0.07	11.44

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2009 Temperature (F): 95 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

8/9/2008 4:53:24 PM

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Industrial park		6.96	1000 sq ft	108.90	757.94	6,633.91
					757.94	6,633.91

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	47.7	1.7	97.9	0.4
Light Truck < 3750 lbs	10.0	4.0	88.0	8.0
Light Truck 3751-5750 lbs	22.5	0.9	98.7	0.4
Med Truck 5751-8500 lbs	10.1	1.0	99.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	2.1	0.0	76.2	23.8
Lite-Heavy Truck 10,001-14,000 lbs	0.9	0.0	55.6	44.4
Med-Heavy Truck 14,001-33,000 lbs	1.6	6.2	18.8	75.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.5	0.0	20.0	80.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.0	0.0	0.0	0.0
Motorcycle	3.5	71.4	28.6	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	0.9	11.1	77.8	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	10.8	7.3	7.3

8/9/2008 4:53:24 PM

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Rural Trip Length (miles)	15.0	10.0	10.0	15.0	10.0	10.0
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Industrial park				41.5	20.8	37.8

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Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\ddeckman\Application Data\Urbemis\Version9a\Projects\SNGS - Existing Zoning FAR 050.urb924

Project Name: Existing Zoning

Project Location: Sacramento County AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day, unmitigated)	0.70	0.80	0.67	0.00	0.00

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day, unmitigated)	7.83	12.61	88.42	0.06	11.44

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day, unmitigated)	8.53	13.41	89.09	0.06	11.44

8/9/2008 4:54:42 PM

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10
Natural Gas	0.06	0.80	0.67	0.00	0.00
Hearth					
Landscaping - No Winter Emissions					
Consumer Products					
Architectural Coatings	0.64				
TOTALS (lbs/day, unmitigated)	0.70	0.80	0.67	0.00	0.00

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10
Industrial park	7.83	12.61	88.42	0.06	11.44
TOTALS (lbs/day, unmitigated)	7.83	12.61	88.42	0.06	11.44

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2009 Temperature (F): 50 Season: Winter

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

8/9/2008 4:54:42 PM

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Industrial park		6.96	1000 sq ft	108.90	757.94	6,633.91
					757.94	6,633.91

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	47.7	1.7	97.9	0.4
Light Truck < 3750 lbs	10.0	4.0	88.0	8.0
Light Truck 3751-5750 lbs	22.5	0.9	98.7	0.4
Med Truck 5751-8500 lbs	10.1	1.0	99.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	2.1	0.0	76.2	23.8
Lite-Heavy Truck 10,001-14,000 lbs	0.9	0.0	55.6	44.4
Med-Heavy Truck 14,001-33,000 lbs	1.6	6.2	18.8	75.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.5	0.0	20.0	80.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.0	0.0	0.0	0.0
Motorcycle	3.5	71.4	28.6	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	0.9	11.1	77.8	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	10.8	7.3	7.3

8/9/2008 4:54:42 PM

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Rural Trip Length (miles)	15.0	10.0	10.0	15.0	10.0	10.0
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Industrial park				41.5	20.8	37.8

APPENDIX A-3

Health Risk Screening Assessment

Prepared by Environ Corporation
March 2008

ENVIRON

March 25, 2008

Ms. Emily Keller
Senior Scientist, Wetlands and Wildlife Biologist
PBS&J
1200 Second Street
Sacramento, CA 95814

RE: Health Risk Screening Analysis - Proposed Sacramento Natural Gas Storage Project, Florin Gas Field Facility

Dear Ms. Keller:

At the request of PBS&J, ENVIRON International Corporation (ENVIRON) performed an ambient air quality health risk screening analysis (HRSA) of the toxic air contaminant (TAC) emissions from a glycol dehydration unit associated with the Sacramento Natural Gas Storage Project at the Florin Gas Field (the "Project") in Sacramento, California (the "Site"). Our analysis indicates that the proposed operations of the Project are not expected to have a significant human health risk impact as defined under Sacramento Metropolitan Air Quality Management District (SMAQMD) California Environmental Quality Act (CEQA) Guidelines.

Process

ENVIRON performed this HRSA using information obtained from PBS&J. This HRSA reflects the fact that we utilized conservative methodologies for:

1) the estimation of TAC emissions,
2) the calculation of screening-level airborne TAC concentrations at offsite receptors, and
3) the estimation of cancer risks and non-cancer hazards at these receptors.

Potential incremental health effects resulting from exposure to projected emissions of TAC associated with the Project were evaluated for hypothetical offsite workers and offsite residential receptors nearby the Site boundary. Two sensitive offsite receptors representing Still Water's Academy and Elder Creek Elementary were also considered. ENVIRON evaluated potential exposures to TAC emission at these locations using conservative (i.e., health protective) exposure parameters consistent with the California Environmental Protection Agency (Cal/EPA) Office of Environmental Health Hazard Assessment (OEHHA) risk screening guidance.[1]

Using an established emission estimation model developed by the Gas Research Institute (GRI) for use in regulatory permitting projects (GRI-GLYCalc 4.0), ENVIRON estimated

[1] California Environmental Protection Agency (Cal/EPA). 2003. *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments.* Office of Environmental Health Hazard Assessment. August.

TAC emissions for the glycol dehydration unit. Parameters used for GRI-GLYCalc and emission estimates are shown in Table 1. GRI-GLYCalc estimates emissions of the BTEX compounds (i.e., benzene, toluene, ethyl benzene and xylenes) and n-hexane, all of which are considered TACs under OEHHA guidance.[2]

Consistent with SMAQMD-approved practices, TAC concentrations for estimated emissions at receptor locations were conservatively estimated using the United States Environmental Protection Agency (USEPA) air dispersion model SCREEN3, which represents worst-case scenario meteorological conditions. Parameters used in SCREEN3 modeling are shown in Table 2 and estimated one-hour maximum and annual average concentrations for BTEX and n-hexane are presented in Table 3. One-hour maximum concentrations estimated using SCREEN3 were converted to annual average concentrations using a conservative conversion factor of 0.1, per OEHHA guidance.[3]

Quantitative estimates of cancer risks and non-cancer health effects associated with potential offsite residential, offsite worker and offsite child exposure at nearby schools to TACs from the Project were then calculated based on the screening air dispersion modeling results. Exposure assumptions used in this analysis are presented in Table 4 and toxicity values are presented in Table 5. GRI-GLYCalc only estimates BTEX emissions as a composite, therefore all BTEX was assumed to be benzene as it has the highest toxicity of all BTEX compounds. This is a conservative assumption as BTEX emissions represent a mixture of compounds that have a composite toxicity lower than benzene.

As part of this HRSA, the estimated human health risks were compared to the thresholds for significance for TACs in the SMAQMD CEQA Guidelines for a maximally exposed individual (MEI). These results are shown in Table 6. The SMAQMD CEQA Guidelines thresholds correspond to the TAC concentration that would not pose an unacceptable health risk to offsite populations. According to the SMAQMD CEQA Guidelines, the threshold for significance for TACs is a cancer risk greater than ten in one million (1×10^{-5}) and a non-cancer hazard index (HI) of greater than one for the MEI.[4]

Findings

The results of our analysis indicate that the estimated incremental cancer risks and non-cancer HIs for the offsite workers and offsite residents in the vicinity of Project and the offsite children at nearby schools are below the SMAQMD CEQA thresholds (i.e. an estimated cancer risk of less than ten in one million and an HI less than one), as summarized in Table 6. Thus, based on the results of this HRSA, the Project should not have a significant adverse impact on human health according to SMAQMD CEQA Guidelines.

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[2] Ibid.

[3] Ibid.

[4] Sacramento Metropolitan Air Quality Management District (SMAQMD). 2004. Guide to Air Quality Assessment in Sacramento County. July.

To provide perspective for the results of a HRSA, OEHHA indicates that the estimated cancer risks can be "compared to the overall risk of cancer in the general U.S. population" or "to the risk posed by all harmful chemicals in a particular medium, such as air. The cancer risk from breathing current levels of pollutants in California's ambient air over a 70-year lifetime is estimated to be 760 in one million."[5] Furthermore, the California Department of Health Services (DHS) reports that two in five Californians will be diagnosed with cancer during their lifetime, corresponding to a background cancer risk of 400,000 in one million.[6]

The many conservative assumptions that have been used in this screening assessment regarding the identification of truck traffic routes and associated emissions, estimation of ambient air concentrations, and exposure assumptions likely lead to an overestimate of potential risks, the magnitude of which could likely be substantial. The USEPA explains the effect of using conservative parameters in regulatory risk assessments as follows: [7]

> *"These values are upper-bound estimates of excess cancer risk potentially arising from lifetime exposure to the chemical in question. A number of assumptions have been made in the derivation of these values, many of which are likely to overestimate exposure and toxicity. The actual incidence of cancer is likely to be lower than these estimates and may be zero."*

Closing

Thank you for the opportunity to complete this assignment. If you have any questions about our analysis or need further information, please feel free to contact Liz Miesner at 415.796.1938 or emiesner@environcorp.com or Michael Keinath at 510.420.2539 or mkeinath@environcorp.com.

Sincerely,

Michael Keinath, P.E.
Manager

Elizabeth A. Miesner, M.S.
Principal

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[5] Office of Environmental Health Hazard Assessment (OEHHA) 2001. A Guide to Health Risk Assessment. California Environmental Protection Agency.

[6] California Department of Health Services (DHS), California Cancer Registry. 2006. Available at http://www.dhs.ca.gov/cdic.

[7] USEPA. 1989. Risk Assessment Guidance for Superfund: Volume 1- Human Health Evaluation Manual (Part A). Interim Final. Washington, D.C. December.

Attachments:

Table 1: GRI-Glycalc 4.0 Inputs and Outputs

Table 2: SCREEN3 Modeling Parameters

Table 3: Summary of Receptor Concentrations

Table 4: OEHHA-Recommended Exposure Parameters for Evaluating Cancer Risk for Resident, Worker, and Child Receptors

Table 5: Inhalation Carcinogenic and Non-Carcinogenic Toxicity Values for Benzene and n-Hexane

Table 6: Summary of Carcinogenic Risks and Non-Cancer Hazard Indices

Table 1
GRI-Glycalc 4.0 Inputs and Outputs
SNGS Florin Facility
Sacramento, CA

Inputs	Units	Value
Annual Hours of Operation	hours	3075.0
Wet gas temperature	degrees F	97.00
Wet gas pressure	psig	250.00
Wet Gas Water Content		Saturated
Composition of the wet gas[1]		
Methane	volume %	99.97%
n-Hexane	volume %	0.03%
BTEX	volume %	<0.01%
Dry Gas Flow Rate[2]	MMSCF / day	225-314
Dry Gas Water Content	lbs H_2O / MMSCF	7.0
Lean Glycol Type:		TEG
Lean Glycol Water Content:	weight % H_2O	1.0%
Lean Glycol Recirculation Ratio:	gallons/lb H2O	3.0
Glycol Pump Type		Electric/Pneumatic
Flash Tank Control[3]		Vented to atmosphere
Flash Tank Temperature:	degrees F	200.0
Flash Tank Pressure:	psig	75.0
Output		
Annual BTEX Emissions (at Average Dry Gas Flow Rate)	lbs/yr	976
Maximum Hourly BTEX Emissions (at Maximum Dry Gas Flow Rate)	lbs/hr	0.44
Annual n-Hexane Emissions (at Average Dry Gas Flow Rate)	lbs/yr	9,614

Notes:

1. Client data specified BTEX concentrations <1 ppm. To be conservative, ENVIRON assumed a concentration of 1 ppm of BTEX.
2. The average flow rate is 225 MMSCF/day; the maximum flow rate is 314 MMSCF/day.
3. Assumed to be conservative.

