

A P P E N D I X B

C O N S T R U C T I O N H E A L T H R I S K
A S S E S S M E N T



**CONSTRUCTION
HEALTH RISK
ASSESSMENT
FOR:**

CASTRO VILLAGE

SHOPPING CENTER



prepared for:

**R. T. NAHAS
COMPANY**

Contact:
Mr. Randy Nahas

prepared by:

**THE PLANNING
CENTER | DC&E**

Contact:
Cathleen Fitzgerald
Senior Engineer

NOVEMBER 2012

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NOVEMBER 2012

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1. Introduction

The R. T. Nahas Company, the Project Applicant, is proposing to add a 25,000 square foot store and additional parking spaces to the Castro Valley Shopping Center. The project would involve the removal of three small residences and the Village Car Wash. New construction and renovation would take place on 2.63 acres located at the southeast corner of Jamison Way and Patio Drive in the community of Castro Valley, Alameda County, California. The project is bounded by Jamison Way to the north, commercial properties, a vacant lot, and Redwood road to the east, Village Drive to the south, and commercial/retail businesses to the west (see Figure 1).

The latest version of the Bay Area Air Quality Management District (BAAQMD) CEQA Air Quality Guidelines requires projects to evaluate the impacts of construction on sensitive receptors (BAAQMD, 2012). Construction of the project would take place starting in 2013 and will include demolition, grading, building construction, paving, and painting. The construction phase is estimated to take place over a period of 124 days beginning in April 2013 and ending in September 2013.

The nearest residential housing is located approximately 70 feet north from the project across Jamison Way and there are additional residences across Woodbine Avenue to the west and across Redwood Road to the east. The residents at these locations could be potentially impacted from the proposed construction activities.

The BAAQMD has developed *Screening Tables for Air Toxics Evaluation During Construction* (2010) that evaluate construction-related health risks associated with residential, commercial, and industrial projects. According to the screening tables, the residences are closer than the distance of 100 meters (328 feet) that would screen out potential health risks. Therefore, a site-specific construction health risk assessment (HRA) was prepared for this project.

This construction HRA considers the health impact of planned construction operations at the project site to sensitive receptors (adults and children in the nearby residences) from diesel equipment exhaust and PM_{2.5}.



2. Project Description

The proposed new construction project at the existing shopping center encompasses approximately 2.63 acres at the southeast corner of Jamison Way and Patio Drive in the community of Castro Valley, Alameda County, California. It is bordered by Jamison Way to the north; commercial properties, a vacant lot, and Redwood road to the east; Village Drive to the south; and commercial/retail businesses to the west. To the west, north, and east are sensitive receptors (residences). The project site and vicinity are depicted in Figure 1.



Project Location and ISCST3 Model Configuration



--- Site Boundary

+ Residential Receptor

0 600
Scale (Feet)



Source: Google Earth Pro 2011

3. Methodology and Significance Thresholds

The purpose of the construction HRA is to evaluate the potential health impacts associated with diesel particulate matter (DPM) and particulate matter less than 2.5 microns (PM_{2.5}) from construction activities associated with the proposed project. Construction sources evaluated in this HRA include off-road construction equipment (excavators, forklifts, graders, pavers, rollers, scrapers, dozers, tractors, loaders, and backhoes).

The BAAQMD's 2010 adopted "Thresholds of Significance" for local community risk impacts were challenged in a lawsuit and subsequently rescinded. However, lead agencies can determine that these are appropriate air quality thresholds for projects they review. The 2010 BAAQMD thresholds that were used for this project are shown below:

- Non-compliance with a qualified risk reduction plan
- Excess cancer risk of more than 10 in a million
- Non-cancer hazard index (chronic or acute) greater than 1.0
- Incremental increase in average annual PM_{2.5} concentration of greater than 0.3 µg/m³

Since Alameda County does not have a qualified risk reduction plan, a site-specific analysis of DPM and PM_{2.5} impacts on sensitive receptors was conducted.

The methodology used in this HRA is consistent with the following BAAQMD and the Office of Environmental Health Hazard Assessment (OEHHA) guidance documents:

- BAAQMD, 2012. *California Environmental Quality Act Air Quality Guidelines*. May 2012.
- BAAQMD, 2010. *Screening Tables for Air Toxics Evaluation During Construction*. May 2010.
- BAAQMD, 2011. *Recommended Methods for Screening and Modeling Local Risks and Hazards*. Version 2.0. May 2011
- OEHHA, 2012. *Air Toxics Hot Spots Program Risk Assessment Guidelines*. June, 2012.

Potential exposures to DPM and PM_{2.5} from proposed project construction activities were evaluated for off-site sensitive receptors in the vicinity of the site, including the residences to the west, north, and east. Using air dispersion models, receptor concentrations were estimated and excess lifetime cancer risks and chronic non-cancer hazard indexes were calculated. These risks were then compared to the significance thresholds identified in the BAAQMD CEQA guidelines.



