

Screening Health Risk Assessment

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APPENDIX

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Memo

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From: James A. Reyff
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RE: Northgate 42 Gas station, Los Banos, CA

SUBJECT: GDF Screening Health Risk Assessment

The Northgate 42 project would develop a commercial site in Los Banos, CA that would include a gasoline station with market, a carwash, a retail shop and a drive thru restaurant. In addition, there would be parking lots and driveways. The gasoline station would be a source of toxic air contaminant (TAC) emissions from vapors associated with evaporation of gasoline. Illingworth & Rodkin, Inc. (I&R) conducted a screening health risk assessment (HRA) that addresses operation of the gas station.

Health risk assessments for air pollutants from gas stations focus on the following pollutants: benzene, toluene, ethyl-benzene, xylenes, naphthalene, propylene, and n-Hexane. Health risk assessments characterize potential cancer and noncancer health impacts to the public, in the form of residents, school children and workers. Gasoline stations, also referred to as gasoline dispensing facilities (GDF), are subject to air district permitting and quantification of health risks per the requirements of Assembly Bill 2588 Air Toxics "Hot Spots" Act. The San Joaquin Valley Air Pollution Control District has jurisdiction for air quality in San Joaquin Valley, which includes Los Banos.

Significance Thresholds

Exposure to TACs would be considered significant by SJVAPCD if the probability of contracting cancer for the Maximally Exposed Individual (MEI) would exceed 20 in 1 million or would result in a Hazard Index (HI) greater than 1 for non-cancer health effects¹. The HI represents the ratio of

¹ SJVAPCD significance thresholds for toxic air contaminants are published on their website at <https://ww2.valleyair.org/media/2lpbkso0/2-cms-format-air-quality-thresholds-of-significance-toxic-air-contaminants.pdf>, accessed on May 9, 2025. Note that these have been updated since the last version of the GAMAQI was published in 2015.

the predicted exposure to a recommended exposure limit, where an HI of greater than 1.0 indicates an unhealthy exposure. The MEI is the receptor type modeled that would have the highest predicted health risk for that receptor type.

HRA Methodology

To help Air Districts prepare gas station health risk assessments to meet the requirements of Assembly Bill 2588 Air Toxics “Hot Spots” Act, the California Air Resources Board (CARB) and the California Air Pollution Control Officer’s Association (CAPCOA) have developed standardized Technical Guidance². The development of the Technical Guidance includes tools created to assist Air Districts in performing screening health risk assessments. In addition, CARB has developed Supplemental Policy Guidance with recommendations for gas station operators, local governments, and Air Districts to reduce community scale health impacts from new and existing gas stations. Both guidance documents support actions under Assembly Bill 617 to improve air quality in communities that are disproportionately burdened by air pollution.

The CARB website includes the tools used to perform screening health risk assessments for GDFs. These tools follow the Technical Guidance and allow air district staff access to customize HRAs per their policy and requirements. The *Variable Meteorology Tool* was used for this project, which allows the use of meteorological data that is more appropriate for this facility and to apply SJVAPCD’s policy for computing health risk impacts.

Model Inputs

The GDF *Variable Meteorology Tool* included the following inputs for this project:

1. Meteorology. A 5-year (2004-08) meteorological data set for the Los Banos was used that was processed by SJVAPCD with AERMET, Version 18081_UStar and compiled from one-minute data using AERMINUTE with a wind speed threshold of 0.50 m/s. The meteorological data was extrapolated by MM5, which is short for Fifth-Generation Mesoscale Model. This is a regional mesoscale model used for creating weather forecasts and climate projections. The model is maintained by Penn State University and the National Center for Atmospheric Research. Specific station data are as follows:
 - a. Name: Los Banos, CA (MM5)
Longitude: -120.835393
Latitude: 37.05694
Station ID: 99004
Anemometer Ht (m): 15
Base Elevation (m): 42
Website: <https://ww2.valleyair.org/permitting/air-dispersion-modeling/meteorological-data-zip-files/>
2. The rural modeling option was used
3. Downwash effects were included since the project includes an approximate single story 20 meter (m) by 10 m building about 5 meters east of the GDF.

²CARB and CAPCOA. 2022. Gasoline Service Station Industrywide Risk Assessment Technical Guidance February 18. Accessed at https://ww2.arb.ca.gov/sites/default/files/2022-03/Draft%202022%20Gas%20Station%20IWG%20-%20Technical%20Guidance_ADA%20Compliant.pdf on May 9, 2025.