Abbreviations:

BTEX - benzene, toluene, ethyl benzene, xylenes
F - Fahrenheit
hr - hour
lb(s) - pound(s)
MMSCF - million standard cubic feet
ppm - parts per million
TEG - triethylene glycol
yr - year
% - percent

Source:

Inputs provided by client.

Table 2
SCREEN3 Modeling Parameters
SNGS Florin Facility
Sacramento, CA

Parameter	Units	Value
BTEX Emission Rate (1-hr maximum) [1]	g/s	0.056
BTEX Emission Rate (annual) [2]	g/s	0.014
n-Hexane Emission Rate (annual) [2]	g/s	0.14
Stack Height	m	6.1
Stack Diameter	m	0.356
Exit Velocity	m/s	4.91
Exit Temperature	K	644
Air Temperature	K	293

Notes:

1. 1-hour maximum emission rate = hourly emissions (lbs/hr)*453.59 g/lb / (3600 s/hr)
2. Annual emission rate = annual emissions (lbs/yr)*453.59 g/lb / (8760 hr/yr * 3600 s/hr)

Abbreviations:

BTEX - benzene, toluene, ethyl benzene, xylenes
g - gram
hr - hour
K - Kelvin
lb - pound
m - meter
s - second
yr - year

Table 3
Summary of Receptor Concentrations
SNGS Florin Facility
Sacramento, CA

Receptor	Location	BTEX 1-Hour Maximum Concentration[1]	BTEX Annual Average Concentration[2]	n-Hexane Annual Average Concentration[2]
		ug/m^3	ug/m^3	ug/m^3
PMI	92 meters from source	18	0.44	4.4
MEIW	Nearest offsite worker identified at 150 meters north or east of source	17	0.42	4.1
MEIR	Nearest residence identified 800 meters west of source	7.7	0.19	1.9
Still Water's Academy	8008 43rd Ave. (900 meters west of source)	6.8	0.17	1.7
Elder Creek Elementary	7934 Lemon Hill Ave. (900 meters west of source)	6.8	0.17	1.7

Notes:

1. Estimated directly using SCREEN3 with the maximum hourly emission rate of BTEX under the maximum dry gas flow rate of 314 MMSCF/day.

2. Estimated using SCREEN3 to estimate a 1-hour maximum concentration for the emissions of BTEX and n-hexane under the average dry gas flow rate of 225 MMSCF/day and then scaling the 1-hour maximum concentration to an annual concentration using the factor 0.1, as recommended by OEHHA guidance.

Abbreviations:

BTEX - benzene, toluene, ethyl benzene, xylenes
MEIR - Maximally Exposed Individual Resident
MEIW - Maximally Exposed Individual Worker
MMSCF - million standard cubic feet
OEHHA - Office of Environmental Health Hazard Assessment
PMI - Point of Maximum Impact
ug/m^3 - microgram per cubic meter

Source:

California Environmental Protection Agency (Cal/EPA). 2003. "Air Toxics Hot Spots Program Risk Assessment Guidelines, the Air Toxics Hot Spots Program Guidance Manual for Preparations of Health Risk Assessments," Office of Environmental Health Hazard Assessment, August.

Table 4

OEHHA-Recommended Exposure Parameters for Evaluating Cancer Risk for Resident, Worker, and Child Receptors

SNGS Florin Facility

Sacramento, CA

Exposure Parameter	Units	Resident	Worker	Child
Daily Breathing Rate [1]	[L/kg-day]	302	149	581
Exposure Time	[hours/day]	24	8	8
Exposure Frequency	[days/year]	350	245	180
Exposure Duration	[years]	70	40	9
Conversion Factor (CF)	[m^3/L]	0.001	0.001	0.001
Averaging Time	[days]	25550	25550	25550
Intake Factor, Inhalation (IF_{inh}) [2]	[m^3/kg-day]	0.29	0.057	0.012

Notes:

1. Resident uses 80th percentile breathing rate used per ARB Guidance. Worker and child use high end values per OEHHA.
2. Resident and worker: IFinh = (Breathing Rate*Exposure Frequency*Exposure Duration*CF)/(Averaging time)
   Child: IFinh = (Breathing Rate*[Exposure Time/24 hours]*Exposure Frequency*Exposure Duration*CF)/(Averaging time)

Abbreviations:

CF - conversion factor
IFinh - inhalation intake factor
kg - kilogram
l - liter
m - meter
OEHHA = Office of Environmental Health Hazard Assessment

Source:

California Air Resources Board (ARB). 2003. "Air Resources Board Recommended Interim Risk Management Policy for Inhalation-Based Residential Cancer Risk." October 9.

California Environmental Protection Agency (Cal/EPA). 2003. "Air Toxics Hot Spots Program Risk Assessment Guidelines, the Air Toxics Hot Spots Program Guidance Manual for Preparations of Health Risk Assessments," Office of Environmental Health Hazard Assessment, August .

Table 5
Inhalation Carcinogenic and Non-Carcinogenic Toxicity Values for Benzene and n-Hexane
SNGS Florin Facility
Sacramento, CA

Chemical	CPF $(mg/kg\text{-}day)^{-1}$	Source	Chronic REL (ug/m^3)	Reference	Acute REL (ug/m^3)	Source
Benzene [1]	0.10	Cal/EPA 2007	60	Cal/EPA 2005	1300	Cal/EPA 2003
n-Hexane	NA		7000	Cal/EPA 2005	NA	

Notes:

1. BTEX assumed to be 100% benzene as it has the highest toxicity of BTEX compounds.

Abbreviation:

BTEX - benzene, toluene, ethyl benzene, xylenes
CPF - Cancer Potency Factor
NA - not applicable
REL - Reference exposure level
(mg/kg-day)-1 - milligram per kilogram-day
ug/m^3 - microgram per cubic meter

Source:

California Environmental Protection Agency (Cal/EPA). 2003. Air Toxics Hot Spots Program Risk Assessment Guidelines, the Air Toxics Hot Spots Program Guidance Manual for Preparations of Health Risk Assessments," OEHHA, August.

California Environmental Protection Agency (Cal/EPA). 2005. All Chronic Reference Exposure Levels Adopted by Office of Environmental Health Hazard Assessment (OEHHA). January.

California Environmental Protection Agency (Cal/EPA). 2007. California Cancer Potency Values. Office of Environmental Health Hazard Assessment. April 9.

Table 6
Summary of Carcinogenic Risks and Non-Cancer Hazard Indices
SNGS Florin Facility
Sacramento, CA

Receptor	Location	Cancer Risk (in a million)	Chronic HI [1]	AcuteHI
PMI [2]	92 meters from source	13	0.008	0.014
MEIW [3]	Nearest offsite worker identified at 150 meters north or east of source	2	0.0017	0.013
MEIR	Nearest residence identified 800 meters west of source	6	0.0035	0.0059
Still Water's Academy [4]	8008 43rd Ave. (900 meters west of source)	0.2	0.0031	0.0052
Elder Creek Elementary [4]	7934 Lemon Hill Ave. (900 meters west of source)	0.2	0.0031	0.0052
	SMAQMD Significance Threshold	10	1	1

Notes:

1. Chronic HI = $HQ_{benzene} + HQ_{n\text{-}hexane}$
2. The PMI reflects resident exposure assumptions, though there are no residences at this location. Therefore, the SMAQMD Significance Threshold is not exceeded.
3. Per OEHHA guidance, the air concentration used in evaluation of the chronic HI for the MEIW was adjusted to account for non-continuous exposure (e.g., 245 days/365 days and 8 hours/24 hours).
4. As a conservative estimate, no adjustemnt was made for exposure duration at the school receptors.

Abbreviations:

HI - Hazard Index
HQ - Hazard Quotient
MEIR - Maximally Exposed Individual Resident
MEIW - Maximally Exposed Individual Worker
PMI - Point of Maximum Impact
SMAQMD - Sacramento Metropolitan Air Quality Management District

Source:

California Environmental Protection Agency (Cal/EPA). 2003. Air Toxics Hot Spots Program Risk Assessment Guidelines, the Air Toxics Hot Spots Program Guidance Manual for Preparations of Health Risk Assessments," OEHHA, August.

Sacramento Metropolitan Air Quality Management District (SMAQMD). 2004. Guide to Air Quality Assessment in Sacramento County. July.

APPENDIX A-4

Odor Analysis

Prepared by Impact Sciences, Inc.
August 2008

Sacramento Natural Gas Storage
Odor Analysis
Point of Maximum Impact

Chemical	Threshold (ppm)	Molecular Weight (g/g-mole)	1-Hour Concentration ($\mu g/m^3$)	Concentration (ppm, 60 min avg)	Concentration (ppm, 5 min avg)	Exceeds Odor Threshold?
Benzene	1.5	78.11	18	5.64E-03	9.27E-03	No
Toluene	2.9	92.15	18	4.78E-03	7.86E-03	No
Ethyl Benzene	2.3	106.16	18	4.15E-03	6.82E-03	No
Xylene	1.1	106.16	18	4.15E-03	6.82E-03	No
Hexane	130	86.17	177	5.04E-02	8.28E-02	No

Notes:
1) U.S. Environmental Protection Agency. "Health Effects Notebook for Hazardous Air Pollutants." <http://epa.gov/ttn/atw/hlthef/hapindex.html>
2) Only a BTEX ambient concentration was estimated for the health risk screening analysis. All BTEX components were assumed to have the same ambient concentration.
3) The 1-hour hexane concentration was assumed to be proportional to the ratio of the annual hexane emissions to the annual BTEX emissions because the 1-hour hexane emissions were not reported in the health risk screening analysis (Environ 2008).

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APPENDIX A-5

Greenhouse Gas Emissions—Construction

Prepared by Dudek
August 2008

Adjustment of Estimated Construction Emissions
to Account for Other GHG Emissions
from Construction Worker Vehicle Trips

Emission Source	Data Source	Project Construction Emissions
Worker Trips	1	392 tons CO_2
	2	413 tons CO_2E
Project Total	1	979 tons CO_2
Diesel Equipment and Vehicles	calc	587 tons CO_2
Adjusted Total	calc	1,000 tons CO_2E
	calc	907 metric tons CO_2E

Notes:

1. tons of CO_2 from SNGS, Supplemental PEA (2007).