4. *Construction Emissions*

Construction emissions were calculated, using the proposed construction schedule and the California Emissions Estimation Model, known as CalEEMod (SCAQMD, 2011). The CalEEMod construction emissions output is provided in Appendix A.

The project was assumed to take place over 124 days in 2013 beginning in April and ending in September. Two model runs were conducted. The first run assumed that no mitigation measures were used to reduce emissions from the construction equipment. The second run assumed that the project would use Tier 3 standards for off-road equipment greater than 90 hp to achieve emission reductions. The modeled emission rates for both scenarios are summarized in Table 1.

Parameter	Unmitigated (lb/day)	Mitigated (lb/day)
DPM	1.41	1.08
PM _{2.5}	1.41	1.08



5. Dispersion Modeling

To assess the impact of emitted compounds on sensitive receptors at the project, air quality modeling using the ISCST3 model was performed. The model is a steady state Gaussian plume model and is an approved model by BAAQMD for estimating ground level impacts from point and fugitive sources in simple and complex terrain. The construction emissions for the project were modeled as a polyarea source.

The model requires additional input parameters, including chemical emission data and local meteorology. Inputs for the construction phase emission rates are those described in Section 4. Meteorological data obtained from the BAAQMD for the nearest met station (Chabot) and the latest available year of record (2005) were used to represent local weather conditions and prevailing winds.

DPM emissions were based on the CalEEMod unmitigated and mitigated construction runs, using annual exhaust PM₁₀ construction emissions presented in lb/day. The PM_{2.5} emissions were taken from the CalEEMod PM_{2.5} total, which includes exhaust PM_{2.5}. An emission release height of 4.15 meters was used as representative of the stack exhaust height for off-road construction equipment and an initial vertical dispersion parameter of 1.93 m was used, per CARB guidance (2000).

The modeling analysis also considered the spatial distribution and elevation of each emitting source in relation to the sensitive receptors. To accommodate the model's Cartesian grid format, direction-dependent calculations were obtained by identifying the Universal Transverse Mercator (UTM) coordinates for each source location. The United States Geological Society 30-meter Digital Elevation Model (DEM) data were used to account for elevation differences. DEM data allowed for the direct computation of source and receptor elevations within the ISCST3 model.

To determine contaminant impacts during construction hours, the model's scalar option was invoked to predict flagpole-level concentrations (1.8 m) for emissions generated between the hours of 7:00 AM and 4:00 PM, with a one-hour break for lunch between noon and 1:00 PM. In addition, a scalar factor was applied to HROFDY in the ISCST3 model to account for the number of days of construction activity per year.

The configuration of the area sources and the receptor locations are presented in Figure 1. The ISCST3 model output data are presented in Appendix B.



6. Risk Characterizations

6.1 CARCINOGENIC CHEMICAL RISK

Carcinogenic compounds are not considered to have threshold levels (i.e., dose levels below which there are no risks). Any exposure, therefore, will have some associated risk. As a result, the BAAQMD has established a threshold of ten in a million (10E-06) as a level posing no significant risk for exposures to carcinogens.

Health risks associated with exposure to carcinogenic compounds can be defined in terms of the probability of developing cancer as a result of exposure to a chemical at a given concentration. The cancer risk probability is determined by multiplying the chemical's annual concentration by its cancer potency factor (CPF), a measure of the carcinogenic potential of a chemical when a dose is received through the inhalation pathway. It is an upper-limit estimate of the probability of contracting cancer as a result of continuous exposure to an ambient concentration of one microgram per cubic meter ($\mu\text{g}/\text{m}^3$) over a lifetime of 70 years.

Cancer risks were calculated using BAAQMD recommended methods for a residential receptor. For the inhalation pathway, contaminant dose is multiplied by the cancer potency factor in units of inverse dose expressed in milligrams per kilogram per day ($\text{mg}/\text{kg}/\text{day}$)⁻¹ to derive the cancer risk estimate. To calculate the contaminant dose, the following equation was used:

$$\text{Dose} = (C_{\text{air}} \times IR \times EF \times ED \times CF) / (AT)$$

where:

Dose	=	dose through inhalation pathway ($\text{mg}/\text{kg}/\text{day}$)
C_{air}	=	concentration of contaminant in air ($\mu\text{g}/\text{m}^3$)
IR	=	inhalation rate (302 L/kg body weight per day for adult)
	=	inhalation rate (581 L/kg body weight per day for child)
EF	=	exposure frequency (350 days/year)
ED	=	exposure duration (70 years for residential receptor)
CF	=	conversion factor (10^6 [$\text{mg}/\mu\text{g} \cdot \text{m}^3/\text{L}$])
AT	=	averaging time (25,550 days or 70 years)

The CPFs used in the assessment were obtained from OEHHA guidance. For DPM, a CPF of $1.1 \text{ mg}/\text{kg}\text{-day}^{-1}$ was used.