4. A flag pole receptor height of 0 m, with default receptor distances were used.
5. Default fraction of time at home for ages greater than 16 were used along with 70-year exposure duration for residences and 40 years for workers.
6. The GDF was assumed to meet current Vapor Recovery Regulations that include EV Phase 1 and EV Phase 2 control requirements to collect at least 95 percent of fueling vapors.
7. Default emission factors were used that reflect vapor recovery regulations.
8. According to the applicant, a maximum of 2,500,000 gallons of gasoline per year would be the throughput. Default calculations of 700 gallons per hour dispensed and 8,800 gallons loaded were used.

Receptor Distances

The GDF *Variable Meteorology Tool* provides predictions of cancer risk, chronic HI and Acute HI at discrete distances, regardless of direction, at specific distances from 10 to 1,000 m from the edge of the GDF. Both residential and worker risks are provided. The output from the model is provided in the *Attachment*. This is a screening tool, which does not reflect the effect that wind direction would have on predicted health risks.

For this assessment, the closest receptors were used to predict impacts. For workers, this was measured as the distance of 30 m south from the edge of the GDF to a commercial building frontage directly across Highway 152. The closest residence was measured as 150 m northeast of the GDF across Maryland Avenue. Figure 1 shows the locations of these receptors, based on Google Earth imagery.