2. US EPA, Office of Transportation and Air Quality, *Greenhouse Gas Emissions from a Typical Passenger Vehicle (EPA420-F-05-004)*, (2005) 4

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APPENDIX A-6

Greenhouse Gas Emissions—Operational

Prepared by Dudek and Impact Sciences, Inc.
August 2008

Sacramento Natural Gas Storage
Comparison of Greenhouse Gas Emissions from Electric Motors
and Natural Gas-Fired Internal Combustion Engines

Source	Annual Energy Usage	CO_2E Emission Factor [3] (lbs CO_2E/kW-hr)	CO_2E Emission Factor [4] (lbs CO_2E/MMBtu)	Annual CO_2E Emissions (tons CO_2E/yr)	Annual CO_2E Emissions (MT CO_2E/yr)
Electric Motor-Driven Compressors [1]	6,222,000 kWh/yr	0.714		2,221	2,015
Engine-Driven Compressors [2]	63,193 MMBtu/yr		117.3	3,707	3,363
Difference in GHG Emissions				(1,486)	(1,348)

Sources:

1. SNGS estimates that the electric-powered compressors would use 6,222,000 kWh/yr for injecting gas into the reservoir.
2. Assumptions for engine-powered compressors
   Compressors would be driven by two Caterpillar 3612 engines rated at 3,550 HP each.
   Engines would combust 7,470 Btu/HP-hr at HHV.
   Engines would operate at equivalent levels (hours and load) to that for electric-powered compressors.
3. SMUD. Annual Emissions Report. https://www.climateregistry.org/CARROT/public/Reports.aspx (Report is for 2006, but it also reports data for 2007).
4. California Climate Action Registry, *General Reporting Protocol: Reporting Entity-Wide Greenhouse Gas Emissions Version 3.0*, (2008) Tables C.6 and C.7.

Where:

CO_2E	Carbon dioxide equivalent
kW-hr	kilowatt-hour
lbs	pounds
MT	metric tons (= 2,204.623 lbs)
yr	year

Sacramento Natural Gas Storage
Greenhouse Gas Emissions from Glycol Reboiler

Heat Input Rating	3.0	MMBtu/hr
Operating Hours	3,075	hr/yr

		CO_2	CH_4	N_2O
Emission Factor	kg/MMBtu	53.06	0.0059	0.0001
Global Warming Potential		1	21	310
Greenhouse Gas Emissions	metric ton/yr	491		
	tons/yr	541		

Source:
Operating Hours: Environ, Health Risk Assessment Screening Analysis - Proposed SNGS Project, 3/25/08.
Emission Factors for Natural Gas Combustion: CCAR, General Reporting Protocol, 2008.

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Urbemis 2007 Version 9.2.4

Combined Annual Emissions Reports (Tons/Year)

File Name: C:\Documents and Settings\ddeckman\Application Data\Urbemis\Version9a\Projects\SNGS - Worker Trips.urb924

Project Name: SNGS - Worker Trips

Project Location: Sacramento County AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	CO2
TOTALS (tons/year, unmitigated)	10.57

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	CO2
TOTALS (tons/year, unmitigated)	10.57

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Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

Source	CO2
General heavy industry	10.57
TOTALS (tons/year, unmitigated)	10.57

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2009 Season: Annual

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
General heavy industry		1.50	1000 sq ft	4.00	6.00	62.70
					6.00	62.70

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	59.5	1.7	97.9	0.4
Light Truck < 3750 lbs	12.5	4.0	88.0	8.0
Light Truck 3751-5750 lbs	28.0	0.9	98.7	0.4
Med Truck 5751-8500 lbs	0.0	1.0	99.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	0.0	0.0	76.2	23.8
Lite-Heavy Truck 10,001-14,000 lbs	0.0	0.0	55.6	44.4

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Med-Heavy Truck 14,001-33,000 lbs	0.0	6.2	18.8	75.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.0	0.0	20.0	80.0
Other Bus	0.0	0.0	0.0	100.0
Urban Bus	0.0	0.0	0.0	0.0
Motorcycle	0.0	71.4	28.6	0.0
School Bus	0.0	0.0	0.0	100.0
Motor Home	0.0	11.1	77.8	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	10.8	7.3	7.3
Rural Trip Length (miles)	15.0	10.0	10.0	15.0	10.0	10.0
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	100.0	0.0	0.0			
% of Trips - Commercial (by land use)						
General heavy industry				90.0	5.0	5.0

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APPENDIX A-7

Glycol Dehydration Unit and Emergency Generator Ambient Air Quality Impact Analysis

Prepared by Dudek for Final EIR in response to comment B5-313

October 2009

APPENDIX A-7 GLYCOL DEHYDRATION UNIT AND EMERGENCY GENERATOR AMBIENT AIR QUALITY IMPACT ANALYSIS

An ambient air quality impact analysis was performed for the oxides of nitrogen (NO_x) emissions from a proposed glycol dehydration unit and 100-kilowatt natural gas-fired emergency generator at the proposed Sacramento Natural Gas Storage (SNGS), LLC compressor station. Only the NO_x emissions were found to exceed the Sacramento Metropolitan Air Quality Management District's (SMAQMD's) screening thresholds for ambient air quality impact (see discussion in Section D.2, Impact A-2, of the Environmental Impact Report [EIR]).

The analysis determined whether the NO_x emissions would cause an exceedance of the 1-hour and annual California Ambient Air Quality Standards for nitrogen dioxide (NO_2). The ambient air quality analysis for the glycol dehydration unit was performed using the source characteristics from a screening health risk assessment prepared for the proposed project (Environ 2008) and the estimated hourly NO_x emissions described in Section D.2, Impact A-2, of the EIR). The glycol dehydration unit was assumed to operate 3,075 hours per year (Environ 2008). The generator was assumed to operate at full output 1 hour per day for maintenance and testing purposes and up to 50 hours per year. The dispersion modeling analysis for these sources was performed using the Lakes Environmental's SCREEN-View air quality dispersion model, Version 3.0.0 (Lakes Environmental 2009), which uses the U.S. Environmental Protection Agency's (EPA) SCREEN3 model.

Background concentrations were selected as the maxima from the Stockton Boulevard monitoring station for the last 3 years (2006 – 2007). The maximum 1-hour concentration was 0.077 parts per million (ppm), and the maximum annual concentration was 0.016 ppm.

Modeling Analysis

Glycol Dehydration Unit

The dehydration unit's NO_x emissions were estimated to be 0.05 pounds per hour and 153.8 pounds per year.

SCREEN3 was run using the following stack parameters:

- Exhaust flow rate: Exit velocity 4.91 meters per second (Environ 2008)
- Exhaust temperature: 644ºK (Environ 2008)
- Stack height: 6.1 meters (Environ 2008)

- Stack diameter: 0.356 meters (Environ 2008)
- Emission Rate: 1 gram per second

Emergency Generator

Based on the manufacturer's specifications, the engine's NO_x emissions were estimated to be 3.27 pounds per hour and 163.7 pounds per year.

SCREEN3 was run using the following stack parameters:

- Exhaust flow rate: 687 actual cubic feet per minute (0.32 cubic meter per second) (manufacturer's specification)
- Exhaust temperature: 1,184ºF (913.15ºK) (manufacturer's specification)
- Stack height: 8 feet (2.438 meters) (assumed)
- Stack diameter: 4 inches (0.102 meters) (assumed)
- Emission Rate: 1 gram per second

Receptor Locations

Receptors were placed at the nearest residential receptor to the west of the compressor station and the nearest two schools (Still Water's Academy and Elder Creek Elementary School). In addition, automated receptors were placed at 100 meter intervals (as determined by SCREEN3) from the closest off-site distance (52 meters for the glycol dehydration unit and 20 meters for the emergency generator) out to a distance of 2,000 meters.

Results

The results of the SCREEN3 modeling are provided in Attachment A. These results are based on an emission rate of 1 gram per second. Per EPA guidance (EPA 1992), the 1-hour results were multiplied by 0.1 to simulate the annual averages. The results were then multiplied by the glycol dehydration unit's and engine's 1-hour and annual NO_x emission rates.

Most of NO_x in the combustion exhaust will occur in the form of nitric oxide (NO), rather than as NO_2. Nitric oxide is converted in the atmosphere through chemical reactions to NO_2. To account for this effect, the NO_2-to-NO_X ratio from the South Coast Air Quality Management District's *Final Localized Significance Threshold Methodology* (LST Methodology; SCAQMD 2008) was applied to the modeling results. The LST Methodology assumes that initially only five percent of the emitted NO_x is NO_2. At 5,000 meters downwind, 100 percent conversion of NO to

NO_2 is assumed. The ratio of NO_2 to NO_x varies between these two points. Using the appropriate NO_2-to-NO_x ratio from the LST Methodology, the NO_x modeling results were converted to NO_2 at the point of maximum impact off of the compressor station site and at the 3 sensitive receptors. The results were then added to the maximum 1-hour and annual background concentrations as shown in Tables 1 and 2 for the glycol dehydration unit and Tables 3 and 4 for the emergency generator. The results of the NO_2 impact calculations are provided in Attachment A.

Table 1
Summary of Maximum Modeled Nitrogen Dioxide Impacts
Glycol Dehydration Unit
(1-Hour Averaging Period)

Receptor	Background Concentration (ppm)	Modeled NO_x Impact (ppm)	NO_2 to NO_x Ratio	NO_2 Impact (ppm)	Impact plus Background (ppm) [2]	CAAQS (ppm)
Maximum Impact	0.077	0.0015	0.060	0.00009	0.08	0.18
Residential	0.077	0.0003	0.383	0.00010	0.08	0.18
Still's Water Academy	0.077	0.0002	0.425	0.00009	0.08	0.18
Elder Creek Elementary	0.077	0.0002	0.425	0.00009	0.08	0.18

Notes:
[1] The background concentration is the maximum NO_2 concentration during the last 3 years.
[2] The values in the *Impact plus Background* column are compared to the values in *CAAQS* column to assess if the emissions from the proposed project would contribute to exceedances of the CAAQS.

Table 2
Summary of Maximum Modeled Nitrogen Dioxide Impacts
Glycol Dehydration Unit
(Annual Averaging Period)

Receptor	Background Concentration (ppm) [1]	Modeled NO_x Impact (ppm)	NO_2 to NO_x Ratio	NO_2 Impact (ppm)	Impact plus Background (ppm) [2]	CAAQS (ppm)
Maximum Impact	0.016	0.00005	0.060	0.000003	0.016	0.030
Residential	0.016	0.00001	0.383	0.000003	0.016	0.030
Still's Water Academy	0.016	0.00001	0.425	0.000003	0.016	0.030
Elder Creek Elementary	0.016	0.00001	0.425	0.000003	0.016	0.030

Notes:
[1] The background concentration is the maximum NO_2 concentration during the last 3 years.
[2] The values in the *Impact plus Background* column are compared to the values in *CAAQS* column to assess if the emissions from the proposed project would contribute to exceedances of the CAAQS.

Table 3
Summary of Maximum Modeled Nitrogen Dioxide Impacts
Emergency Generator
(1-Hour Averaging Period)

Receptor	Background Concentration (ppm) [1]	Modeled NO_x Impact (ppm)	NO_2 to NO_x Ratio	NO_2 Impact (ppm)	Impact plus Background (ppm) [2]	CAAQS (ppm)
Maximum Impact	0.077	0.33	0.053	0.017	0.09	0.18
Residential	0.077	0.018	0.388	0.007	0.09	0.18
Still's Water Academy	0.077	0.013	0.467	0.006	0.09	0.18
Elder Creek Elementary	0.077	0.014	0.454	0.006	0.09	0.18

Notes:
[1] The background concentration is the maximum NO_2 concentration during the last 3 years.
[2] The values in the *Impact plus Background* column are compared to the values in *CAAQS* column to assess if the emissions from the proposed project would contribute to exceedances of the CAAQS.

