HUMAN HEALTH RISK ASSESSMENT AND ECOLOGICAL RISK ASSESSMENT FOR ROMIC'S EAST PALO ALTO FACILITY

Prepared for:

Romic Environmental Technologies, Corp.
East Palo Alto, California

Prepared by:

ENVIRON Corporation
Emeryville, California

February 19, 2001

TABLE OF CONTENTS

EXECUTIVE SUMMARY ES-1
ES.1 Introduction ES-1
ES.2 Facility Description ES-1
ES.3 Human Health Risk Assessment ES-2
ES.3.1 Chronic Health Effects ES-3
ES.3.2 Acute Health Effects ES-5
ES.3.3 Occupational Standards ES-5
ES.4 Non-Routine Releases ES-5
ES.5 Odor Impacts ES-6
ES.6 Ecological Risk Assessment ES-6
ES.7 Conclusions ES-7
ES.8 References ES-8

1.0 INTRODUCTION 1-1
1.1 Overview 1-1
1.2 Report Organization 1-2
1.3 References 1-3

2.0 SITE DESCRIPTION 2-1
2.1 Overview of Site and Surrounding Area 2-1
2.2 Facility Operations and Anticipated Emissions 2-1
2.4 Hydrological Conditions 2-4
2.5 Local Land Use 2-4
2.6 Meteorological Conditions 2-5
2.7 References 2-5

3.0 HAZARD IDENTIFICATION 3-1
3.1 Identification of Chemicals from Operation Emissions 3-1
3.2 Toxicity Assessment 3-2
3.2.1 Chronic Toxicity 3-3
3.2.1.1 Carcinogenic Effects 3-4
3.2.1.2 Noncarcinogenic Effects 3-5
3.2.2 Acute Toxicity 3-6
3.2.3 Occupational Standards 3-6
3.2.4 Toxicity Profiles 3-6
3.3 References 3-7

4.0 IDENTIFICATION OF POTENTIAL HUMAN EXPOSURE PATHWAYS AND EXPOSED POPULATIONS 4-1
4.1 Potentially Exposed Populations 4-1
4.2 Relevant Exposure Pathways 4-2
4.3 Estimation of Intake 4-3
4.4 Exposure Assumptions for Relevant Receptors and Pathways 4-4
4.4.1 Human Physiology Assumptions 4-4
4.4.2 Population-Specific Assumptions 4-5
4.4.3 Route-Specific Assumptions 4-6

TABLE OF CONTENTS (Continued)

4.5 References 4-6

5.0 ESTIMATION OF REPRESENTATIVE EXPOSURE CONCENTRATIONS 5-1
5.1 Characterization of Emissions 5-2
5.2 Chemical Emission Rates 5-7
5.3 Determination of Off-Site Concentration of Chemicals in Routine Air Releases 5-16
5.3.1 Air Dispersion Model 5-16
5.3.2 Model Options 5-17
5.3.3 Meteorological Data 5-18
5.3.4 Receptor Locations 5-19
5.3.5 Source Configuration and Emission Allocation 5-19
5.3.6 Modeling Approach and Results 5-21
5.4 On-site Worker Sampling Data 5-23
5.5 References 5-23

6.0 RISK CHARACTERIZATION 6-1
6.1 Method for Estimating Risk 6-1
6.2 Cancer Risks and Chronic Noncancer Hazard Indices for Off-Site Residents 6-2
6.3 Cancer Risks and Chronic Noncancer Hazard Indices for Off-Site Workers 6-3
6.4 Cancer Risks and Chronic Noncancer Hazard Indices for Off-Site Recreationists 6-4
6.5 Risk Isopleths and Sensitive Subpopulations 6-4
6.5.1 Off-Site Residents 6-4
6.5.2 Off-Site Workers 6-5
6.5.3 Off-Site Recreationist 6-5
6.5.4 Sensitive Receptors 6-5
6.6 Acute Hazard Indices for an Individual at the Site Boundary 6-5
6.7 On-Site Worker Monitoring Data Compared to Occupational Standards 6-6
6.8 Uncertainties 6-6
6.9.1 Characterization of Waste Composition 6-6
6.9.2 Selection of Chemicals for Risk Assessment 6-6
6.9.3 Estimation of Representative Exposure Concentrations 6-6
6.9.4 Estimation of Human Exposure to Chemicals 6-8
6.9.5 Toxicity Assessment 6-8
6.9.6 Calculation of Risks 6-9
6.10 References 6-10

7.0 EVALUATION OF NON-ROUTINE RELEASES 7-1
7.1 Description of Non-Routine Release Scenarios 7-1
7.1.1 Scenario 1: Off-Site Release 7-1
7.1.2 Scenario 2: On-Site Release 7-3
7.1.3 Scenario 3: Fire/Explosion 7-3
7.1.3.1 Site History 7-4
7.1.3.2 Process Safety Systems and Design Features 7-5
7.1.3.3 Potential for Off-Site Impacts 7-9
7.2 Air Dispersion Modeling - Non-Routine Releases 7-10
7.2.1 Chemical Selection 7-10

TABLE OF CONTENTS (Continued)

7.2.2 Source Parameters 7-11
7.2.3 Meteorological Conditions 7-11
7.2.4 Emissions Model 7-13
7.2.5 Dispersion Model 7-13
7.2.6 Short-term Averaging Periods 7-13
7.3 Non-Routine Releases: Exposure Assessment Results 7-14
7.3.1 Level of Concern 7-14
7.3.2 Summary of Results 7-14
7.4 References 7-15

8.0 EVALUATION OF ODOR IMPACTS 8-1
8.1 Methodology and Results 8-1
8.2 References 8-2

9.0 ECOLOGICAL ASSESSMENT 9-1
9.1 Problem Formulation 9-1
9.2 Exposure Assessment 9-2
9.3 Effects Assessment 9-2
9.4 Risk Characterization 9-4
9.5 References 9-4

10.0 CONCLUSION 10-1

LIST OF TABLES

Table ES.1 Summary of Human Health Risk - Current
Table ES.2 Summary of Human Health Risk - Future