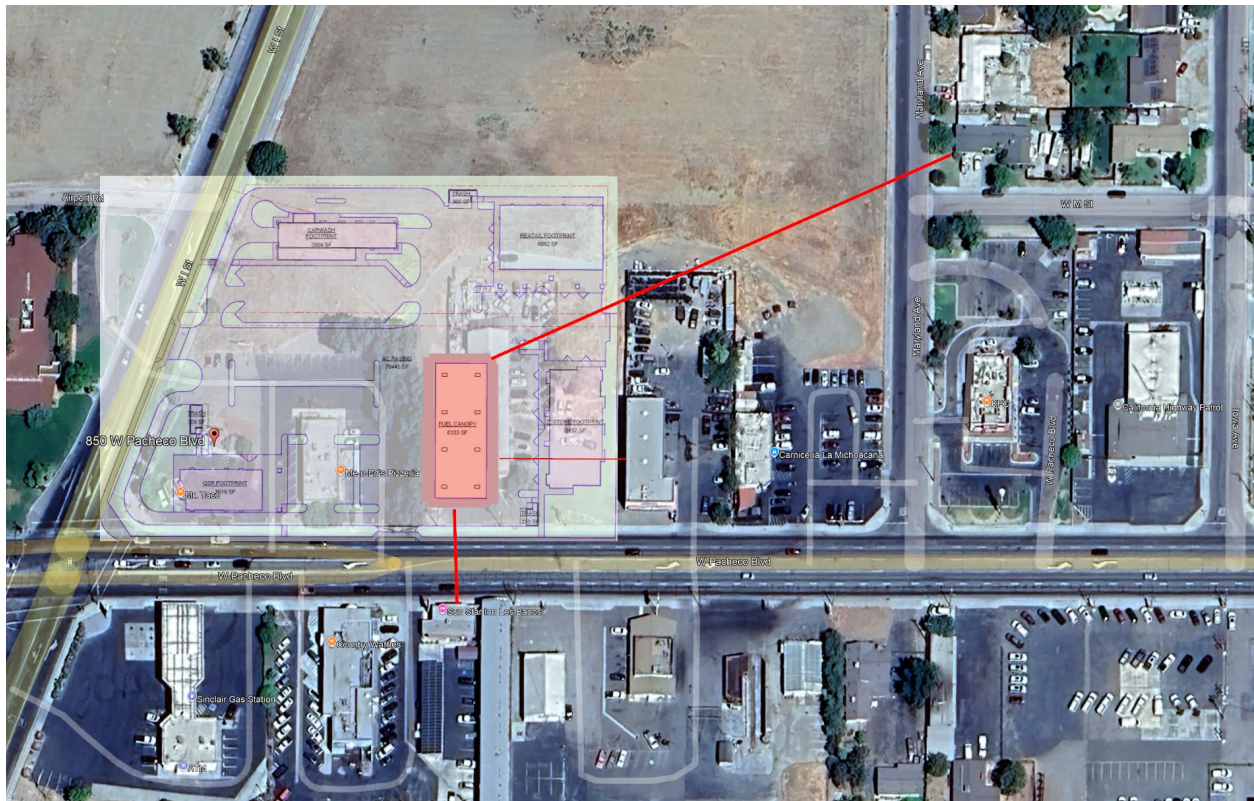


Figure 1. Closest Receptors to Northgate 42 GDF

Results

The GDF *Variable Meteorology Tool* provided screening predictions of cancer risk, chronic HI and Acute HI. These results were found to be below SJVAPCD thresholds. Screening assessments are meant to provide overestimates of impacts using simplified modeling techniques. Had screening levels been predicted to exceed thresholds, then SJVAPCD recommends a more refined approach that uses the U.S. EPA AERMOD model along with specific receptor locations and refinements of inputs.

Table 1 shows the predicted health risks for the closest worker and residential receptor. Predicted levels for this project are well below SJVAPCD thresholds. There is a school located over 300 m northeast of the project. The health risk impacts at the school would be much less than those at the nearest residence that is 150 m northeast. Exposure periods for school children are less than those for residential receptors. There are other factors that result in lower risks for school children when compared to residential receptors (e.g., age sensitivity factors).

Table 1. Predicted Health Risks Based on Screening Model

Receptor Type	Distance (m)	Cancer Risk (chances/million)	Chronic HI	Acute HI
Worker	30	0.9	0.0	0.5
Residence	150	1.0	0.0	0.1
SJVAPCD Threshold		20	1.0	1.0
Exceeds Threshold?		No	No	No

Attachment: GDF Variable Meteorology Tool Output

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EVR Phase I & EVR Phase II				
Receptor Distance	Cancer Risk (chances/million)		Chronic	Acute
	Resident	Worker	HI	HI
10	29.1	2.4	0.1	0.9
20	16.3	1.4	0.1	0.6
30	10.3	0.9	0.0	0.5
40	7.1	0.6	0.0	0.4
50	5.2	0.4	0.0	0.4
60	3.8	0.3	0.0	0.3
70	3.0	0.3	0.0	0.2
80	2.5	0.2	0.0	0.2
90	2.0	0.2	0.0	0.2
100	1.7	0.1	0.0	0.2
120	1.2	0.1	0.0	0.1
140	1.0	0.1	0.0	0.1
160	0.8	0.1	0.0	0.1
180	0.6	0.1	0.0	0.1
200	0.5	0.0	0.0	0.1
220	0.4	0.0	0.0	0.1
240	0.4	0.0	0.0	0.0
260	0.3	0.0	0.0	0.0
280	0.3	0.0	0.0	0.0
300	0.2	0.0	0.0	0.0
350	0.2	0.0	0.0	0.0
400	0.1	0.0	0.0	0.0
450	0.1	0.0	0.0	0.0
500	0.1	0.0	0.0	0.0
600	0.1	0.0	0.0	0.0
700	0.1	0.0	0.0	0.0
800	0.0	0.0	0.0	0.0
900	0.0	0.0	0.0	0.0
1000	0.0	0.0	0.0	0.0

Summary of Inputs					
Annual Throughput	2500000	gallons/year			
Max Hourly Dispensing	700	gallons/hour			
Max Hourly Loading	8800	gallons/hour			
Surface File Name	"C:\Users\JReyff\Downloads\GDF_Variable_Met\LosBanos_04-08.SFC"				
Profile File Name	"C:\Users\JReyff\Downloads\GDF_Variable_Met\LosBanos_04-08.pft"				
Building downwash included	yes				
Emission Factors					
CARB default emission factors used	Loading	0.15	lb/gal		
	Breathing	0.024	lb/gal		
	Refueling	0.089	lb/gal		
	Spillage	0.24	lb/gal		
	Hose Permeation	0.009	lb/gal		
Fraction of time at home for >16	0.73	unitless			
Exposure Duration Resident	30	years			
Exposure Duration Worker	25	years			
Operating Schedule					
0.36	0.36	0.36	0.36	0.36	1.46
1.46	1.46	1.46	1.46	1.46	1.46
1.46	1.46	1.46	1.46	1.46	1.46
1.46	0.36	0.36	0.36	0.36	0.36
Dispersion Type	Rural				
Tool version	Version 1.0 - February 18, 2022				