Table 4
Summary of Maximum Modeled Nitrogen Dioxide Impacts
Emergency Generator
(Annual Averaging Period)

Receptor	Background Concentration (ppm) [1]	Modeled NO_x Impact (ppm)	NO_2 to NO_x Ratio	NO_2 Impact (ppm)	Impact plus Background (ppm) [2]	CAAQS (ppm)
Maximum Impact	0.016	0.0002	0.053	0.00001	0.016	0.030
Residential	0.016	0.00001	0.388	0.00000	0.016	0.030
Still's Water Academy	0.016	0.00001	0.467	0.00000	0.016	0.030
Elder Creek Elementary	0.016	0.00001	0.454	0.00000	0.016	0.030

Notes:
[1] The background concentration is the maximum NO_2 concentration during the last 3 years.
[2] The values in the *Impact plus Background* column are compared to the values in *CAAQS* column to assess if the emissions from the proposed project would contribute to exceedances of the CAAQS.

The combined results for the glycol dehydration unit and emergency generator at the listed receptors are shown in Table 5.

Table 5
Combined Results of Air Quality Impact Analysis for NO_2

Receptor	Averaging Period	Background Concentration (ppm) [1]	Modeled Impact (ppm) [2]	Impact plus Background (ppm) [3]	CAAQS (ppm)	Exceeds CAAQS?
Property Boundary	1 hour	0.077	0.018	0.09	0.18	NO
	Annual	0.016	0.00001	0.016	0.030	NO
Residential Receptor	1 hour	0.077	0.007	0.08	0.18	NO
	Annual	0.016	0.00001	0.016	0.030	NO
Still's Water Academy	1 hour	0.077	0.006	0.08	0.18	NO
	Annual	0.016	0.00001	0.016	0.030	NO
Elder Creek Elementary	1 hour	0.077	0.006	0.08	0.18	NO
	Annual	0.016	0.00001	0.016	0.030	NO

Notes:
[1] The background concentration is the maximum NO_2 concentration during the last 3 years.
[2] The modeled impacts include those associated with the glycol dehydration unit and emergency generator at the listed receptors.
[3] The values in the *Impact plus Background* column are compared to the values in *CAAQS* column to assess if the emissions from the proposed project would contribute to exceedances of the CAAQS.

As shown in Table 5, neither the 1-hour nor annual emissions from the glycol dehydration unit and emergency generator would cause a violation of the CAAQS at the specified off-site locations. Thus, this air quality impact would be less than significant.

REFERENCES

Environ. 2008. *Health Risk Screening Analysis—Proposed Sacramento National Gas Storage Project, Florin Gas Field Facility.* March 2008.

EPA (U.S. Environmental Protection Agency). 1992. Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised (EPA-454/R-92-019). October.

Lakes Environmental. 2009. Screen View Software (Version 3.0.0).

SCAQMD (South Coast Air Quality Management District). 2008. *Final Localized Significance Threshold Methodology*, revised July 2008.

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Attachment 1

SCREEN3 Results and
NO_2 Impact Calculations

08/18/09

13:10:58

*** SCREEN3 MODEL RUN ***

*** VERSION DATED 96043 ***

C:\Lakes\ScreenView\Projects\SNGS generator.scr

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	1.00000
STACK HEIGHT (M)	=	2.4384
STK INSIDE DIAM (M)	=	0.1015
STK EXIT VELOCITY (M/S)	=	40.0721
STK GAS EXIT TEMP (K)	=	913.1500
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	1.5000
URBAN/RURAL OPTION	=	URBAN
BUILDING HEIGHT (M)	=	0.0000
MIN HORIZ BLDG DIM (M)	=	0.0000
MAX HORIZ BLDG DIM (M)	=	0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.

THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

STACK EXIT VELOCITY WAS CALCULATED FROM

VOLUME FLOW RATE = 0.32422760 (M**3/S)

BUOY. FLUX = 0.687 M**4/S**3; MOM. FLUX = 1.327 M**4/S**2.

*** FULL METEOROLOGY ***

****

*** SCREEN AUTOMATED DISTANCES ***

****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
20.	1502.	4	8.0	8.0	2560.0	4.46	3.21	2.82	NO
100.	605.9	4	1.5	1.5	480.0	13.22	15.99	14.13	NO
200.	294.9	4	1.0	1.0	320.0	18.61	31.14	27.59	NO
300.	245.1	6	1.0	1.0	10000.0	24.20	31.80	20.88	NO
400.	192.0	6	1.0	1.0	10000.0	24.20	41.32	26.05	NO
500.	149.8	6	1.0	1.0	10000.0	24.20	50.59	30.87	NO

600.	119.4	6	1.0	1.0	10000.0	24.20	59.60	35.37	NO
700.	97.53	6	1.0	1.0	10000.0	24.20	68.34	39.60	NO
800.	81.41	6	1.0	1.0	10000.0	24.20	76.85	43.59	NO
900.	69.25	6	1.0	1.0	10000.0	24.20	85.12	47.38	NO
1000.	59.85	6	1.0	1.0	10000.0	24.20	93.17	50.98	NO
1100.	52.43	6	1.0	1.0	10000.0	24.20	101.02	54.41	NO
1200.	46.47	6	1.0	1.0	10000.0	24.20	108.68	57.71	NO
1300.	41.59	6	1.0	1.0	10000.0	24.20	116.15	60.87	NO
1400.	37.54	6	1.0	1.0	10000.0	24.20	123.46	63.92	NO
1500.	34.14	6	1.0	1.0	10000.0	24.20	130.59	66.85	NO
1600.	31.25	6	1.0	1.0	10000.0	24.20	137.57	69.70	NO
1700.	28.77	6	1.0	1.0	10000.0	24.20	144.41	72.45	NO
1800.	26.62	6	1.0	1.0	10000.0	24.20	151.10	75.12	NO
1900.	24.74	6	1.0	1.0	10000.0	24.20	157.66	77.72	NO
2000.	23.10	6	1.0	1.0	10000.0	24.20	164.10	80.24	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 20. M:

20.	1502.	4	8.0	8.0	2560.0	4.46	3.21	2.82	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)

DWASH=NO MEANS NO BUILDING DOWNWASH USED

DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED

DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED

DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****

*** SCREEN DISCRETE DISTANCES ***

****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
60.	904.8	4	2.0	2.0	640.0	10.52	9.76	8.64	NO
128.	505.8	4	1.0	1.0	320.0	18.61	20.50	18.18	NO
810.	80.04	6	1.0	1.0	10000.0	24.20	77.68	43.98	NO
970.	62.43	6	1.0	1.0	10000.0	24.20	90.78	49.92	NO
1000.	59.85	6	1.0	1.0	10000.0	24.20	93.17	50.98	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)

DWASH=NO MEANS NO BUILDING DOWNWASH USED

DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED

DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED

DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****

*** SUMMARY OF SCREEN MODEL RESULTS ***

****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	1502.	20.	0.

****

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

****

08/18/09

11:33:19

*** SCREEN3 MODEL RUN ***

*** VERSION DATED 96043 ***

C:\Lakes\ScreenView\Projects\SNGS Reboiler.scr

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	1.00000
STACK HEIGHT (M)	=	6.1000
STK INSIDE DIAM (M)	=	0.3560
STK EXIT VELOCITY (M/S)	=	4.9100
STK GAS EXIT TEMP (K)	=	644.0000
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	0.0000
URBAN/RURAL OPTION	=	URBAN
BUILDING HEIGHT (M)	=	0.0000
MIN HORIZ BLDG DIM (M)	=	0.0000
MAX HORIZ BLDG DIM (M)	=	0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.

THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 0.831 M**4/S**3; MOM. FLUX = 0.348 M**4/S**2.

*** FULL METEOROLOGY ***

****

*** SCREEN AUTOMATED DISTANCES ***

****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
52.	461.2	4	4.0	4.0	1280.0	10.57	8.34	7.35	NO
100.	397.1	4	1.5	1.5	480.0	18.54	16.09	14.24	NO
200.	246.6	4	1.0	1.0	320.0	24.76	31.25	27.71	NO
300.	179.8	6	1.0	1.0	10000.0	29.29	31.88	21.00	NO
400.	157.1	6	1.0	1.0	10000.0	29.29	41.39	26.15	NO
500.	129.8	6	1.0	1.0	10000.0	29.29	50.64	30.95	NO
600.	107.0	6	1.0	1.0	10000.0	29.29	59.64	35.45	NO
700.	89.34	6	1.0	1.0	10000.0	29.29	68.38	39.67	NO

800.	75.72	6	1.0	1.0	10000.0	29.29	76.88	43.65	NO
900.	65.13	6	1.0	1.0	10000.0	29.29	85.15	47.43	NO
1000.	56.76	6	1.0	1.0	10000.0	29.29	93.20	51.03	NO
1100.	50.05	6	1.0	1.0	10000.0	29.29	101.05	54.46	NO
1200.	44.58	6	1.0	1.0	10000.0	29.29	108.71	57.75	NO
1300.	40.07	6	1.0	1.0	10000.0	29.29	116.18	60.91	NO
1400.	36.29	6	1.0	1.0	10000.0	29.29	123.48	63.96	NO
1500.	33.10	6	1.0	1.0	10000.0	29.29	130.61	66.89	NO
1600.	30.37	6	1.0	1.0	10000.0	29.29	137.59	69.73	NO
1700.	28.02	6	1.0	1.0	10000.0	29.29	144.43	72.48	NO
1800.	25.98	6	1.0	1.0	10000.0	29.29	151.12	75.15	NO
1900.	24.19	6	1.0	1.0	10000.0	29.29	157.68	77.75	NO
2000.	22.61	6	1.0	1.0	10000.0	29.29	164.11	80.27	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 52. M:

53.	461.4	4	4.0	4.0	1280.0	10.57	8.34	7.35	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)

DWASH=NO MEANS NO BUILDING DOWNWASH USED

DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED

DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED

DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****

*** SCREEN DISCRETE DISTANCES ***

****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
800.	75.72	6	1.0	1.0	10000.0	29.29	76.88	43.65	NO
900.	65.13	6	1.0	1.0	10000.0	29.29	85.15	47.43	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)

DWASH=NO MEANS NO BUILDING DOWNWASH USED

DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED

DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED

DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****

*** SUMMARY OF SCREEN MODEL RESULTS ***

****

CALCULATION	MAX CONC	DIST TO	TERRAIN

PROCEDURE	(UG/M**3)	MAX (M)	HT (M)
SIMPLE TERRAIN	461.4	53.	0.

****

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

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Sacramento Natural Gas Storage
Engine-Generator Emissions

Engine Rating	100	kW
	158	HP
Fuel Input (1)	1.29	MMBtu/hr
Operating Schedule	1.0	hr/day
	50.0	hr/yr

	NOx	ROC	CO	SOx (2)	PM10	GHG (4)
gm/BHP-hr (2)	9.4	0.90	15.0			
lb/MMBtu (3)				5.88E-04	1.94E-02	1.40E+02
lb/hr	3.27	0.31	5.22	0.001	0.02	180.51
lb/day	3.27	0.31	5.22	0.001	0.02	180.51
lb/yr	163.71	15.67	261.24	0.04	1.25	9,025.32

Notes:
(1) Based on 1,260 scf/hr @ 1,020 Btu/scf.
(2) Based on engine emission specifications, except SOx and PM10.
(3) Based on EPA *Compilation of Air Pollutant Emission Factors*, Table 3.2-3 (July 2000).
(4) GHG includes CO2 and methane per Table 3.2-3.