Table 3.1 Chemicals Selected for Quantitative Evaluation
Table 3.2 Carcinogenic Inhalation Toxicity Data
Table 3.3 Chronic Noncarcinogenic Inhalation Toxicity Data
Table 3.4 Acute Inhalation Reference Exposure Levels
Table 3.5 Occupational Standards - Permissible Exposure Levels (PEL)

Table 4.1 Exposure Assumptions – Average Exposed Individual (AEI)
Table 4.2 Exposure Assumptions – Reasonable Maximum Exposure (RME)

Table 5.1 Sources of Emissions
Table 5.2 Dispersion Model (ISCST3) Control Parameters
Table 5.3 Building Downwash Parameters
Table 5.4 Receptor Information
Table 5.5 Source Locations and Parameters – Point Sources
Table 5.6 Source Locations and Parameters – Volume Sources
Table 5.7 Source Locations and Parameters – Area Sources
Table 5.8 Area and Personal Worker Sampling Results

Table 6.1 Summary of Human Health Risk Results - Current
Table 6.2 Summary of Human Health Risk Results - Future
Table 6.3 Estimated Cancer Risks for an Off-Site Resident by Emission Source – Current RME
Table 6.4 Estimated Cancer Risks for an Off-Site Resident by Emission Source – Future RME
Table 6.5 Estimated Cancer Risk for an Off-Site Worker by Emission Source – Current RME
Table 6.6 Estimated Cancer Risk for an Off-Site Worker by Emission Source – Future RME
Table 6.7 Estimated Cancer Risk for Maximum Sensitive Receptors
Table 6.8 Acute Hazard Indices for an Individual at the Site Boundary
Table 6.9 Acute Hazard Indices for an Individual Summed by Toxic Endpoint
Table 6.10 Comparison of Measured Concentrations to Permissible Exposure Levels (PELs) for an On-Site Worker

Table 7.1 Ranking of Chemicals for Scenario #1
Table 7.2 Ranking of Chemicals for Scenario #2
Table 7.3 Emissions and Dispersion Modeling Parameters for Scenario #1
Table 7.4 Emissions and Dispersion Modeling Parameters for Scenario #2

Table 8.1 Comparison of Estimated Peak Air Concentrations (3-Minute Average) at Boundary to Odor Threshold
Table 9.1 Measurement Endpoints Evaluated for Ecologically Significant Receptors

LIST OF FIGURES

Figure 2.1 Site Location Map
Figure 2.2 Site Layout
Figure 2.3 Location of Receptors

Figure 4.1 Conceptual Site Model

Figure 5.1 Land Use Analysis
Figure 5.2 Locations for Building Downwash
Figure 5.3 Locations of Meteorological Stations
Figure 5.4 Modeled Receptor Points
Figure 5.5 Close-Up View of Modeled Receptor Points
Figure 5.6 Source Locations

Figure 6.1 Isopleth of Current Emissions - Average Risk for Residents
Figure 6.2 Isopleth of Current Emissions - RME Risk for Residents
Figure 6.3 Isopleth of Future Emissions - Average Risk for Residents
Figure 6.4 Isopleth of Future Emissions - RME Risk for Residents
Figure 6.5 Isopleth of Current Emissions - Average Risk for Workers
Figure 6.6 Isopleth of Current Emissions - RME Risk for Workers
Figure 6.7 Isopleth of Future Emissions - Average Risk for Workers
Figure 6.8 Isopleth of Future Emissions - RME Risk for Workers
Figure 6.9 Isopleth of Current Emissions - RME Risk for Recreationalists
Figure 6.10 Isopleth of Future Emissions - RME Risk for Recreationalists

Figure 7.1 Truck Route
Figure 7.2 On-Site Representative Spill Area Locations

LIST OF APPENDICES

Appendix A Selection of Chemicals for Risk Assessment
Appendix B Toxicity Profiles
Appendix C Air Emissions Support Documents
Appendix D Air Dispersion Model Files
Appendix E Ecological Risk Assessment

ACRONYM LIST

AE	Assessment Endpoint
AEI	Average Exposed Individual
AFFF	Aqueous Film Forming Foam
AIHA	American Industrial Hygiene Association
ASME	American Society of Mechanical Engineers
AT	Averaging Time
BAAQMD	Bay Area Air Quality Management District
BAF	Bioaccumulation Factor
BPIP	Building Profile Input Program
BW	Body Weight
C	Chemical Concentration
CAG	Carcinogen Assessment Group
Cal/EPA	California Environmental Protection Agency
Cal-OSHA	California Occupational Safety and Health Administration
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CDI	Chronic Daily Intake
COPEC	Chemical of Potential Ecological Concern
CR	Contact Rate
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
DTSC	Department of Toxic Substances Control
EA	Ecological Assessment
ED	Exposure Duration
EF	Exposure Frequency
ET	Exposure Time
EIR	Environmental Impact Report
ERA	Ecological Risk Assessment
ERPG	Emergency Response Planning Guidelines
FEMA	Federal Emergency Management Agency
HEAST	Health Effects Summary Tables
I	Intake of Chemical
IRIS	Integrated Risk Information System
IRM	Interim Remedial Measure
ISD	Interim Status Document
kg	kilograms
LOAEL	Lowest-Observed-Adverse-Effect-Level
LOEL	Lowest-Observed-Effect-Level
m^2	square meters
m^3	cubic meters
mg	milligrams
MOSD	Midpeninsula Open Space District
msl	mean sea level

NCDC	National Climatic Data Center
NCEA	National Center for Environmental Assessment
NOAEL	No-Observed-Adverse-Effect-Level
NOEL	No-Observed-Effect-Level
NPDES	National Pollutant Discharge Elimination System
OVA	Organic Vapor Analyzer
PCB	Polychlorinated Biphenyl
PEA	Preliminary Exposure Assessment
PEL	Permissible Exposure Limit
ppm	parts per million
psi	pounds per square inch
PSM	Process Safety Management
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
REL	Reference Exposure Level
RfC	Reference Concentration
RfD	Reference Dose
RME	Reasonable Maximum Exposure
RWQCB	Regional Water Quality Control Board
SCRAM	Support Center for Regulatory Air Models
SWRCB	State Water Resources Control Board
TRV	Toxicity Reference Value
TSD	Treatment, Storage, and Disposal
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

ES.1 Introduction

Romic operates a commercial hazardous waste recycling facility ("Site") in East Palo Alto, California. The main operations at the Site consist of recycling waste solvents to produce reusable solvents, blending wastes to produce fuel-grade materials, recycling antifreeze, and treating industrial wastewater.