OEHHA and BAAQMD procedures require the incorporation of age sensitivity factors into the evaluation. For estimating cancer risk for residential adult receptors that include exposure over a 70-year lifetime, a cancer risk adjustment factor (CRAF) of 1.7 is applied. For estimating cancer risk to child receptors, a CRAF of 10 and 3 is applied, depending on the age of the child. The CRAF is used in the following equation to obtain the cancer risk:

$$\text{Cancer Risk} = (\text{Dose} \times \text{Cancer Potency Factor} \times \text{CRAF})$$



6. Risk Characterization

where:

Cancer Risk = risk (potential chances per million)
Dose = dose through inhalation (mg/kg-day)
Cancer Potency Factor = toxicity factor (mg/kg-day⁻¹)
CRAF = cancer risk adjustment factor (1.7 for residential receptor)
CRAF = cancer risk adjustment factor (10 for children 0 to 2 years)
CRAF = cancer risk adjustment factor (3 for children 2 to 16 years)

The excess lifetime cancer risk to the maximally exposed individual (MEI) during the construction period was calculated, based on the factors provided above. The calculated results are provided in Appendix C.

6.2 NONCARCINOGENIC HAZARDS

An evaluation of the potential noncancer effects of chronic chemical exposures was also conducted. Adverse health effects are evaluated by comparing the annual ground level concentration of each chemical compound with the appropriate reference exposure limit (REL). Available RELs promulgated by OEHHA were considered in the assessment.

To quantify noncarcinogenic impacts, the hazard index approach was used. The hazard index assumes that chronic subthreshold exposures adversely affect a specific organ or organ system (toxicological endpoint). For each discrete chemical exposure, target organs presented in regulatory guidance were used. To calculate the hazard index, each chemical concentration or dose is divided by the appropriate toxicity value. For compounds affecting the same toxicological endpoint, this ratio is summed. Where the total equals or exceeds one, a health hazard is presumed to exist. In a manner consistent with the assessment of carcinogenic exposures, REL/RfC (reference concentration) values were converted to units expressed in mg/kg/day to accommodate the above intake algorithm.

The chronic hazard analysis for DPM is provided in Appendix C. The calculations contain the relevant exposure concentrations and corresponding reference dose values used in the evaluation of noncarcinogenic exposures.

6.3 CRITERIA POLLUTANTS

The BAAQMD has recently incorporated PM_{2.5} into the District's CEQA significance thresholds due to recent studies that show adverse health impacts from exposure to this pollutant. An incremental increase of greater than 0.3 ug/m³ for the annual average PM_{2.5} concentration is considered to be a significant impact. The modeling results for PM_{2.5} are summarized in Table 2; the model runs are provided in Appendix B.

For PM_{2.5}, the maximum annual concentration for the unmitigated run was calculated to be 0.14 ug/m³, which is less than the significance threshold of 0.3 ug/m³. For the mitigated run, the PM_{2.5} concentration was estimated to be 0.11 ug/m³, which also is below the significance threshold. The results of the modeling indicate that residential receptors in the vicinity of the project would not be adversely impacted by PM_{2.5} emissions during the 124-day construction period.



7. Conclusions

Results of the health risk assessment indicate that the incremental cancer risk for the unmitigated project for a resident next to the project site during the construction period, based on the maximum concentration for a 70-year, 24-hour outdoor exposure duration, is 1.1×10^{-6} (1.1 per million), which is less than the significance threshold of 10 per million. However, the incremental cancer risk for the child for the unmitigated project was estimated to be 1.2×10^{-5} or 12×10^{-6} , which is above the significance threshold of 10 in a million. Therefore, mitigation measures are warranted.

The proposed mitigation measure is the use of Tier 3 standards for all construction equipment greater than 90 hp. With implementation of this mitigation measure, the incremental cancer risk for the maximally exposed adult next to the project site during the construction period is reduced to 8.3×10^{-7} . For the child resident, the maximally exposed individual was calculated to have an excess cancer risk of 9.4×10^{-6} , which also is less than the 10 in a million significance threshold.

For non-carcinogenic effects, the hazard index identified for each toxicological endpoint totaled less than one. Therefore, chronic non-carcinogenic hazards are within acceptable limits. In addition, $PM_{2.5}$ annual concentrations are below the BAAQMD significance thresholds. The results are summarized in Table 2.

<i>Receptor</i>	<i>Value</i>	<i>BAAQMD Significance Threshold</i>	<i>Exceeds Significance Threshold?</i>
Unmitigated - Adult Resident	1.1E-06	10E-06	No
Unmitigated- Child Resident	12E-06	10E-06	Yes
Unmitigated - Chronic Hazard	0.028	1.0	No
Unmitigated - $PM_{2.5}$ Concentration ($\mu\text{g}/\text{m}^3$)	0.14	0.3	No
Mitigated - Adult Resident	8.3E-07	10E-06	No
Mitigated – Child Resident	9.4E-06	10E-06	No
Mitigated – Chronic Hazard	0.022	1.0	No
Mitigated - $PM_{2.5}$ Concentration ($\mu\text{g}/\text{m}^3$)	0.11	0.3	No

The results of this construction risk assessment indicate that the project would have a less than significant impact with respect to risk for near-by adult or child residents during the 124-day construction period, with the implementation of Tier 3 standards on all construction equipment greater than 90 hp.