Annual Emissions						
Pollutant	Loading (lb/year)	Breathing (lb/year)	Refueling (lb/year)	Spillage (lb/year)	Hose Permeation (lb/year)	Total (lb/year)
Benzene	1.71E+00	2.74E-01	1.02E+00	4.24E+00	1.03E-01	7.35E+00
Ethyl Benzene	4.02E-01	6.43E-02	2.38E-01	7.73E+00	2.41E-02	8.46E+00
n-Hexane	6.84E+00	1.09E+00	4.06E+00	1.11E+01	4.10E-01	2.35E+01
Naphthalene	1.67E-03	2.67E-04	9.90E-04	1.04E+00	1.00E-04	1.05E+00
Propylene	1.35E-02	2.16E-03	8.00E-03	7.32E-04	8.09E-04	2.52E-02
Xylenes	1.53E+00	2.46E-01	9.11E-01	3.95E+01	9.21E-02	4.23E+01
Toluene	4.18E+00	6.68E-01	2.48E+00	3.38E+01	2.51E-01	4.13E+01

Hourly Emissions						
Pollutant	Loading (lb/hr)	Breathing (lb/hr)	Refueling (lb/hr)	Spillage (lb/hr)	Hose Permeation (lb/hr)	Total (lb/hr)
Benzene	7.25E-03	9.23E-05	3.42E-04	1.18E-03	3.46E-05	8.90E-03
Xylenes	6.72E-03	8.56E-05	3.17E-04	1.16E-02	3.21E-05	1.88E-02
Toluene	1.78E-02	2.26E-04	8.39E-04	9.75E-03	8.48E-05	2.87E-02

Emission Factors					
Scenario Selected	g (lb VOC/1000 gal)	g (lb VOC/1000 gal)	g (lb VOC/1000 gal)	g (lb VOC/1000 gal)	g (lb VOC/1000 gallons)
EVR Phase I and EVR Phase II	0.15	0.024	0.089	0.24	0.009

Annual Emissions Weight % (Summer/Winter Average)			
CAS	Chemical	Vapor Weight %	Liquid Weight %
71432	Benzene	0.46%	0.71%
100414	Ethyl Benzene	0.11%	1.29%
110543	n-Hexane	1.82%	1.86%
91203	Naphthalene	0.00044%	0.17%
115071	Propylene	0.0036%	0.00012%
1330207	Xylenes	0.41%	6.59%
108883	Toluene	1.11%	5.63%

Hourly Emissions Weight % (Summer Fuel)			
CAS	Chemical	Vapor Weight %	Liquid Weight %
71432	Benzene	0.55%	0.70%
1330207	Xylenes	0.51%	6.91%
108883	Toluene	1.35%	5.80%

Throughput Summary		
Annual Throughput	2500000	gallons per year
Hourly Dispensing Throughput	700	gallons per hour
Hourly Loading Throughput	8800	gallons per hour

Emission Calculations Details

In order to calculate emissions for a particular pollutant use the following formulas:

Annual Loading Emissions = Loading Emission Factor * Annual Throughput * Vapor Weight % Pollutant / 1000

Annual Breathing Emissions = Breathing Emission Factor * Annual Throughput * Vapor Weight % Pollutant / 1000

Annual Refueling Emissions = Refueling Emission Factor * Annual Throughput * Vapor Weight % Pollutant / 1000

Annual Spillage Emissions = Spillage Emission Factor * Annual Throughput * Liquid Weight % Pollutant / 1000

Annual Hose Permeation Emissions = Hose Permeation Emission Factor * Annual Throughput * Vapor Weight % Pollutant / 1000

Total Annual Emissions = Annual Loading Emissions + Annual Breathing Emissions + Annual Refueling Emissions + Annual Spillage Emissions + Annual Hose Permeation Emissions

Hourly Loading Emissions = Loading Emission Factor * Hourly Loading Throughput * Vapor Weight % Pollutant / 1000

Hourly Breathing Emissions = Breathing Emission Factor * Hourly Dispensing Throughput * Vapor Weight % Pollutant / 1000

Hourly Refueling Emissions = Refueling Emission Factor * Hourly Dispensing Throughput * Vapor Weight % Pollutant / 1000

Hourly Spillage Emissions = Spillage Emission Factor * Hourly Dispensing Throughput * Liquid Weight % Pollutant / 1000

Hourly Hose Permeation Emissions = Hose Permeation Emission Factor * Hourly Dispensing Throughput * Vapor Weight % Pollutant / 1000

Total Hourly Emissions = Hourly Loading Emissions + Hourly Breathing Emissions + Hourly Refueling Emissions + Hourly Spillage Emissions + Hourly Hose Permeation Emissions