The Department of Toxic Substances Control (DTSC) will be evaluating the Resource Conservation and Recovery Act (RCRA) Part B permit renewal/modification for the Site. In support of that permit evaluation, Romic has volunteered to perform a human health and ecological risk assessment and to prepare an Environmental Impact Report (EIR). The purpose of the risk assessment is to evaluate potential adverse effects to human and ecological receptors that are at or around the facility and that could be exposed to chemical emissions from the Site. This report presents the methodology and results of the human health and ecological risk assessments.

The results of the human health risk assessment show that the estimated lifetime incremental cancer risks are less than 1×10^{-5} for all populations evaluated. This estimated cancer risk is less than the 1×10^{-5} risk level used for Proposition 65 and well within the acceptable risk level used by the USEPA for hazardous waste sites (1×10^{-4} to 1×10^{-6}). The noncancer hazard indices (HIs) calculated in this risk assessment were below one for all populations evaluated. According to USEPA, individual chemical exposures that yield a HI of less than 1 are not expected to result in adverse noncancer health effects (USEPA 1989). Based on the results of the risk assessment, no significant chronic or acute health effects are expected for the off-site populations evaluated. The results of this ecological risk assessment indicate that the chemicals detected in slough sediment do not pose unacceptable risk to local receptors.

ES.2 Facility Description

Industrial wastes have been recycled and processed at the Site since 1956 (initial operations conducted by the Hird Chemical Corporation with Romic taking control of the facility in 1964). Industrial wastes are currently shipped to the Site for recycling and treatment from various industries. In addition, Romic serves as a household hazardous waste collection site for residents in San Mateo County. Local residents may drop off used motor oil, paints, cleaners, and other wastes at the facility that should not be discarded with other household trash.

The most common hazardous wastes received at Romic's facility are solvents, antifreeze, industrial wastewater, and other oil-based chemicals. These general wastes make up approximately ninety-five percent of the wastes recycled and processed at the Site. The other five-percent consists of dyes, photo processing chemicals, detergents/soaps, adhesives, metals, household hazardous waste, and coatings.

Air emissions from the Site primarily result from its recycling and blending operations, with some additional emissions from ancillary operations (such as truck washing, fuel dispensing, and ground water treatment). Because no dust-generating operations occur at the Site, only volatile

emissions resulting from liquid waste handling and processing are evaluated in the risk assessment.

Romic has applied to the DTSC for a permit renewal and modification to continue operating a hazardous waste treatment and storage facility. No changes to the size of the facility, its zoning status or the type of facility are planned. The planned modifications include the following:

- Change the designation of existing, but currently unregulated storage tanks and units, to a designation of regulated under the permit
- Add tanks for organic liquid and wastewater
- Add tanks for fuel-blending operations
- Add wastewater treatment units
- Designate drum sampling areas as drum storage areas

ES.3 Human Health Risk Assessment

The region immediately surrounding the Site is zoned for industrial operations. Beyond this area, the land use is mixed and includes industrial, commercial, and residential areas. The residences are primarily to the west and to the south. Wetlands and undeveloped land lie to the north, east and southeast, with the San Francisco Bay beyond this area east of the Site.

Based on the land use surrounding the Site, this risk assessment evaluated off-site workers, off-site residents, and off-site recreationists. Potential risks to off-site workers and off-site residents have been estimated at actual worker and residential locations. The off-site recreational user is assumed to be present along the bicycle path in the Ravenswood Reserve in the vicinity of the Site. In addition to the above populations, the risk assessment also evaluates the risk at specific locations including schools, daycare centers, health care facilities, and senior homes in the vicinity of the Site.

The risk assessment analyzes both current and future emissions from the Site. The current scenario considers emissions from all existing sources at the Site. Therefore, it includes emissions from existing, but currently unregulated tanks and units at the Site and drum storage emissions from drums in the drum sampling areas that are not currently classified as drum storage areas. The future scenario considers all the emissions sources in the current scenario, plus the proposed additional tanks for liquid and aqueous organic waste storage and fuel-blending operations and wastewater treatment units. In addition, the future scenario also includes emissions from leaks from components (pumps, valves, flanges, etc.) on proposed tanks and units.

Since emissions include only volatile chemicals, the only relevant exposure route would be inhalation. Because deposition of volatile chemicals will be insignificant, direct contact pathways (such as dermal contact and soil ingestion) and indirect contact pathways (ingestion of contaminated vegetables/meats/fish and mother's milk) are not quantitatively evaluated in the risk assessment.

For this risk assessment, exposure assumptions corresponding to both an average exposed individual (AEI) and a reasonable maximum exposure (RME) scenario were developed. Intake

assumptions for the average exposure scenario are selected to represent the best estimate of exposure while the intake assumptions for the RME scenario represent "the highest exposure that is reasonably expected to occur at a site" (USEPA 1989). According to the USEPA, the intent of the RME scenario is "to estimate a conservative exposure case (i.e., well above the average case) that is still within the range of possible exposures" (USEPA 1989). The RME is estimated by combining "upper-bound and mid-range exposure factors so that the result represents an exposure scenario that is both protective and reasonable; not the worst possible case" (USEPA 1991).

In order to estimate the ambient air concentrations, emissions of chemicals from the Site were estimated and the dispersion of the emissions in the air was modeled. The Industrial Source Complex Short Term Version 3 (ISCST3) dispersion model (Version 99155) was used to estimate off-site ambient air concentrations at the selected receptors.