Maximum Ambient NO_2 Impacts
(Glycol Dehydration Unit)

Receptor	Averaging Period	Background Conc.	Modeled NOx Impacts		NO_2 to NOx Ratio	NO_2 Impact	NO_2 Impact + Background	CAAQS	Exceeds CAAQS?
		ppm	µg/m^3	ppm		ppm	ppm	ppm	
Point of Maximum Impact	1 hour	0.077	2.907	0.0015	0.060	0.00009	0.08	0.18	No
Point of Maximum Impact	Annual	0.016	0.102	0.00005	0.060	0.000003	0.016	0.030	No
Residential	1 hour	0.077	0.477	0.0003	0.383	0.00010	0.08	0.18	No
Residential	Annual	0.016	0.017	0.00001	0.383	0.000003	0.016	0.030	No
Still Water's Academy	1 hour	0.077	0.410	0.0002	0.425	0.00009	0.08	0.18	No
Still Water's Academy	Annual	0.016	0.014	0.00001	0.425	0.000003	0.016	0.030	No
Elder Creek Elementary	1 hour	0.077	0.410	0.0002	0.425	0.00009	0.08	0.18	No
Elder Creek Elementary	Annual	0.016	0.014	0.00001	0.425	0.000003	0.016	0.030	No

Maximum Ambient NO_2 Impacts
(Emergency Generator)

Receptor	Averaging Period	Background Conc.	Modeled NOx Impacts		NO_2 to NOx Ratio	NO_2 Impact	NO_2 Impact + Background	CAAQS	Exceeds CAAQS?
		ppm	$\mu g/m^3$	ppm		ppm	ppm	ppm	
Point of Maximum Impact	1 hour	0.077	618.85	0.33	0.053	0.017	0.09	0.18	No
Point of Maximum Impact	Annual	0.016	0.35	0.0002	0.053	0.00001	0.016	0.030	No
Residential	1 hour	0.077	32.98	0.018	0.388	0.007	0.09	0.18	No
Residential	Annual	0.016	0.02	0.00001	0.388	0.00000	0.016	0.030	No
Still Water's Academy	1 hour	0.077	24.66	0.013	0.467	0.006	0.09	0.18	No
Still Water's Academy	Annual	0.016	0.01	0.00001	0.467	0.00000	0.016	0.030	No
Elder Creek Elementary	1 hour	0.077	25.72	0.014	0.454	0.006	0.09	0.18	No
Elder Creek Elementary	Annual	0.016	0.01	0.00001	0.454	0.00000	0.016	0.030	No

SCAQMD
LST Methodology

Distance	NO2 to NOx Ratio
20	0.053
50	0.059
70	0.064
100	0.074
200	0.114
500	0.258
1000	0.467
2000	0.75
3000	0.9
4000	0.978
5000	1

Emergency Generator		Reboiler	
Distance	Ratio		
20	0.053	52	0.060
810	0.388	800	0.383
970	0.454	900	0.425
1000	0.467		

Source: SCAQMD. 2008. Final Localized Significance Thresholds Methodology (Revised).

Maximum Ambient NO_2 Impacts
(Combined Impact)

Receptor	Averaging Period	Background Conc. ppm	Modeled Impacts ppm	Impact + Background ppm	CAAQS ppm	Exceeds CAAQS?
Point of Maximum Impact	1 hour	0.077	0.018	0.09	0.18	No
Point of Maximum Impact	Annual	0.016	0.00001	0.016	0.030	No
Residential	1 hour	0.077	0.007	0.08	0.18	No
Residential	Annual	0.016	0.00001	0.016	0.030	No
Elder Creek Elementary	1 hour	0.077	0.006	0.08	0.18	No
Elder Creek Elementary	Annual	0.016	0.00001	0.016	0.030	No
Still Water's Academy	1 hour	0.077	0.006	0.08	0.18	No
Still Water's Academy	Annual	0.016	0.00001	0.016	0.030	No

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APPENDIX A-8

Emergency Generator Health Risk Screening Assessment

Prepared by Dudek for Final EIR in response to comment B5-313
October 2009

APPENDIX A-8 EMERGENCY GENERATOR HEALTH RISK SCREENING ASSESSMENT

A health risk screening assessment was performed to assess the health impacts of toxic air contaminant (TAC) emissions from a proposed 100-kilowatt natural gas-fired emergency generator at the Sacramento Natural Gas Storage, LLC compressor station.

The health risk assessment was performed the Lakes Environmental's SCREEN-View air quality dispersion model, Version 3.0.0 (Lakes Environmental 2009), which uses the U.S. Environmental Protection Agency's (EPA) SCREEN3 model, and the estimated TAC emissions for a rich-burn gas-fired engine. The generator was assumed to operate 1 hour per day for maintenance and testing and up to 50 hours per year. The analysis determined whether the TAC emissions would cause an exceedance of the Sacramento Metropolitan Air Quality Management District's CEQA thresholds of significance for cancer and noncancer health impacts. The thresholds are 10 in one million for cancer risk and a hazard index of 1.0 for acute and chronic noncancer health impacts. The results of this analysis were added to the health impacts resulting from TAC emissions from the glycol dehydration process as previously evaluated in a health risk screening assessment (Environ 2008).

Estimated TAC Emissions

The TAC emissions from the emergency generator's engine were estimated using emission factors from the California Air Toxics Emission Factor Database (CATEF; CARB 2009). The emission factors are based on the fuel usage, which was obtained from the manufacturer's specifications. The hourly and annual estimated TAC emissions are shown in Table 1.

Table 1
Summary of Toxic Air Contaminant Emissions
Emergency Generator

Chemical	Pounds/Hour	Pounds/Year
Acenaphthene	4.27E-06	2.14E-04
Acenaphthylene	2.04E-05	1.02E-03
Acetaldehyde	2.29E-03	1.15E-01
Acrolein	1.73E-03	8.63E-02
Anthracene	2.85E-06	1.42E-04
Benzene	1.29E-02	6.43E-01
Benzo(a)anthracene	4.27E-07	2.14E-05
Benzo(a)pyrene	1.90E-07	9.51E-06
Benzo(b)fluoranthene	3.79E-07	1.90E-05
Benzo(g,h,i)perylene	3.09E-07	1.54E-05

Table 1 (Continued)

Chemical	Pounds/Hour	Pounds/Year
Benzo(k)fluoranthene	1.47E-07	7.37E-06
1,3-Butadiene	1.32E-04	6.62E-03
Chrysene	4.98E-07	2.49E-05
Dibenz(a,h)anthracene	1.83E-08	9.14E-07
Ethylbenzene	1.81E-05	9.07E-04
Fluoranthene	1.51E-06	7.56E-05
Fluorene	1.14E-05	5.70E-04
Formaldehyde	1.44E-02	7.18E-01
Indeno(1,2,3-cd)pyrene	2.61E-07	1.30E-05
Naphthalene	1.09E-04	5.46E-03
Phenanthrene	1.12E-05	5.58E-04
Propylene	5.29E-02	2.65E+00
Pyrene	3.33E-06	1.66E-04
Toluene	3.30E-03	1.65E-01
Xylene (Total)	9.30E-05	4.65E-03

Note: Values are expressed in scientific notation (X.XXE+XX) (e.g., 2.14E-04 is 0.000214.

Modeling Analysis

Emergency Generator

SCREEN3 was run using the following stack parameters:

- Exhaust flow rate: 687 actual cubic feet per minute (0.32 cubic meter per second) (manufacturer's specification)
- Exhaust temperature: 1,184ºF (913.15ºK) (manufacturer's specification)
- Stack height: 8 feet (2.438 meters) (assumed)
- Stack diameter: 4 inches (0.102 meters) (assumed)
- Emission Rate: 1 gram per second

Receptors

Receptors were placed at the nearest residential receptor to the west of the compressor station and the nearest two schools (Still Water's Academy and Elder Creek Elementary School). In addition, automated receptors were placed at 100 meter intervals (as determined by SCREEN3) from the closest fenceline (20 meters) of the compressor station to 2,000 meters. For the health risk assessment, only the impacts at these 3 sensitive receptors were evaluated. Additional receptors were modeled for the point of maximum impact and nearest workplace receptor based

on the locations identified in the health risk screening assessment for the glycol dehydration unit (Environ 2008). Based on the relative locations of the glycol dehydration unit and emergency generator, which are approximately 32 meters apart, receptors were placed at 60 meters and 128 meters from the emergency generator for the latter two receptors, respectively.

Modeling Results

The results of the SCREEN3 modeling are included in Attachment A. These results are based on an emission rate of 1 gram per second. Per EPA guidance (EPA 1992), the 1-hour results were multiplied by 0.1 to simulate the annual averages. The results were then multiplied by the engine's 1-hour and annual TAC emission rates shown in Table 1 to determine the downwind concentrations.

Health Impact Calculations

The inhalation cancer risks were calculated using methods in the California Environmental Protection Agency Office of Environmental Health Hazard Assessment (OEHHA) manual for health risk assessments prepared under the Air Toxics Hot Spots program (OEHHA 2003). Inhalation cancer risks were calculated using the following equations:

Inhalation Cancer Risk = Cancer Potency Factor (milligram per kilogram per day)$^{-1}$ × Dose Inhalation (milligrams per kilogram/day)

Dose Inhalation = $C_{air} \times DBR \times A \times EF \times ED \times 10^{-6} / AT$

where:

C_{air} = concentration in microgram per cubic meter

DBR = breathing rate in liter per kilogram of body weight per day

A = inhalation absorption factor

EF = exposure frequency in days per year

ED = exposure duration in years

AT = averaging time period over which exposure is averaged in days (25,550 days for 70 years)

For these calculations, a residential daily breathing rate of 302 liters/kilogram of body weight per day was used per California Air Resources Board and OEHHA policy (CARB/OEHHA 2003.

For students at the two schools, a daily breathing rate of 581 liters/kilogram of body weight per day, adjusted for an 8-hour day, was used for students per the OEHHA health risk assessment manual (OEHHA 2003). A daily breathing rate of 149 liter/kilogram of body weight per day was used for the off-site workplace receptor per the OEHHA health risk assessment manual (OEHHA 2003).

For those TACs that have an oral cancer potency factor, the cancer risk due to noninhalation pathways were estimated using the multipathway factors from the South Coast Air Quality Management District guidance for compliance with Rule 1401 (New Source Review of Toxic Air Contaminants). The contribution from these TACs (all of which are polycyclic aromatic hydrocarbons) is relatively small compared to the TACs that create most of the cancer risk (i.e., acetaldehyde, benzene, and formaldehyde. At the screening level, this approach gives a reasonable estimation of cancer risk. A more rigorous analysis would not result in a substantial difference in the cancer risks. The calculations and estimated cancer risks by substance are shown in Attachment A. The cancer risks at the sensitive receptors due to the generator emissions are summarized in Table 2 along with the results from the health risk assessment for the glycol dehydration process and the combined cancer risk.