8. *References*

Bay Area Air Quality Management District (BAAQMD), 2012. *California Environmental Quality Act Air Quality Guidelines*. Dated June 2010.

BAAQMD, 2010. *Screening Tables for Air Toxics Evaluation During Construction. Version 1.0*. Dated May 2010.

BAAQMD, 2011. *Recommended Methods for Screening and Modeling Local Risks and Hazards. Version 2.0*. May 2011.

California Air Resources Board (CARB), 2000. *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles*.

Office of Environmental Health Hazard Assessment (OEHHA). 2010. *Toxicity Criteria Database*. <http://oehha.ca.gov/risk/chemicaldb/index.asp>. Accessed November 2, 2010.

OEHHA, 2012. *Air Toxic Hot Spots Program Risk Assessment Guidelines. Technical Support Document for Exposure Assessment and Stochastic Analysis*. Dated June 2012.

South Coast Air Quality Management District (SCAQMD), 2011. *California Emissions Estimator Model User's Guide. Version 2011.1* Prepared for SCAQMD, Diamond Bar, CA by ENVIRON International Corporation, Emeryville, CA. Dated February 2011.



Appendix A.
CalEEMod Input Parameters and Output



Worksheet - CalEEMOD Maximum Daily to Average Daily Construction Emissions

ONSITE EMISSIONS

ONSITE -WINTER RUN		ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total
Type	No. Days	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day
Building Demolition	10	1.64	11.4	8.64	0.01	0.15	0.82	0.97	0.00	0.82	0.82
Building Grading	9	4.21	33.2	19.5	0.04	0.16	1.78	1.94	0.00	1.78	1.78
Foundation, Trenching	20	1.46	9.61	7.43	0.01		0.81	0.81		0.81	0.81
Shell Construction	40	1.17	7.66	5.26	0.01		0.64	0.64		0.64	0.64
Roof Construction	5	0.61	5.82	1.72	0.01		0.20	0.20		0.20	0.20
Interior Construction	40	1.47	10.6	7.76	0.01		0.69	0.69		0.69	0.69
Parking Demolition	20	1.64	11.4	8.64	0.01	0.27	0.82	1.09	0.00	0.82	0.82
Parking Grading	30	4.21	33.2	19.5	0.04	0.00	1.78	1.78	0.00	1.78	1.78
Paving	8	2.96	15.7	10.1	0.02		1.16	1.16		1.16	1.16
Architectural Coating	10	58.2	1.64	1.08	0.00		0.15	0.15		0.15	0.15
2013 Annual (lbs)		957	2726	1787	3.07	8.34	175	184	0.00	175	175

Average Daily Construction Emissions (lbs/day)

ONSITE EMISSIONS	No. Days	ROG	NOx	CO	SO2	Fugitive PM10*	Exhaust PM10	PM10 Total	Fugitive PM2.5*	Exhaust PM2.5	PM2.5 Total
2013	124	7.71	22.0	14.4	0.02	0.07	1.41	1.48	0.00	1.41	1.41
Threshold		54	54	NA	NA	BCM	82	NA	BCM	54	NA

*Fugitive Dust Excluded from BAAQMD's daily thresholds. BAAQMD's Basic Control Measures (BCM) required.

**CONSTRUCTION DPM AND PM2.5 EMISSIONS
INPUT TO ISCST3 MODEL - UNMITIGATED**

Year	2013
DPM Emissions ¹ (lbs/day)	1.41
DPM Emissions (lbs/hr)	0.1763
DPM Emissions (gm/sec)	0.02221
Modeled Area (acres)	2.63
Modeled Area (m2)	10643
DPM Emission Rate (gm/sec/m2)	2.09E-06
PM2.5 Emissions (lbs/day)	1.41
PM2.5 Emissions (lbs/hr)	0.1763
PM2.5 Emissions (gm/sec)	0.02221
Modeled Area (acres)	2.63
Modeled Area (m2)	10643
PM2.5 Emission Rate (gm/sec/m2)	2.09E-06

¹DPM emissions taken as PM₁₀ exhaust emissions from CalEEMod computer runs

	2013
Hr/day	8
Total construction days	124
Scalar for HROFDY in ISCST3 model	0.34

Assume maximum of 8.0 hrs/day of heavy equipment operation
Operating hours between 7 am and 4 pm, with 1-hour lunch period

Worksheet - CalEEMOD Maximum Daily to Average Daily Construction Emissions

ONSITE EMISSIONS - MITIGATED (Tier 3 Engines for Equipment over 90 HP)