The estimated risks in this assessment are based primarily on a series of conservative assumptions related to predicted environmental concentrations, exposure, and chemical toxicity. The use of conservative assumptions tends to produce upper-bound estimates of risk. Although it is difficult to quantify the uncertainties associated with all the assumptions made in this risk assessment, the use of conservative assumptions is likely to result in substantial overestimates of exposure, and hence, risk.

ES 3.1 Chronic Health Effects

Estimating cancer risks and noncancer HIs requires information regarding the level of intake of the chemical and the relationship between intake of the chemical and its toxicity as a function of human exposure to the chemical. The methodology used to derive the cancer risks and noncancer HIs for the selected chemicals is based on guidance provided by USEPA and Cal/EPA. The potential risk associated with a chemical in air can be estimated using equations that describe the relationships among the estimated intake of site-related chemicals, toxicity of the specific chemicals, and overall risk for carcinogenic and noncarcinogenic health effects. For carcinogenic effects, the relationship is given by the following equation (USEPA 1989):

$$Risk = I \times CSF$$

Where:

Risk = Cancer Risk; the probability of an individual developing cancer as a result of exposure to a particular cumulative dose of a potential carcinogen (unitless)

I = Intake of a chemical (mg chemical/kg body weight-day)

CSF = Cancer Slope Factor (mg chemical/kg body weight-day)

The relationship for noncarcinogenic effects is given by the following equation (USEPA 1989):

$$HI = \frac{I}{RfD}$$

Where:

HI = Hazard Index; an expression of the potential for noncarcinogenic effects, which relates the allowable amount of a chemical (RfD) to the estimated site-specific intake (unitless)

I = Intake of chemical (mg chemical/kg body weight-day)

RfD = Reference Dose; the toxicity value indicating the threshold amount of chemical contacted below which no adverse health effects are expected (mg chemical/kg body weight-day).

The National Contingency Plan (NCP) (40 CFR 300) is commonly cited as the basis for acceptable incremental risk levels. According to the NCP, lifetime incremental cancer risks posed by a site should not exceed one hundred in a million (1×10^{-4}) to one in a million (1×10^{-6}). For noncancer health hazards, a target HI of one (1) is identified. Individual chemical exposures that yield HIs of less than 1 are not expected to result in adverse noncancer health effects (USEPA 1989).

A summary of the cumulative cancer risks and noncancer hazard indices calculated in this risk assessment are presented in Tables ES.1 and ES.2 for the current and future emissions, respectively. As shown in these tables, the estimated lifetime incremental cancer risks are less than 1×10^{-5} for all populations and the estimated HIs are less than one for all populations.

For off-site residents, the estimated AEI cancer risk is 7×10^{-7} for the current and future emissions scenarios. The estimated RME cancer risk is 3×10^{-6} for the current and future emissions scenarios. The estimated noncancer HIs are less than 1 for both the current and future emissions scenarios for off-site residents. No individual chemical has an estimated cancer risk greater than 1×10^{-6}. Seven chemicals have an estimated cancer risk of greater than 1×10^{-7}. These chemicals are benzene (6×10^{-7} current and future), gasoline (6×10^{-7} current and future), methylene chloride (5×10^{-7} current and future), chloroform (4×10^{-7} current and future), 2-nitropropane (3×10^{-7} current and future), hydrazine (2.1×10^{-7} current and future), and carbon tetrachloride (2×10^{-7} current and future).

For off-site workers, the estimated AEI cancer risk is 1×10^{-6} for the current and future emissions scenarios. The estimated RME cancer risk is 7×10^{-6} for the current and future emission scenarios. The estimated noncancer HIs are less than 1 for both the current and future scenarios for off-site workers. Two chemicals have an estimated cancer risk slightly above 1×10^{-6}. These chemicals are as benzene (1×10^{-6} current and future) and methylene chloride (1×10^{-6} current and future). Seven chemicals have an estimated cancer risk of greater than 1×10^{-7}.

These chemicals are chloroform (8×10^{-7} current, 9×10^{-7} future), 2-nitropropane (7×10^{-7} current and future), hydrazine (5×10^{-7} current and future), carbon tetrachloride (4×10^{-7} current and future), 1,1-dichloroethane (2×10^{-7} current and future), trichloroethene (1×10^{-7} current and future) and formaldehyde (1×10^{-7} current and future).

For off-site recreationists, the estimated AEI cancer risk is 3×10^{-8} for the current and future emissions scenarios. The estimated RME cancer risk is 4×10^{-7} for the current and future emissions scenarios. The maximum estimated risk for all sensitive receptors is less than 1×10^{-6}.

ES.3.2 Acute Health Effects

In order to evaluate the potential for acute health effects, the maximum one-hour concentration estimated at the Site boundary was compared with the acute Reference Exposure Level (RELs) developed by Cal/EPA (1999). The acute RELs are the concentration level at or below which no adverse health effects are anticipated for the specified exposure duration. No individual chemical exceeded their corresponding acute REL. The maximum total acute hazard index for different toxic endpoints was estimated to be 0.8 for reproductive/development effects. The major chemical contributor to this hazard index was benzene. Because total acute hazard indices for all toxicity endpoints are below one (1), acute adverse health effects are not expected to occur.

ES.3.3 Occupational Standards

Area and personal air sampling results were used to evaluate potential inhalation exposures to on-site workers. The sampling results were compared with the Permissible Exposure Limits (PELs) derived by the California Occupational Safety and Health Administration (Cal-OSHA) (CCR Title 8, Section 5155, Table AC-1). The Cal-OSHA PELs are required to be as stringent or more stringent than the federal OSHA PELs. A worker's exposure to a chemical in a workday, expressed as an eight-hour time weighted average concentration, must not exceed the PEL for that chemical. All sampling results were below the chemical-specific PELs. The maximum concentration of vinyl chloride represented the highest percentage of its PEL at approximately 70%. Because the air sampling results are below the PELs, on-site exposures are expected to be well within the Cal-OSHA standards for workers.