Table 2
Summary of Maximum Modeled
Cancer Risks due to the Proposed Operations

Receptor	Generator	Glycol Dehydration	Combined Cancer Risk
Point of Maximum Impact	0.6×10^{-6}	13.0×10^{-6}	13.6×10^{-6}
Maximally Exposed Individual – Workplace	0.06×10^{-6}	2.0×10^{-6}	2.1×10^{-6}
Maximally Exposed Individual – Residential	0.05×10^{-6}	6.0×10^{-6}	6.1×10^{-6}
Still's Water Academy	0.002×10^{-6}	0.2×10^{-6}	0.2×10^{-6}
Elder Creek School	0.002×10^{-6}	0.2×10^{-6}	0.2×10^{-6}

As shown in Table 2, the combined cancer risk is less than the SMAQMD threshold of significance of 10 in one million (10×10^{-6}). Thus, this impact is less than significant.

Acute and chronic hazard indices were estimated using the methods in the OEHHA manual. The 1-hour and annual estimated concentrations of the TACs were divided by the acute and chronic Reference Exposure Levels (REL), respectively. The REL is the concentration at or below which no adverse health effects are anticipated. The acute and chronic hazard indices are shown in Tables 3 and 4, respectively, along with the results from the health risk assessment for the glycol dehydration process and the combined hazard indices. The hazard indices were conservatively estimated by totaling the hazard quotients for the individual chemicals regardless of their target organ systems.

Table 3
Summary of Maximum Modeled
Acute Noncancer Health Impacts due to the Proposed Operations

Receptor	Generator	Glycol Dehydration	Combined Chronic Cancer Risk
Point of Maximum Impact	0.1102	0.0140	0.1242
Maximally Exposed Individual – Workplace	0.0616	0.0130	0.0746
Maximally Exposed Individual – Residential	0.0098	0.0059	0.0157
Still's Water Academy	0.0073	0.0052	0.0125
Elder Creek School	0.0076	0.0052	0.0128

Table 4
Summary of Maximum Modeled
Chronic Noncancer Health Impacts due to the Proposed Operations

Receptor	Generator	Glycol Dehydration	Combined Chronic Hazard Index
Point of Maximum Impact	0.00013	0.0080	0.0081
Maximally Exposed Individual – Workplace	0.00007	0.0017	0.0018
Maximally Exposed Individual – Residential	0.000011	0.0035	0.0035
Still's Water Academy	0.000008	0.0031	0.0031
Elder Creek School	0.000008	0.0031	0.0031

As shown in Tables 3 and 4, the combined hazard indices are much less than the SMAQMD threshold of significance of 1.0. Thus, this impact is less than significant.

REFERENCES

CARB/OEHHA (California Air Resources Board and Office of Environmental Health Hazard Assessment). 2003. Recommended Interim Risk Management Policy for Inhalation-Based Residential Cancer Risk. October.

California Air Resources Board. 2009. "California Air Toxics Emission Factor Database." Accessed August 3, 2009 at: http://www.arb.ca.gov/ei/catef/catef.htm

Environ. 2008. *Health Risk Screening Analysis—Proposed Sacramento National Gas Storage Project, Florin Gas Field Facility.* March 2008.

EPA (U.S. Environmental Protection Agency). 1992. Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised (EPA-454/R-92-019). October.

Lakes Environmental. 2009. Screen View Software (Version 3.0.0).

OEHHA (California Environmental Protection Agency Office of Environmental Health Hazard Assessment). 2003. Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. August.

SCAQMD (South Coast Air Quality Management District). 2008. Risk Assessment Procedures for Rules 1401 and 212, Attachment L. July.

Attachment 1

SCREEN3 Results and Health Impact Calculations

08/18/09

13:10:58

*** SCREEN3 MODEL RUN ***

*** VERSION DATED 96043 ***

C:\Lakes\ScreenView\Projects\SNGS generator.scr

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	1.00000
STACK HEIGHT (M)	=	2.4384
STK INSIDE DIAM (M)	=	0.1015
STK EXIT VELOCITY (M/S)	=	40.0721
STK GAS EXIT TEMP (K)	=	913.1500
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	1.5000
URBAN/RURAL OPTION	=	URBAN
BUILDING HEIGHT (M)	=	0.0000
MIN HORIZ BLDG DIM (M)	=	0.0000
MAX HORIZ BLDG DIM (M)	=	0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.

THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

STACK EXIT VELOCITY WAS CALCULATED FROM

VOLUME FLOW RATE = 0.32422760 (M**3/S)

BUOY. FLUX = 0.687 M**4/S**3; MOM. FLUX = 1.327 M**4/S**2.

*** FULL METEOROLOGY ***

****

*** SCREEN AUTOMATED DISTANCES ***

****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
20.	1502.	4	8.0	8.0	2560.0	4.46	3.21	2.82	NO
100.	605.9	4	1.5	1.5	480.0	13.22	15.99	14.13	NO
200.	294.9	4	1.0	1.0	320.0	18.61	31.14	27.59	NO
300.	245.1	6	1.0	1.0	10000.0	24.20	31.80	20.88	NO
400.	192.0	6	1.0	1.0	10000.0	24.20	41.32	26.05	NO
500.	149.8	6	1.0	1.0	10000.0	24.20	50.59	30.87	NO

600.	119.4	6	1.0	1.0	10000.0	24.20	59.60	35.37	NO
700.	97.53	6	1.0	1.0	10000.0	24.20	68.34	39.60	NO
800.	81.41	6	1.0	1.0	10000.0	24.20	76.85	43.59	NO
900.	69.25	6	1.0	1.0	10000.0	24.20	85.12	47.38	NO
1000.	59.85	6	1.0	1.0	10000.0	24.20	93.17	50.98	NO
1100.	52.43	6	1.0	1.0	10000.0	24.20	101.02	54.41	NO
1200.	46.47	6	1.0	1.0	10000.0	24.20	108.68	57.71	NO
1300.	41.59	6	1.0	1.0	10000.0	24.20	116.15	60.87	NO
1400.	37.54	6	1.0	1.0	10000.0	24.20	123.46	63.92	NO
1500.	34.14	6	1.0	1.0	10000.0	24.20	130.59	66.85	NO
1600.	31.25	6	1.0	1.0	10000.0	24.20	137.57	69.70	NO
1700.	28.77	6	1.0	1.0	10000.0	24.20	144.41	72.45	NO
1800.	26.62	6	1.0	1.0	10000.0	24.20	151.10	75.12	NO
1900.	24.74	6	1.0	1.0	10000.0	24.20	157.66	77.72	NO
2000.	23.10	6	1.0	1.0	10000.0	24.20	164.10	80.24	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 20. M:

20.	1502.	4	8.0	8.0	2560.0	4.46	3.21	2.82	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)

DWASH=NO MEANS NO BUILDING DOWNWASH USED

DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED

DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED

DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****

*** SCREEN DISCRETE DISTANCES ***

****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
60.	904.8	4	2.0	2.0	640.0	10.52	9.76	8.64	NO
128.	505.8	4	1.0	1.0	320.0	18.61	20.50	18.18	NO
810.	80.04	6	1.0	1.0	10000.0	24.20	77.68	43.98	NO
970.	62.43	6	1.0	1.0	10000.0	24.20	90.78	49.92	NO
1000.	59.85	6	1.0	1.0	10000.0	24.20	93.17	50.98	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)

DWASH=NO MEANS NO BUILDING DOWNWASH USED

DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED

DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED

DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****

*** SUMMARY OF SCREEN MODEL RESULTS ***

****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	1502.	20.	0.

****

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

****

Sacramento Natural Gas Storage
Engine-Generator Emissions

Engine Rating	100	kW
	158	HP
Operating Schedule	1.0	hr/day
	50.0	hr/yr
Fuel Usage	1,260	scf/hr

Substance	CAS No.	lb/MMscf	lb/hr	lb/yr
Acenaphthene	83-32-9	3.39E-03	4.27E-06	2.14E-04
Acenaphthylene	208-96-8	1.62E-02	2.04E-05	1.02E-03
Acetaldehyde	75-07-0	1.82E+00	2.29E-03	1.15E-01
Acrolein	107-02-8	1.37E+00	1.73E-03	8.63E-02
Anthracene	120-12-7	2.26E-03	2.85E-06	1.42E-04
Benzene	71-43-2	1.02E+01	1.29E-02	6.43E-01
Benzo(a)anthracene	56-55-6	3.39E-04	4.27E-07	2.14E-05
Benzo(a)pyrene	50-32-8	1.51E-04	1.90E-07	9.51E-06
Benzo(b)fluoranthene	205-99-2	3.01E-04	3.79E-07	1.90E-05
Benzo(g,h,i)perylene	191-24-2	2.45E-04	3.09E-07	1.54E-05
Benzo(k)fluoranthene	207-08-9	1.17E-04	1.47E-07	7.37E-06
1,3-Butadiene	106-99-0	1.05E-01	1.32E-04	6.62E-03
Chrysene	218-01-9	3.95E-04	4.98E-07	2.49E-05
Dibenz(a,h)anthracene	53-70-3	1.45E-05	1.83E-08	9.14E-07
Ethylbenzene	100-41-4	1.44E-02	1.81E-05	9.07E-04
Fluoranthene	206-44-0	1.20E-03	1.51E-06	7.56E-05
Fluorene	86-73-7	9.04E-03	1.14E-05	5.70E-04
Formaldehyde	50-00-0	1.14E+01	1.44E-02	7.18E-01
Indeno(1,2,3-cd)pyrene	193-39-5	2.07E-04	2.61E-07	1.30E-05
Naphthalene	91-20-3	8.66E-02	1.09E-04	5.46E-03
Phenanthrene	85-01-8	8.85E-03	1.12E-05	5.58E-04
Propylene	115-07-1	4.20E+01	5.29E-02	2.65E+00
Pyrene	129-00-0	2.64E-03	3.33E-06	1.66E-04
Toluene	108-88-3	2.62E+00	3.30E-03	1.65E-01
Xylene (Total)	1330-20-7	7.38E-02	9.30E-05	4.65E-03

Source:
1. CARB, CATEF Database for rich-burn engines < 650 HP
   http://www.arb.ca.gov/app/emsinv/catef_form.html

Sacramento Natural Gas Storage
Engine-Generator
Screening Health Risk Asssessment

Location: Point of Maximum Impact

Dilution Factor from SCREEN3
- Hourly X/Q 904.8 μg/m^3/(g/s)
- Annual X/Q 90.48 μg/m^3/(g/s)

Daily Breathing Rate	302 L/kg-day
Exposure Time Factor	1
Exposure Frequency	350 days/year
Exposure Duration	70 years
Averaging Time	25,550 days