ONSITE -WINTER RUN		ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total
Type	No. Days	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day
Building Demolition	10	1.08	6.67	8.77	0.01	0.15	0.62	0.77	0.00	0.62	0.62
Building Grading	9	2.81	17.9	20.0	0.04	0.16	1.27	1.43	0.00	1.27	1.27
Foundation, Trenching	20	0.96	5.75	7.09	0.01		0.58	0.58		0.58	0.58
Shell Construction	40	0.84	5.65	5.09	0.01		0.46	0.46		0.46	0.46
Roof Construction	5	0.46	3.00	3.00	0.01		0.17	0.17		0.17	0.17
Interior Construction	40	1.19	7.91	8.31	0.01		0.65	0.65		0.65	0.65
Parking Demolition	20	1.08	6.67	8.77	0.01	0.27	0.62	0.89	0.00	0.62	0.62
Parking Grading	30	2.81	17.9	20.0	0.04	0.00	1.27	1.27	0.00	1.27	1.27
Paving	8	2.43	11.1	10.2	0.02		0.98	0.98		0.98	0.98
Architectural Coating	10	58.2	1.64	1.08	0.00		0.15	0.15		0.15	0.15
2013 Annual (lbs)		846	1677	1829	3.07	8.34	134	143	0.00	134	134

Average Daily Construction Emissions (lbs/day)

ONSITE EMISSIONS	No. Days	ROG	NOx	CO	SO2	Fugitive PM10*	Exhaust PM10	PM10 Total	Fugitive PM2.5*	Exhaust PM2.5	PM2.5 Total
2013	124	6.82	13.5	14.7	0.02	0.07	1.08	1.15	0.00	1.08	1.08
Threshold		54	54	NA	NA	BCM	82	NA	BCM	54	NA

*Fugitive Dust Excluded from BAAQMD's daily thresholds. BAAQMD's Basic Control Measures (BCM) required.

**CONSTRUCTION DPM AND PM2.5 EMISSIONS
INPUT TO ISCST3 MODEL - MITIGATED - TIER 3 EQUIPMENT**

Year	2013
DPM Emissions ¹ (lbs/day)	1.08
DPM Emissions (lbs/hr)	0.1350
DPM Emissions (gm/sec)	0.01701
Modeled Area (acres)	2.63
Modeled Area (m2)	10643
DPM Emission Rate (gm/sec/m2)	1.60E-06
PM2.5 Emissions (lbs/day)	1.08
PM2.5 Emissions (lbs/hr)	0.1350
PM2.5 Emissions (gm/sec)	0.01701
Modeled Area (acres)	2.63
Modeled Area (m2)	10643
PM2.5 Emission Rate (gm/sec/m2)	1.60E-06

¹DPM emissions taken as PM₁₀ exhaust emissions from CalEEMod computer runs

	2013
Hr/day	8
Total construction days	124
Scalar for HROFDY in ISCST3 model	0.34

Assume maximum of 8.0 hrs/day of heavy equipment operation
Operating hours between 7 am and 4 pm, with 1-hour lunch period

Appendix B.
ISCST3 Model Output Files



```
*** ISCST3 - VERSION 02035 ***      *** Castro Village Shopping Center      ***      11/09/12
*** Construction HRA - DPM and PM2.5 - Unmitigated      ***      13:39:43
**MODELOPTs:
CONC          URBAN ELEV          DFAULT
                                     ***      MODEL SETUP OPTIONS SUMMARY      ***
-----
**Intermediate Terrain Processing is Selected
**Model Is Setup For Calculation of Average CONCentration Values.
  -- SCAVENGING/DEPOSITION LOGIC --
**Model Uses NO DRY DEPLETION.  DDPLETE = F
**Model Uses NO WET DEPLETION.  WDPLETE = F
**NO WET SCAVENGING Data Provided.
**NO GAS DRY DEPOSITION Data Provided.
**Model Does NOT Use GRIDDED TERRAIN Data for Depletion Calculations
**Model Uses URBAN Dispersion.
**Model Uses Regulatory DEFAULT Options:
  1. Final Plume Rise.
  2. Stack-tip Downwash.
  3. Buoyancy-induced Dispersion.
  4. Use Calms Processing Routine.
  5. Not Use Missing Data Processing Routine.
  6. Default Wind Profile Exponents.
  7. Default Vertical Potential Temperature Gradients.
  8. "Upper Bound" Values for Supersquat Buildings.
  9. No Exponential Decay for URBAN/Non-SO2
**Model Accepts Receptors on ELEV Terrain.
**Model Assumes No FLAGPOLE Receptor Heights.
**Model Calculates ANNUAL Averages Only
**This Run Includes:      1 Source(s);      1 Source Group(s); and      66 Receptor(s)
**The Model Assumes A Pollutant Type of:  OTHER
**Model Set To Continue RUNNING After the Setup Testing.
**Output Options Selected:
  Model Outputs Tables of ANNUAL Averages by Receptor
  Model Outputs External File(s) of Concurrent Values for Postprocessing (POSTFILE Keyword)
  Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)
**NOTE:  The Following Flags May Appear Following CONC Values:  c for Calm Hours
                                                m for Missing Hours
                                                b for Both Calm and Missing Hours
**Misc. Inputs:  Anem. Hgt. (m) = 10.00 ;      Decay Coef. = 0.000      ;      Rot. Angle = 0.0
                 Emission Units = GRAMS/SEC      ;      Emission Rate Unit Factor = 0.10000E+07
                 Output Units = MICROGRAMS/M**3
**Approximate Storage Requirements of Model = 1.2 MB of RAM.
**Input Runstream File:      ISCST3.INP
**Output Print File:        ISCST3.OUT
```