ES.4 Non-Routine Releases

The evaluation of off-site impacts that could result from potential accidental or "non-routine" releases consisted of identifying potential accidental release scenarios, estimating the ambient air concentrations that could result from these release scenarios, and comparing the estimated ambient air concentrations to health levels of concern. The three types of potential "non-routine" releases selected for evaluation.

The first scenario considered an off-site spill of a material being transported to or from the facility via truck. This evaluation concluded that the estimated exposures were below applicable agency criteria. The second scenario considered was the release of a chemical on-site from a storage tank. This evaluation also concluded that the estimated exposures were below applicable agency criteria. The third non-routine release scenario considered was a fire and/or explosion at the Site. As discussed in this section, analyses conducted as part of the facility's safety program

conclude that a scenario in which more than three safety systems or features fail simultaneously to be unlikely. The discussion presented in this evaluation is an overview of Romic's site history and safety systems. This evaluation parallels the federal risk management program, in that the site history, process safety management and potential for off-site consequence impacts were considered.

ES.5 Odor Impacts

In accordance with guidance from Cal/EPA (DTSC 1991), estimates of ambient air concentrations were compared to odor thresholds to evaluate whether or not emissions from the Site could pose an odor nuisance to individuals in the vicinity of the Site. For this risk assessment, the three-minute average ambient air concentrations at the Site boundary were compared with odor thresholds to evaluate the likelihood of odor impacts. For all of the chemicals evaluated, the estimated 3-minute concentrations were less than the corresponding odor thresholds. Moreover, for most of the chemicals under evaluation, the estimated three-minute air concentration was less than one-tenth of a percent (<0.1%) of their odor thresholds. The estimated three-minute concentrations for 4-methyl-2-pentanone, carbon disulfide, and formaldehyde represent the highest percentage of their odor thresholds at approximately 3%. Because the modeled air concentrations at the Site boundary are all substantially less than the odor thresholds for each chemical, emissions of these chemicals from routine operations are not expected to cause an odor nuisance. Furthermore, if odor impacts from these chemicals are not expected at the Site boundary, odor impacts are also not expected at more distant residents or workplaces in the vicinity of the Site.

ES.6 Ecological Risk Assessment

The ecological risk assessment (ERA) considers information previously collected at the Site to characterize ecological resources and chemical distribution in the slough. It has been designed to estimate the potential for exposures both to aquatic receptors living in the slough as well as to terrestrial receptors that may use the slough for feeding purposes. The ERA includes problem formulation, exposure and effects assessment, and risk characterization as the major components of the overall risk analysis.

The on-site areas of the Romic facility contain no viable ecological habitat. The majority of the Site area is paved or covered with buildings. The study area for this ERA is comprised of a north south trending slough immediately east of the facility (eastern slough) that is connected to a smaller east-west trending slough located to the north of the Site (northern slough) (collectively referred to as the tidal slough).

The receptor classes considered in this ERA include benthic invertebrates, terrestrial mammals (evaluated as the raccoon) and shore birds (evaluated as the California clapper rail, which is included on both the state and federal endangered species lists). The exposure pathways evaluated in the terrestrial assessment include food chain exposure to mammals through ingestion of contaminated prey and sediment as well as inhalation of volatile chemicals in slough sediments. A sediment equilibrium partitioning and vapor emission model was developed to evaluate inhalation exposures.

The exposure pathways evaluated in the aquatic assessment include direct contact with and ingestion of sediments by benthic invertebrates, and food chain exposure to benthic feeding birds through ingestion of contaminated prey and sediment, as well as inhalation of volatile chemicals in slough sediments. Feeding patterns and residence time in the slough for fish species are insufficient to support rigorous exposure models, and fish exposure will not be quantitatively evaluated in this assessment. It is expected that protection of benthic invertebrates would be protective of fish species as benthic invertebrates have much greater exposure to the sediments in the slough than do fish.

The results of the terrestrial assessment indicate that there minimal potential for risk to the wildlife community that may utilize the Site. The hazard quotient (HQs) for both the California Clapper Rail and the raccoon were below a level of concern. Conservative approaches were used throughout and the conclusions are considered to be conservative, protective and representative of the entire slough area.

The results of the aquatic assessment indicated that some toxicity was observed in the amphipod test, the results of the benthic community analysis do not indicate that sediment benthos have been impacted. The in situ bivalve growth study results are difficult to interpret, and neither indicates the potential for risk, or that risk is not expected. The benthic community assessment results are considered to carry more weight than the laboratory amphipod toxicity results in characterizing risk to the benthic community. The direct measure of the community provides greater confidence than a single laboratory bioassay, and is the best indicator of risk to the community. Based on the results of the benthic community analysis, a finding "no unacceptable risk" for the benthic community living in the study area is supported.

There are many sources of uncertainty documented in the report that are associated with the risk findings. The most significant areas of uncertainty include estimating exposure levels of the different receptors, selecting TRVs appropriate to each receptor, spatial and temporal representativeness of the data, and the food chain and inhalation dose models. To account for the uncertainty in the analysis, conservative assumptions were used throughout and have likely resulted in an overestimate of potential risk.

ES.7 Conclusions

A summary of the cumulative cancer risks calculated in this risk assessment show that the estimated lifetime incremental cancer risks are less than 1×10^{-5} for all populations evaluated. This estimated cancer risk is less than the 1×10^{-5} risk level used for Proposition 65 and well within the acceptable risk level used by the USEPA for hazardous waste sites (1×10^{-4} to 1×10^{-6}).

For noncancer health hazards, a target HI of one (1) is identified. Individual chemical exposures that yield HIs of less than 1 are not expected to result in adverse noncancer health effects (USEPA 1989). The HIs calculated in this risk assessment are below one for all populations evaluated.

Based on the results of the risk assessment, no significant chronic or acute health effects are expected for the off-site populations evaluated. In addition, based on previous on-site worker sampling results, no occupational standard exceedences are expected.

The results of this ecological risk assessment indicate that the chemicals detected in slough sediment do not pose unacceptable risk to local receptors.