Substance	CAS No.	lb/hr	1-hour Concentration (μg/m^3)	Acute REL (μg/m^3)	Acute Hazard Index	lb/yr	Annual Concentration (μg/m^3)	Chronic REL (μg/m^3)	Chronic Hazard Index	Inhalation Cancer Potency Factor (mg/kg-day)$^{-1}$	Inhalation Cancer Risk	Multi Pathway Factor	Cancer Risk
Acenaphthene	83-32-9												
Acenaphthylene	208-96-8												
Acetaldehyde	75-07-0	2.29E-03	2.61E-01	4.7E+02	5.6E-04	1.15E-01	1.49E-04	1.4E+02	1.1E-06	1.0E-02	4.3E-08	1.00	4.3E-08
Acrolein	107-02-8	1.73E-03	1.97E-01	2.5E+00	7.9E-02	8.63E-02	1.12E-04	3.5E+01	3.2E-06				
Anthracene	120-12-7												
Benzene	71-43-2	1.29E-02	1.47E+00	1.3E+03	1.1E-03	6.43E-01	8.36E-04	6.0E+01	1.4E-05	1.0E-01	2.4E-07	1.00	2.4E-07
Benzo(a)anthracene	56-55-6					2.14E-05	2.78E-08			3.9E-01	8.0E-12	29.76	2.4E-10
Benzo(a)pyrene	50-32-8					9.51E-06	1.24E-08			3.9E+00	3.6E-12	29.76	1.1E-10
Benzo(b)fluoranthene	205-99-2					1.90E-05	2.47E-08			3.9E-01	7.1E-12	29.76	2.1E-10
Benzo(g,h,i)perylene	191-24-2												
Benzo(k)fluoranthene	207-08-9					7.37E-06	9.59E-09			3.9E-01	2.8E-12	29.76	8.3E-11
1,3-Butadiene	106-99-0					6.62E-03	8.61E-06	2.0E+01	4.3E-07	6.0E-01	2.5E-09	1.00	2.5E-09
Chrysene	218-01-9					2.49E-05	3.24E-08			3.9E-02	9.4E-12	29.76	2.8E-10
Dibenz(a,h)anthracene	53-70-3					9.14E-07	1.19E-09			4.1E+00	3.4E-13	10.26	3.5E-12
Ethylbenzene	100-41-4					9.07E-04	1.18E-06	2.0E+03	5.9E-10	8.7E-03	3.4E-10	10.26	3.5E-09
Fluoranthene	206-44-0												
Fluorene	86-73-7												
Formaldehyde	50-00-0	1.44E-02	1.64E+00	5.5E+01	3.0E-02	7.18E-01	9.35E-04	9.0E+00	1.0E-04	2.1E-02	2.7E-07	1.00	2.7E-07
Indeno(1,2,3-cd)pyrene	193-39-5					1.30E-05	1.70E-08			3.9E-01	4.9E-12	29.76	1.5E-10
Naphthalene	91-20-3					5.46E-03	7.10E-06	9.0E+00	7.9E-07	1.2E-01	2.1E-09	1.00	2.1E-09
Phenanthrene	85-01-8												
Propylene	115-07-1					2.65E+00	3.44E-03	3.0E+03	1.1E-06				
Pyrene	129-00-0												
Toluene	108-88-3	3.30E-03	3.76E-01	3.7E+04	1.0E-05	1.65E-01	2.15E-04	3.0E+02	7.2E-07				
Xylene (Total)	1330-20-7	9.30E-05	1.06E-02	2.2E+04	4.8E-07	4.65E-03	6.05E-06	7.0E+02	8.6E-09				
Total					1.1E-01				1.3E-04				5.7E-07

Sources:
1. Acute REL, Chronic RELs, Cancer Potency Factors - Office of Env. Health Hazard Assessment/California Air Resources Board, Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, February 9, 2009.
2. Multi-Pathway Factors - South Coast Air Quality Management District, Risk Assessment Procedures for Rules 1401 and 212, Attachment L, July 11, 2008.

Sacramento Natural Gas Storage
Engine-Generator
Screening Health Risk Asssessment

Location: Workplace

Dilution Factor from SCREEN3
- Hourly X/Q 505.8 μg/m^3/(g/s)
- Annual X/Q 50.58 μg/m^3/(g/s)

Daily Breathing Rate	149 L/kg-day
Exposure Time Factor	1
Exposure Frequency	245 days/year
Exposure Duration	40 years
Averaging Time	25,550 days

Substance	CAS No.	lb/hr	1-hour Concentration (μg/m^3)	Acute REL (μg/m^3)	Acute Hazard Index	lb/yr	Annual Concentration (μg/m^3)	Chronic REL (μg/m^3)	Chronic Hazard Index	Inhalation Cancer Potency Factor (mg/kg-day)$^{-1}$	Inhalation Cancer Risk	Multi Pathway Factor	Cancer Risk
Acenaphthene	83-32-9												
Acenaphthylene	208-96-8												
Acetaldehyde	75-07-0	2.29E-03	1.46E-01	4.7E+02	3.1E-04	1.15E-01	8.34E-05	1.4E+02	6.0E-07	1.0E-02	4.8E-09	1.00	4.8E-09
Acrolein	107-02-8	1.73E-03	1.10E-01	2.5E+00	4.4E-02	8.63E-02	6.28E-05	3.5E+01	1.8E-06				
Anthracene	120-12-7												
Benzene	71-43-2	1.29E-02	8.19E-01	1.3E+03	6.3E-04	6.43E-01	4.68E-04	6.0E+01	7.8E-06	1.0E-01	2.7E-08	1.00	2.7E-08
Benzo(a)anthracene	56-55-6					2.14E-05	1.55E-08			3.9E-01	8.9E-13	29.76	2.6E-11
Benzo(a)pyrene	50-32-8					9.51E-06	6.92E-09			3.9E+00	4.0E-13	29.76	1.2E-11
Benzo(b)fluoranthene	205-99-2					1.90E-05	1.38E-08			3.9E-01	7.9E-13	29.76	2.3E-11
Benzo(g,h,i)perylene	191-24-2												
Benzo(k)fluoranthene	207-08-9					7.37E-06	5.36E-09			3.9E-01	3.1E-13	29.76	9.1E-12
1,3-Butadiene	106-99-0					6.62E-03	4.81E-06	2.0E+01	2.4E-07	6.0E-01	2.8E-10	1.00	2.8E-10
Chrysene	218-01-9					2.49E-05	1.81E-08			3.9E-02	1.0E-12	29.76	3.1E-11
Dibenz(a,h)anthracene	53-70-3					9.14E-07	6.65E-10			4.1E+00	3.8E-14	10.26	3.9E-13
Ethylbenzene	100-41-4					9.07E-04	6.60E-07	2.0E+03	3.3E-10	8.7E-03	3.8E-11	10.26	3.9E-10
Fluoranthene	206-44-0												
Fluorene	86-73-7												
Formaldehyde	50-00-0	1.44E-02	9.15E-01	5.5E+01	1.7E-02	7.18E-01	5.23E-04	9.0E+00	5.8E-05	2.1E-02	3.0E-08	1.00	3.0E-08
Indeno(1,2,3-cd)pyrene	193-39-5					1.30E-05	9.49E-09			3.9E-01	5.4E-13	29.76	1.6E-11
Naphthalene	91-20-3					5.46E-03	3.97E-06	9.0E+00	4.4E-07	1.2E-01	2.3E-10	1.00	2.3E-10
Phenanthrene	85-01-8												
Propylene	115-07-1					2.65E+00	1.93E-03	3.0E+03	6.4E-07				
Pyrene	129-00-0												
Toluene	108-88-3	3.30E-03	2.10E-01	3.7E+04	5.7E-06	1.65E-01	1.20E-04	3.0E+02	4.0E-07				
Xylene (Total)	1330-20-7	9.30E-05	5.93E-03	2.2E+04	2.7E-07	4.65E-03	3.38E-06	7.0E+02	4.8E-09				
Total					6.2E-02				7.0E-05				6.2E-08

Sources:
1. Acute REL, Chronic RELs, Cancer Potency Factors - Office of Env. Health Hazard Assessment/California Air Resources Board, Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, February 9, 2009.
2. Multi-Pathway Factors - South Coast Air Quality Management District, Risk Assessment Procedures for Rules 1401 and 212, Attachment L, July 11, 2008.

Sacramento Natural Gas Storage
Engine-Generator
Screening Health Risk Asssessment

Location: Residential Receptor

Dilution Factor from SCREEN3
- Hourly X/Q 80.04 μg/m^3/(g/s)
- Annual X/Q 8.00 μg/m^3/(g/s)

Daily Breathing Rate	302 L/kg-day
Exposure Time Factor	1
Exposure Frequency	350 days/year
Exposure Duration	70 years
Averaging Time	25,550 days

Substance	CAS No.	lb/hr	1-hour Concentration (μg/m^3)	Acute REL (μg/m^3)	Acute Hazard Index	lb/yr	Annual Concentration (μg/m^3)	Chronic REL (μg/m^3)	Chronic Hazard Index	Inhalation Cancer Potency Factor (mg/kg-day)$^{-1}$	Inhalation Cancer Risk	Multi Pathway Factor	Cancer Risk
Acenaphthene	83-32-9												
Acenaphthylene	208-96-8												
Acetaldehyde	75-07-0	2.29E-03	2.31E-02	4.7E+02	4.9E-05	1.15E-01	1.32E-05	1.4E+02	9.4E-08	1.0E-02	3.8E-09	1.00	3.8E-09
Acrolein	107-02-8	1.73E-03	1.74E-02	2.5E+00	7.0E-03	8.63E-02	9.94E-06	3.5E+01	2.8E-07				
Anthracene	120-12-7												
Benzene	71-43-2	1.29E-02	1.30E-01	1.3E+03	1.0E-04	6.43E-01	7.40E-05	6.0E+01	1.2E-06	1.0E-01	2.1E-08	1.00	2.1E-08
Benzo(a)anthracene	56-55-6					2.14E-05	2.46E-09			3.9E-01	7.1E-13	29.76	2.1E-11
Benzo(a)pyrene	50-32-8					9.51E-06	1.10E-09			3.9E+00	3.2E-13	29.76	9.4E-12
Benzo(b)fluoranthene	205-99-2					1.90E-05	2.18E-09			3.9E-01	6.3E-13	29.76	1.9E-11
Benzo(g,h,i)perylene	191-24-2												
Benzo(k)fluoranthene	207-08-9					7.37E-06	8.49E-10			3.9E-01	2.5E-13	29.76	7.3E-12
1,3-Butadiene	106-99-0					6.62E-03	7.62E-07	2.0E+01	3.8E-08	6.0E-01	2.2E-10	1.00	2.2E-10
Chrysene	218-01-9					2.49E-05	2.86E-09			3.9E-02	8.3E-13	29.76	2.5E-11
Dibenz(a,h)anthracene	53-70-3					9.14E-07	1.05E-10			4.1E+00	3.0E-14	10.26	3.1E-13
Ethylbenzene	100-41-4					9.07E-04	1.04E-07	2.0E+03	5.2E-11	8.7E-03	3.0E-11	10.26	3.1E-10
Fluoranthene	206-44-0												
Fluorene	86-73-7												
Formaldehyde	50-00-0	1.44E-02	1.45E-01	5.5E+01	2.6E-03	7.18E-01	8.27E-05	9.0E+00	9.2E-06	2.1E-02	2.4E-08	1.00	2.4E-08
Indeno(1,2,3-cd)pyrene	193-39-5					1.30E-05	1.50E-09			3.9E-01	4.3E-13	29.76	1.3E-11
Naphthalene	91-20-3					5.46E-03	6.28E-07	9.0E+00	7.0E-08	1.2E-01	1.8E-10	1.00	1.8E-10
Phenanthrene	85-01-8												
Propylene	115-07-1					2.65E+00	3.05E-04	3.0E+03	1.0E-07				
Pyrene	129-00-0												
Toluene	108-88-3	3.30E-03	3.33E-02	3.7E+04	9.0E-07	1.65E-01	1.90E-05	3.0E+02	6.3E-08				
Xylene (Total)	1330-20-7	9.30E-05	9.38E-04	2.2E+04	4.3E-08	4.65E-03	5.35E-07	7.0E+02	7.6E-10				
Total					9.7E-03				1.1E-05				5.0E-08

Sources:
1. Acute REL, Chronic RELs, Cancer Potency Factors - Office of Env. Health Hazard Assessment/California Air Resources Board, Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, February 9, 2009.
2. Multi-Pathway Factors - South Coast Air Quality Management District, Risk Assessment Procedures for Rules 1401 and 212, Attachment L, July 11, 2008.