*** ISCST3 - VERSION 02035 *** *** Castro Village Shopping Center *** 11/09/12
*** Construction HRA - DPM and PM2.5 - Unmitigated *** 13:39:43
MODELOPTs: URBAN ELEV DFAULT * PAGE 2
CONC

*** AREAPOLY SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC /METER**2)	LOCATION OF AREA X (METERS)	LOCATION OF AREA Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	NUMBER OF VERTS.	INIT. SZ (METERS)	EMISSION RATE SCALAR VARY BY
1	0	0.20900E-05	581421.7	4172708.0	56.5	4.15	8	1.93	HROFDY

*** ISCST3 - VERSION 02035 *** *** Castro Village Shopping Center *** 11/09/12
*** Construction HRA - DPM and PM2.5 - Unmitigated *** 13:39:43
MODELOPTs: URBAN ELEV DFAULT * PAGE 4

* SOURCE EMISSION RATE SCALARS WHICH VARY FOR EACH HOUR OF THE DAY *

HOURL	SCALAR	HOURL	SCALAR	HOURL	SCALAR	HOURL	SCALAR	HOURL	SCALAR	HOURL	SCALAR
SOURCE ID = 1 ; SOURCE TYPE = AREAPOLY :											
1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.00000E+00	8	.34000E+00	9	.34000E+00	10	.34000E+00	11	.34000E+00	12	.00000E+00
13	.34000E+00	14	.34000E+00	15	.34000E+00	16	.34000E+00	17	.00000E+00	18	.00000E+00
19	.00000E+00	20	.00000E+00	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

*** ISCST3 - VERSION 02035 ***
*** Castro Village Shopping Center
*** Construction HRA - DPM and PM2.5 - Unmitigated

*** 11/09/12
*** 13:39:43
*** PAGE 5

**MODELOPTs:
CONC URBAN ELEV DFAULT

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

(581334.3, 4172694.5, 55.8, 0.0); (581334.9, 4172670.0, 55.6, 0.0);
CONC URBAN ELEV DFAULT

PAGE 7

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

FILE: C:\Users\CFITZG-1\DOCUME-1\METDAT-1\BAAQMD\Chabot\cha05600.asc
FORMAT: (4I2,2F9.4,F6.1,I2,2F7.1,f9.4,f10.1,f8.4,i4,f7.2)
SURFACE STATION NO.: 1903 UPPER AIR STATION NO.: 1903
NAME: UNKNOWN NAME: UNKNOWN
YEAR: 2005 YEAR: 2005

Table with 12 columns: YR, MN, DY, HR, FLOW VECTOR, SPEED (M/S), TEMP (K), STAB CLASS, MIXING HEIGHT (RURAL, URBAN), USTAR (M/S), M-O LENGTH (M), Z-0 (M), IPCODE, PRATE (mm/HR). Contains 24 rows of meteorological data.

*** NOTES: STABILITY CLASS 1=A, 2=B, 3=C, 4=D, 5=E AND 6=F.
FLOW VECTOR IS DIRECTION TOWARD WHICH WIND IS BLOWING.

*** ISCST3 - VERSION 02035 *** *** Castro Village Shopping Center *** 11/09/12
 *** Construction HRA - DPM and PM2.5 - Unmitigated *** 13:39:43
 MODELOPTS: URBAN ELEV DFAULT * PAGE 8

*** THE ANNUAL (1 YRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
 INCLUDING SOURCE(S): 1 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

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

	X-COORD (M)	Y-COORD (M)	CONC	X-COORD (M)	Y-COORD (M)	CONC	
	581334.31	4172694.50	0.01530	581334.88	4172670.00	0.02155	
ALL	1ST HIGHEST VALUE IS		0.14079	AT (581497.81, 4172736.25,	57.19,	0.00)	DC NA
	2ND HIGHEST VALUE IS		0.12005	AT (581542.12, 4172738.75,	57.35,	0.00)	DC NA
	3RD HIGHEST VALUE IS		0.11032	AT (581466.50, 4172738.25,	57.00,	0.00)	DC NA
	4TH HIGHEST VALUE IS		0.09719	AT (581560.69, 4172743.00,	57.41,	0.00)	DC NA
	5TH HIGHEST VALUE IS		0.09116	AT (581575.50, 4172739.00,	57.42,	0.00)	DC NA
	6TH HIGHEST VALUE IS		0.08556	AT (581438.38, 4172731.75,	56.78,	0.00)	DC NA
	7TH HIGHEST VALUE IS		0.08012	AT (581657.12, 4172649.50,	56.53,	0.00)	DC NA
	8TH HIGHEST VALUE IS		0.07987	AT (581538.31, 4172761.50,	57.66,	0.00)	DC NA
	9TH HIGHEST VALUE IS		0.07583	AT (581657.12, 4172663.75,	56.67,	0.00)	DC NA
	10TH HIGHEST VALUE IS		0.07475	AT (581497.81, 4172763.75,	57.52,	0.00)	DC NA