ES.8 References

California Environmental Protection Agency (Cal/EPA). 1999. Determination of Acute Reference Exposure Levels for Airborne Toxicants. Office of Environmental Health Hazard Assessment, Air Toxicology and Epidemiology Section. March.

Department of Toxic Substances Control (DTSC). 1991. Permitting of Treatment, Storage and Disposal Facilities (TSDF). Items to be Considered for Inclusion in a Health Risk Assessment. Memorandum from Chuck Salocks to All TSCP Staff Toxicologists. February 14.

United States Environmental Protection Agency (USEPA). 1989. Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part A). Interim Final. Office of Emergency and Remedial Response. EPA-540/1-89/002. Washington, D.C. December.

United States Environmental Protection Agency (USEPA). 1991. Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual. Supplemental Guidance. Standard Default Exposure Factors. Office of Emergency and Remedial Response. March 25.

ES.1
Summary of Human Health Risk - Current
Romic Facility, East Palo Alto, California

Population	Cancer Risk		Adult Hazard Index		Child Hazard Index	
	Average Exposed Individual (AEI)	Reasonable Maximum Exposure (RME)	Average Exposed Individual (AEI)	Reasonable Maximum Exposure (RME)	Average Exposed Individual (AEI)	Reasonable Maximum Exposure (RME)
Actual Receptor Areas						
Resident	6.8E-07	3.0E-06	0.015	0.023	0.047	0.053
Worker	1.2E-06	6.6E-06	0.041	0.062	-	
Recreational Visitor	3.0E-08	3.8E-07	0.001	0.002	0.002	0.008

ES.2
Summary of Human Health Risk - Future
Romic Facility, East Palo Alto, California

Population	Cancer Risk		Adult Hazard Index		Child Hazard Index	
	Average Exposed Individual (AEI)	Reasonable Maximum Exposure (RME)	Average Exposed Individual (AEI)	Reasonable Maximum Exposure (RME)	Average Exposed Individual (AEI)	Reasonable Maximum Exposure (RME)
Actual Receptor Areas						
Resident	7.2E-07	3.1E-06	0.016	0.024	0.049	0.055
Worker	1.2E-06	7.0E-06	0.043	0.066	-	-
Recreational Visitor	3.2E-08	4.1E-07	0.001	0.002	0.002	0.008

1.0 INTRODUCTION

1.1 Overview

Romic operates a commercial hazardous waste treatment, storage, and disposal (TSD) facility ("Site") in East Palo Alto, California. The Site receives waste solvents, antifreeze, wastewater contaminated with solvents and metals (e.g., lead and nickel), and other wastes (e.g., discarded paints and used oil filters). The waste arrives in five- to 30-gallon cans, 55-gallon drums, tri-wall containers, roll-off containers, or tank trucks. The main operations at the Site consist of recycling waste solvents to produce reusable solvents, blending wastes to produce fuel-grade materials, recycling antifreeze, and treating industrial wastewater.

The Department of Toxic Substances Control (DTSC) will be evaluating the Resource Conservation and Recovery Act (RCRA) Part B permit renewal/modification for the Site. As a part of that permit evaluation, Romic has volunteered to perform a risk assessment and to prepare an Environmental Impact Report (EIR). The purpose of the risk assessment is to evaluate potential adverse effects to human and ecological receptors that are at or around the facility and that could be exposed to chemical emissions from the Site. Prior to the preparation of the risk assessment, a human health and ecological risk assessment work plan was presented to DTSC (ENVIRON 1999). This work plan, which provided a detailed description of all tasks to be included in the risk assessment, was approved by DTSC on February 3, 1999. As agreed upon in the work plan, three interim deliverables were prepared as follows:

- Proposed Emissions and Dispersion Modeling Protocol for the Air Impacts Analysis for the RCRA Part B Permit Health Risk Assessment for Romic Environmental Technologies, Corp. This deliverable was reviewed by the Bay Area Air Quality Management District (BAAQMD) and DTSC and a final protocol submitted on September 9, 1999.

- Chemical Selection for the RCRA Part B Permit Health Risk Assessment for Romic Environmental Technologies, Corp. This deliverable was reviewed by DTSC and a final report submitted on December 10, 1999.

- Romic Environmental Technologies Corporation Health Risk Assessment Modeling Protocol for Assessing "Non-Routine" Releases. This deliverable was reviewed by DTSC and a final protocol submitted June 15, 2000.

This report presents the methodology and results of the human health and ecological risk assessments. The methodology used in these assessments are consistent with United States Environmental Protection Agency (USEPA) and California Environmental Protection Agency (Cal/EPA) risk assessment guidance including the following key guidance documents:

- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A), Interim Final (RAGS) (USEPA 1989)

- Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" (USEPA 1991)

- Permitting of Treatment, Storage and Disposal Facilities (TSDF). Items to be Considered for Inclusion in a Health Risk Assessment (DTSC 1991)

- Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities (Cal/EPA 1992)

- Preliminary Endangerment Assessment Guidance Manual (PEA) (Cal/EPA 1994)

- Guidelines for Planning, Conducting, and Reviewing Human and Ecological Risk Assessments (Cal/EPA 1995)

1.2 Report Organization

The risk assessment report is divided into ten sections as follows:

Section 1.0 - Introduction: describes the purpose and scope of the risk assessments and outlines the report organization.

Section 2.0 - Site Description: presents an overview of the Site and surrounding area, provides a description of the facility operations and anticipated emissions, and identifies features at the Site that are relevant to the risk assessment including topography, hydrological conditions, local land use, and meteorological conditions.

Section 3.0 - Hazard Identification: identifies the chemicals to be included in the risk assessment and presents the chronic toxicity values, acute toxicity values, and occupational standards for the selected chemicals.

Section 4.0 – Identification of Potential Human Exposure Pathways and Exposed Populations: discusses both potential and complete exposure pathways and potentially exposed populations to be included in the quantitative risk assessment.

Section 5.0 – Estimation of Representative Exposure Concentrations: characterizes air emissions from the Site and determines the off-site concentrations of chemicals.