Sacramento Natural Gas Storage
Engine-Generator
Screening Health Risk Asssessment

Location: Still's Water Academy

Dilution Factor from SCREEN3
- Hourly X/Q 59.85 $\mu g/m^3/(g/s)$
- Annual X/Q 5.99 $\mu g/m^3/(g/s)$

Daily Breathing Rate	581 L/kg-day
Exposure Time Factor	0.33
Exposure Frequency	180 days/year
Exposure Duration	9 years
Averaging Time	25,550 days

Substance	CAS No.	lb/hr	1-hour Concentration ($\mu g/m^3$)	Acute REL ($\mu g/m^3$)	Acute Hazard Index	lb/yr	Annual Concentration ($\mu g/m^3$)	Chronic REL ($\mu g/m^3$)	Chronic Hazard Index	Inhalation Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$	Inhalation Cancer Risk	Multi Pathway Factor	Cancer Risk
Acenaphthene	83-32-9												
Acenaphthylene	208-96-8												
Acetaldehyde	75-07-0	2.29E-03	1.73E-02	4.7E+02	3.7E-05	1.15E-01	9.87E-06	1.4E+02	7.1E-08	1.0E-02	1.2E-10	1.00	1.2E-10
Acrolein	107-02-8	1.73E-03	1.30E-02	2.5E+00	5.2E-03	8.63E-02	7.43E-06	3.5E+01	2.1E-07				
Anthracene	120-12-7												
Benzene	71-43-2	1.29E-02	9.69E-02	1.3E+03	7.5E-05	6.43E-01	5.53E-05	6.0E+01	9.2E-07	1.0E-01	6.8E-10	1.00	6.8E-10
Benzo(a)anthracene	56-55-6					2.14E-05	1.84E-09			3.9E-01	2.3E-14	29.76	6.7E-13
Benzo(a)pyrene	50-32-8					9.51E-06	8.19E-10			3.9E+00	1.0E-14	29.76	3.0E-13
Benzo(b)fluoranthene	205-99-2					1.90E-05	1.63E-09			3.9E-01	2.0E-14	29.76	6.0E-13
Benzo(g,h,i)perylene	191-24-2												
Benzo(k)fluoranthene	207-08-9					7.37E-06	6.35E-10			3.9E-01	7.8E-15	29.76	2.3E-13
1,3-Butadiene	106-99-0					6.62E-03	5.69E-07	2.0E+01	2.8E-08	6.0E-01	7.0E-12	1.00	7.0E-12
Chrysene	218-01-9					2.49E-05	2.14E-09			3.9E-02	2.6E-14	29.76	7.8E-13
Dibenz(a,h)anthracene	53-70-3					9.14E-07	7.86E-11			4.1E+00	9.7E-16	10.26	9.9E-15
Ethylbenzene	100-41-4					9.07E-04	7.81E-08	2.0E+03	3.9E-11	8.7E-03	9.6E-13	10.26	9.8E-12
Fluoranthene	206-44-0												
Fluorene	86-73-7												
Formaldehyde	50-00-0	1.44E-02	1.08E-01	5.5E+01	2.0E-03	7.18E-01	6.18E-05	9.0E+00	6.9E-06	2.1E-02	7.6E-10	1.00	7.6E-10
Indeno(1,2,3-cd)pyrene	193-39-5					1.30E-05	1.12E-09			3.9E-01	1.4E-14	29.76	4.1E-13
Naphthalene	91-20-3					5.46E-03	4.70E-07	9.0E+00	5.2E-08	1.2E-01	5.8E-12	1.00	5.8E-12
Phenanthrene	85-01-8												
Propylene	115-07-1					2.65E+00	2.28E-04	3.0E+03	7.6E-08				
Pyrene	129-00-0												
Toluene	108-88-3	3.30E-03	2.49E-02	3.7E+04	6.7E-07	1.65E-01	1.42E-05	3.0E+02	4.7E-08				
Xylene (Total)	1330-20-7	9.30E-05	7.01E-04	2.2E+04	3.2E-08	4.65E-03	4.00E-07	7.0E+02	5.7E-10				
Total					7.3E-03				8.3E-06				1.6E-09

Sources:
1. Acute REL, Chronic RELs, Cancer Potency Factors - Office of Env. Health Hazard Assessment/California Air Resources Board, Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, February 9, 2009.
2. Multi-Pathway Factors - South Coast Air Quality Management District, Risk Assessment Procedures for Rules 1401 and 212, Attachment L, July 11, 2008.

Sacramento Natural Gas Storage
Engine-Generator
Screening Health Risk Asssessment

Location: Elder Creek Elementary

Dilution Factor from SCREEN3
- Hourly X/Q 62.61 μg/m^3/(g/s)
- Annual X/Q 6.26 μg/m^3/(g/s)

Daily Breathing Rate	581 L/kg-day
Exposure Time Factor	0.33
Exposure Frequency	180 days/year
Exposure Duration	9 years
Averaging Time	25,550 days

Substance	CAS No.	lb/hr	1-hour Concentration (μg/m^3)	Acute REL (μg/m^3)	Acute Hazard Index	lb/yr	Annual Concentration (μg/m^3)	Chronic REL (μg/m^3)	Chronic Hazard Index	Inhalation Cancer Potency Factor (mg/kg-day)$^{-1}$	Inhalation Cancer Risk	Multi Pathway Factor	Cancer Risk
Acenaphthene	83-32-9												
Acenaphthylene	208-96-8												
Acetaldehyde	75-07-0	2.29E-03	1.81E-02	4.7E+02	3.8E-05	1.15E-01	1.03E-05	1.4E+02	7.4E-08	1.0E-02	1.3E-10	1.00	1.3E-10
Acrolein	107-02-8	1.73E-03	1.36E-02	2.5E+00	5.4E-03	8.63E-02	7.77E-06	3.5E+01	2.2E-07				
Anthracene	120-12-7												
Benzene	71-43-2	1.29E-02	1.01E-01	1.3E+03	7.8E-05	6.43E-01	5.79E-05	6.0E+01	9.6E-07	1.0E-01	7.1E-10	1.00	7.1E-10
Benzo(a)anthracene	56-55-6					2.14E-05	1.92E-09			3.9E-01	2.4E-14	29.76	7.0E-13
Benzo(a)pyrene	50-32-8					9.51E-06	8.57E-10			3.9E+00	1.1E-14	29.76	3.1E-13
Benzo(b)fluoranthene	205-99-2					1.90E-05	1.71E-09			3.9E-01	2.1E-14	29.76	6.2E-13
Benzo(g,h,i)perylene	191-24-2												
Benzo(k)fluoranthene	207-08-9					7.37E-06	6.64E-10			3.9E-01	8.2E-15	29.76	2.4E-13
1,3-Butadiene	106-99-0					6.62E-03	5.96E-07	2.0E+01	3.0E-08	6.0E-01	7.3E-12	1.00	7.3E-12
Chrysene	218-01-9					2.49E-05	2.24E-09			3.9E-02	2.8E-14	29.76	8.2E-13
Dibenz(a,h)anthracene	53-70-3					9.14E-07	8.23E-11			4.1E+00	1.0E-15	10.26	1.0E-14
Ethylbenzene	100-41-4					9.07E-04	8.17E-08	2.0E+03	4.1E-11	8.7E-03	1.0E-12	10.26	1.0E-11
Fluoranthene	206-44-0												
Fluorene	86-73-7												
Formaldehyde	50-00-0	1.44E-02	1.13E-01	5.5E+01	2.1E-03	7.18E-01	6.47E-05	9.0E+00	7.2E-06	2.1E-02	7.9E-10	1.00	7.9E-10
Indeno(1,2,3-cd)pyrene	193-39-5					1.30E-05	1.17E-09			3.9E-01	1.4E-14	29.76	4.3E-13
Naphthalene	91-20-3					5.46E-03	4.91E-07	9.0E+00	5.5E-08	1.2E-01	6.0E-12	1.00	6.0E-12
Phenanthrene	85-01-8												
Propylene	115-07-1					2.65E+00	3.05E-04	3.0E+03	1.0E-07				
Pyrene	129-00-0												
Toluene	108-88-3	3.30E-03	2.60E-02	3.7E+04	7.0E-07	1.65E-01	1.49E-05	3.0E+02	5.0E-08				
Xylene (Total)	1330-20-7	9.30E-05	7.34E-04	2.2E+04	3.3E-08	4.65E-03	4.19E-07	7.0E+02	6.0E-10				
Total					7.6E-03				8.7E-06				1.7E-09

Sources:
1. Acute REL, Chronic RELs, Cancer Potency Factors - Office of Env. Health Hazard Assessment/California Air Resources Board, Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, February 9, 2009.
2. Multi-Pathway Factors - South Coast Air Quality Management District, Risk Assessment Procedures for Rules 1401 and 212, Attachment L, July 11, 2008.

Sacramento Natural Gas Storage
Screening Health Risk Asssessment
Combined Results

Acute Hazard Index

	Receptor				
Source	Point of Max Impact	Workplace	Residential	Still's Water Academy	Elder Creek Elementary
Glycol Dehydration Unit	0.0140	0.0130	0.0059	0.0052	0.0052
Emergency Generator	0.1102	0.0616	0.0097	0.0073	0.0076
Total	0.1242	0.0746	0.0156	0.0125	0.0128
Threshold	1.0	1.0	1.0	1.0	1.0

Chronic Hazard Index

	Receptor				
Source	Point of Max Impact	Workplace	Residential	Still's Water Academy	Elder Creek Elementary
Glycol Dehydration Unit	0.0080	0.0017	0.0035	0.0031	0.0031
Emergency Generator	0.00013	0.00007	0.000011	0.000008	0.000009
Total	0.0081	0.0018	0.0035	0.0031	0.0031
Threshold	1.0	1.0	1.0	1.0	1.0

Cancer Risk (per million)

	Receptor				
Source	Point of Max Impact	Workplace	Residential	Still's Water Academy	Elder Creek Elementary
Glycol Dehydration Unit	13.0	2.0	6.0	0.2	0.2
Emergency Generator	0.6	0.06	0.05	0.002	0.002
Total	13.6	2.1	6.0	0.2	0.2
Threshold	10	10	10	10	10