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

*** ISCST3 - VERSION 02035 *** *** Castro Village Shopping Center *** 11/09/12
*** Construction HRA - DPM and PM2.5 - Unmitigated *** 13:39:43
MODELOPTs: URBAN ELEV DFAULT * PAGE 10
CONC

*** Message Summary : ISCST3 Model Execution ***

----- Summary of Total Messages -----
A Total of 0 Fatal Error Message(s)
A Total of 2 Warning Message(s)
A Total of 12 Informational Message(s)
A Total of 12 Calm Hours Identified

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

***** WARNING MESSAGES *****
OU W565 174 PERPLT:Possible Conflict With Dynamically Allocated FUNIT PLOTFILE
OU W565 175 PERPST:Possible Conflict With Dynamically Allocated FUNIT POSTFILE

*** ISCST3 Finishes Successfully ***

```
*** ISCST3 - VERSION 02035 ***      *** Castro Village Shopping Center      ***      11/09/12
*** Construction HRA - DPM and PM2.5 - Mitigated      ***      13:41:40
**MODELOPTs:
CONC          URBAN ELEV          DFAULT
                                     ***      MODEL SETUP OPTIONS SUMMARY      ***
-----
**Intermediate Terrain Processing is Selected
**Model Is Setup For Calculation of Average CONCentration Values.
  -- SCAVENGING/DEPOSITION LOGIC --
**Model Uses NO DRY DEPLETION.  DDPLETE = F
**Model Uses NO WET DEPLETION.  WDPLETE = F
**NO WET SCAVENGING Data Provided.
**NO GAS DRY DEPOSITION Data Provided.
**Model Does NOT Use GRIDDED TERRAIN Data for Depletion Calculations
**Model Uses URBAN Dispersion.
**Model Uses Regulatory DEFAULT Options:
  1. Final Plume Rise.
  2. Stack-tip Downwash.
  3. Buoyancy-induced Dispersion.
  4. Use Calms Processing Routine.
  5. Not Use Missing Data Processing Routine.
  6. Default Wind Profile Exponents.
  7. Default Vertical Potential Temperature Gradients.
  8. "Upper Bound" Values for Supersquat Buildings.
  9. No Exponential Decay for URBAN/Non-SO2
**Model Accepts Receptors on ELEV Terrain.
**Model Assumes No FLAGPOLE Receptor Heights.
**Model Calculates ANNUAL Averages Only
**This Run Includes:      1 Source(s);      1 Source Group(s); and      66 Receptor(s)
**The Model Assumes A Pollutant Type of:  OTHER
**Model Set To Continue RUNNING After the Setup Testing.
**Output Options Selected:
  Model Outputs Tables of ANNUAL Averages by Receptor
  Model Outputs External File(s) of Concurrent Values for Postprocessing (POSTFILE Keyword)
  Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)
**NOTE:  The Following Flags May Appear Following CONC Values:  c for Calm Hours
                                                    m for Missing Hours
                                                    b for Both Calm and Missing Hours
**Misc. Inputs:  Anem. Hgt. (m) = 10.00 ;      Decay Coef. = 0.000      ;      Rot. Angle = 0.0
                  Emission Units = GRAMS/SEC      ;      Emission Rate Unit Factor = 0.10000E+07
                  Output Units = MICROGRAMS/M**3
**Approximate Storage Requirements of Model = 1.2 MB of RAM.
**Input Runstream File:      ISCST3.INP
**Output Print File:      ISCST3.OUT
```

*** ISCST3 - VERSION 02035 *** *** Castro Village Shopping Center
*** Construction HRA - DPM and PM2.5 - Mitigated

*** 11/09/12
*** 13:41:40
PAGE 2

**MODELOPTs:
CONC URBAN ELEV DFAULT

*** AREAPOLY SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC /METER**2)	LOCATION OF AREA X (METERS)	LOCATION OF AREA Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	NUMBER OF VERTS.	INIT. SZ (METERS)	EMISSION RATE SCALAR VARY BY
1	0	0.16000E-05	581421.7	4172708.0	56.5	4.15	8	1.93	HROFDY

*** ISCST3 - VERSION 02035 *** *** Castro Village Shopping Center *** 11/09/12
*** Construction HRA - DPM and PM2.5 - Mitigated *** 13:41:40
MODELOPTs: URBAN ELEV DFAULT * PAGE 4