Section 6.0 - Risk Characterization: presents estimated potential cancer risks and chronic and acute noncancer health effects related to chemical emissions from the Site. In addition to quantifying risks, this section identifies and describes the uncertainties associated with the risk estimates and discusses how these uncertainties may affect the risk assessment conclusions.

Section 7.0 - Evaluation of Non-Routine Releases: describes the accidental or "non-routine" release scenarios, estimates chemical concentrations in air for these scenarios, and compares these concentrations to levels of potential concern.

Section 8.0 - Evaluation of Odor Impacts: evaluates the potential for emissions to cause odor impacts in the vicinity of the Site.

Section 9.0 - Ecological Risk Assessment: summarizes the potential risk of adverse effects to aquatic and terrestrial wildlife.

Section 10.0 – Conclusion: summarizes the results of the risk assessments and provides conclusions regarding the potential for adverse health risks due to emissions from the Site.

Supporting documentation is presented in the appendices to this report. The preliminary and refined screening processes for chemical selection are presented in Appendix A. Toxicity profiles for the major chemical contributors to the estimated human health risks are presented in Appendix B. Appendix C includes the supporting information and documentation for the estimation of air emissions from the Site. The air dispersion model files are presented in Appendix D. Appendix E includes the Ecological Risk Assessment prepared by ARCADIS JSA.

1.3 References

California Environmental Protection Agency (Cal/EPA). 1992. Supplemental Guidance for Human Health Multimedia Risk Assessments for Hazardous Waste Sites and Permitted Facilities. Sacramento, California. July.

California Environmental Protection Agency (Cal/EPA). 1994. Preliminary Endangerment Assessment Manual (PEA). Department of Toxic Substances Control.

California Environmental Protection Agency (Cal/EPA). 1995. Guidelines for Planning, Conducting, and Reviewing Human and Ecological Risk Assessments. Memorandum from Judith Parker to the Toxicologists of the Office of Scientific Affairs (OSA). February 21.

Department of Toxic Substances Control (DTSC). 1991. Permitting of Treatment, Storage and Disposal Facilities (TSDF). Items to be Considered for Inclusion in a Health Risk Assessment. Memorandum from Chuck Salocks to All TSCP Staff Toxicologists. February 14.

ENVIRON. 1999. Work Plan for Human Health Risk Assessment and Ecological Risk Assessment, Part B Permit for Romic's East Palo Alto Facility. January 6.

United States Environmental Protection Agency (USEPA). 1989. Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part A). Interim Final. Office of Emergency and Remedial Response. EPA-540/1-89/002. Washington, D.C. December.

United States Environmental Protection Agency (USEPA). 1991. Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual. Supplemental Guidance. Standard Default Exposure Factors. Office of Emergency and Remedial Response. March 25.

2.0 SITE DESCRIPTION

This section presents a description of the Site and its operations, as well as of the surrounding general land use, topography and meteorological conditions. The information summarized in this section provides background information or is used directly in evaluations described in later sections, including the identification of potentially exposed populations and exposure pathways, selection of chemicals to be evaluated, and the estimation of air concentrations.

2.1 Overview of Site and Surrounding Area

The Site is located in East Palo Alto, California, and operates as a commercial hazardous waste TSD facility. The Site has been used for recycling and management of industrial chemicals since 1956. Romic has been operating the Site since 1964 and has owned the Site since 1979. Romic Environmental Technologies Corporation was acquired by US Liquids in January 1999. US Liquids is publicly traded on the American Stock Exchange.

The Site primarily recycles waste solvents to produce reusable solvents, blends wastes to produce fuel-grade materials, recycles antifreeze, and treats industrial wastewater. The Site is located adjacent to the tidal wetlands on the southwest edge of the San Francisco Bay in an industrial/commercial area. Figure 2.1 depicts the location of the Site and the surrounding region.

The region immediately surrounding the Site is zoned for industrial operations. The Site's immediate neighbors include a salvage yard and a landscaping firm to the north and west, a automotive salvage company to the southwest, an electrical substation and a chemical manufacturer across the street to the south and another salvage yard to the southeast. Beyond this area, the land use is mixed and includes industrial, commercial, and residential areas. The residences are primarily to the west and to the south. Wetlands and undeveloped land lie to the north, east and southeast, with the San Francisco Bay beyond this area east of the Site.

The Site is approximately 14 acres. Currently, the Site has a central processing area which includes several warehouses for storing and handling waste, tank farms, process equipment including distillation columns, vacuum pots and reboilers, a fuel blending facility and a laboratory waste handling warehouse. On the southern portion of the Site are the wastewater treatment system, the analytical laboratory and the parking lot. The Site also includes administrative buildings and truck and facility maintenance buildings. The Site is mostly paved with concrete with a narrow strip of unpaved area along the perimeter. Figure 2.2 depicts the Site layout.

2.2 Facility Operations and Anticipated Emissions

Industrial wastes have been recycled and processed at the Site since 1956 (initial operations conducted by the Hird Chemical Corporation with Romic taking control of the facility in 1964). Industrial wastes are currently shipped to the Site for recycling and treatment from various industries including, but not limited to:

- Dry cleaning
- Printing
- Electronics
- Aerospace
- Paint
- Automotive

In addition, Romic conducts household hazardous waste (e.g., motor oil, paints, cleaners, etc.) collection events for residents in San Mateo County, San Francisco, and San Francisco County.

The most common hazardous wastes received at Romic's facility are solvents, antifreeze, industrial wastewater, and other oil-based chemicals. These general wastes make up approximately ninety-five percent of the wastes recycled and processed at the Site. The other five-percent consists of dyes, photo processing chemicals, detergents/soaps, adhesives, metals, household hazardous waste, and coatings.