* SOURCE EMISSION RATE SCALARS WHICH VARY FOR EACH HOUR OF THE DAY *

HOURL	SCALAR	HOURL	SCALAR	HOURL	SCALAR	HOURL	SCALAR	HOURL	SCALAR	HOURL	SCALAR
SOURCE ID = 1 ; SOURCE TYPE = AREAPOLY :											
1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.00000E+00	8	.34000E+00	9	.34000E+00	10	.34000E+00	11	.34000E+00	12	.00000E+00
13	.34000E+00	14	.34000E+00	15	.34000E+00	16	.34000E+00	17	.00000E+00	18	.00000E+00
19	.00000E+00	20	.00000E+00	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

*** ISCST3 - VERSION 02035 ***
*** Castro Village Shopping Center
*** Construction HRA - DPM and PM2.5 - Mitigated

*** 11/09/12
*** 13:41:40
*** PAGE 5

**MODELOPTs:
CONC URBAN ELEV DFAULT

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

(581334.3, 4172694.5, 55.8, 0.0); (581334.9, 4172670.0, 55.6, 0.0);
CONC URBAN ELEV DFAULT

PAGE 7

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

FILE: C:\Users\CFITZG-1\DOCUME-1\METDAT-1\BAAQMD\Chabot\cha05600.asc
FORMAT: (4I2,2F9.4,F6.1,I2,2F7.1,f9.4,f10.1,f8.4,i4,f7.2)
SURFACE STATION NO.: 1903 UPPER AIR STATION NO.: 1903
NAME: UNKNOWN NAME: UNKNOWN
YEAR: 2005 YEAR: 2005

Table with columns: YR MN DY HR, FLOW VECTOR, SPEED (M/S), TEMP (K), STAB CLASS, MIXING HEIGHT (M) RURAL URBAN, USTAR (M/S), M-O LENGTH (M), Z-0 (M), IPCODE, PRATE (mm/HR). Contains 24 rows of meteorological data for 05/01/2012.

*** NOTES: STABILITY CLASS 1=A, 2=B, 3=C, 4=D, 5=E AND 6=F.
FLOW VECTOR IS DIRECTION TOWARD WHICH WIND IS BLOWING.

*** ISCST3 - VERSION 02035 *** *** Castro Village Shopping Center *** 11/09/12
 *** Construction HRA - DPM and PM2.5 - Mitigated *** 13:41:40
 MODELOPTS: URBAN ELEV DFAULT * PAGE 8

*** THE ANNUAL (1 YRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
 INCLUDING SOURCE(S): 1 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

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

	X-COORD (M)	Y-COORD (M)	CONC	X-COORD (M)	Y-COORD (M)	CONC	
	581334.31	4172694.50	0.01171	581334.88	4172670.00	0.01650	
ALL	1ST HIGHEST VALUE IS		0.10779	AT (581497.81, 4172736.25,	57.19,	0.00)	DC NA
	2ND HIGHEST VALUE IS		0.09190	AT (581542.12, 4172738.75,	57.35,	0.00)	DC NA
	3RD HIGHEST VALUE IS		0.08445	AT (581466.50, 4172738.25,	57.00,	0.00)	DC NA
	4TH HIGHEST VALUE IS		0.07440	AT (581560.69, 4172743.00,	57.41,	0.00)	DC NA
	5TH HIGHEST VALUE IS		0.06979	AT (581575.50, 4172739.00,	57.42,	0.00)	DC NA
	6TH HIGHEST VALUE IS		0.06550	AT (581438.38, 4172731.75,	56.78,	0.00)	DC NA
	7TH HIGHEST VALUE IS		0.06134	AT (581657.12, 4172649.50,	56.53,	0.00)	DC NA
	8TH HIGHEST VALUE IS		0.06114	AT (581538.31, 4172761.50,	57.66,	0.00)	DC NA
	9TH HIGHEST VALUE IS		0.05805	AT (581657.12, 4172663.75,	56.67,	0.00)	DC NA
	10TH HIGHEST VALUE IS		0.05722	AT (581497.81, 4172763.75,	57.52,	0.00)	DC NA

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

```
*** ISCST3 - VERSION 02035 ***      *** Castro Village Shopping Center      ***      11/09/12
***                               *** Construction HRA - DPM and PM2.5 - Mitigated ***      13:41:40
**MODELOPTs:                               ***                               ***      PAGE 10
CONC          URBAN ELEV          DFAULT

*** Message Summary : ISCST3 Model Execution ***

----- Summary of Total Messages -----
A Total of          0 Fatal Error Message(s)
A Total of          2 Warning Message(s)
A Total of         12 Informational Message(s)
A Total of          12 Calm Hours Identified

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

***** WARNING MESSAGES *****
OU W565   174 PERPLT:Possible Conflict With Dynamically Allocated FUNIT PLOTFILE
OU W565   175 PERPST:Possible Conflict With Dynamically Allocated FUNIT POSTFILE

*****
*** ISCST3 Finishes Successfully ***
*****
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Appendix C.
Risk Calculation Worksheet