Romic does not accept the following types of hazardous waste for treatment or processing:

- Radioactive wastes
- Explosives
- Reactive wastes (i.e., cyanides and sulfides in excess of 10 parts per million [ppm])
- Polychlorinated biphenyls (PCBs) in excess of 5 ppm
- Etiological wastes
- Pathogenic wastes
- Selected pesticide/herbicide wastes

Wastes arrive at the Site in five to 30 gallon cans, 55-gallon drums, tri-wall containers, roll-off containers, or in tank trucks. There are no underground storage tanks at the Site. There are also no surface impoundments used for the storage or treatment of hazardous waste. Incompatible materials received at the Site, such as acids and bases, are stored in separate storage areas.

Waste received at the Site is stored and sampled prior to processing. Organic liquid wastes, such as spent solvents and contaminated fuels that are received in 55-gallon drums, are consolidated into storage tanks. The drums are washed thoroughly with diesel fuel, and the semi-solid residue in the drums is liquefied and used in fuel-blending. The organic liquid waste is either purified into its components by distillation operations or is blended to make fuel-grade mixtures. The fuel-grade mixtures are then sent to cement manufacturers and are burned in place of oil, natural gas or coal as a fuel. Aqueous wastes (i.e., wastewater containing dilute quantities of organic liquids) are processed through a biological treatment system. The Site proposes to install a metals recovery system for reclaiming trace metals in wastewater. The Site also receives small bench-scale quantities of laboratory waste, typically called "lab packs", which it consolidates and either processes or sends to off-site disposal. In addition, the Site receives other wastes that it temporarily stores and sends to off-site disposal in closed containers without additional processing.

Air emissions from the Site primarily result from its recycling and blending operations, with some additional emissions from ancillary operations (such as truck washing, fuel dispensing, and ground water treatment). Because no dust-generating operations occur at the Site, only volatile emissions resulting from liquid waste handling and processing are evaluated in the risk assessment.

The processing sources of emissions include material handling and storage, material sampling and laboratory testing, solid waste consolidation, lab pack processing, fuel-blending operations, drum liquefaction operations, organic liquid material separation, and wastewater treatment operations. Quantitative estimates of emissions of volatile organic compounds (VOCs) from processing operations and ancillary operations are based on emissions testing data, regulatory agency documents, material throughput information, and facility process information and engineering models. Most emissions are fugitive in nature. Some emissions also result from the facility's natural gas-fired boiler.

The DTSC granted Romic an Interim Status Document (ISD) in April 1981 and issued a hazardous waste facility permit in May 1986. Romic submitted a state permit modification and an initial federal permit application in May 1989. The USEPA and DTSC issued the federal permit and the modified state permit in July 1990. The federal permit was appealed, however, and was reissued in July 1992 after the appeal review. The state permit, which was issued in 1986 and later modified, came up for automatic renewal in May 1991. Under the RCRA Part B permitting procedures, a Part B permit requires renewal every 5 years. In accordance with the RCRA Part B permitting procedures, Romic is allowed to continue operating its facility under the terms of its 1986 permit pending the renewal of its Part B permit.

Romic has applied to the DTSC for a permit renewal and modification to continue operating a hazardous waste treatment and storage facility. No changes to the size of the facility, its zoning status or the type of facility are planned. The planned modifications include the following:

- Change the designation of existing, but currently unregulated storage tanks and units, to a designation of regulated under the permit
- Add tanks for organic liquid and wastewater
- Add tanks for fuel-blending operations
- Add wastewater treatment units
- Designate drum sampling areas as drum storage areas

2.3 Topography

The Site is located approximately a half-mile from the San Francisco Bay on the southwestern side of the San Francisco Bay Plain depression. To the north, east and southeast of the Site are saltwater marshes and wetlands. Engineered tidal sloughs are located on the east and north of the Site. These sloughs drain into the bay.

The nearest natural drainage feature is San Francisquito Creek, approximately one mile to the south of the Site. To the east of the Site, across from the eastern slough, is a former saltwater evaporation pond. According to the Federal Emergency Management Agency (FEMA), the Site is on a 100-year floodplain, but is protected by an engineered levee on the east (FEMA 1999).

The surface elevation of the immediate region (i.e., within approximately 2 kilometers of the Site) ranges from 5 to 11 feet above mean sea level (msl). The region is gently sloping towards the bay and is generally flat. The land to the west of the Site continues fairly flat until the foothills of the Santa Cruz Mountains are reached, approximately 10 miles to the west and south of the Site.

2.4 Hydrological Conditions

Interim remedial measures (IRMs) have been conducted at the Site involving the onsite treatment of contaminated shallow groundwater and storm water. The treatment of these waters is conducted under the oversight of the USEPA, the Regional Water Quality Control Board (RWQCB), and the State Water Resources Control Board (SWRCB) as permitted under two National Pollutant Discharge Elimination System (NPDES) permits. Over 3.5 million gallons of water have been extracted from the groundwater and treated since the IRMs began in 1993 under the RCRA Consent Order - 09880015. Additional final remediation of these waters is currently being evaluated. This remedy may involve continued extraction and treatment of groundwater from the identified impacted zones beneath the Site. Under USEPA direction, Romic is currently conducting a localized pilot study to evaluate the effectiveness of in-situ bioremediation to reduce groundwater contamination. The pilot study will have a duration of 1-2 years. The technology does not require removal of water from the ground to achieve contaminant reduction. If successful, the in-situ bioremediation technology would replace the existing extraction and treatment IRM and accelerate remediation of the groundwater.

2.5 Local Land Use

The Site is located in the City of East Palo Alto, California, in San Mateo County. The City of East Palo Alto has a population of approximately 25,000 (The City of East Palo Alto 2001a). The city is located between Interstate 101 on the west, the San Francisco Bay on the east and borders the City of Palo Alto to the south and the City of Menlo Park on the north.

The Site is in an area zoned for light and heavy industrial use (The City of East Palo Alto 2001b). The Site's immediate neighbors are industrial facilities. No schools or daycare centers are within a quarter-mile radius of the Site, although there are several schools and daycare centers within a mile radius. The closest resident is located just under a quarter-mile from the Site, in an area of mixed industrial/commercial/residential land use. Figure 2.3 depicts the location of nearby receptors including residents, bike path, schools, daycare centers, health care facilities and senior homes.

The Midpeninsula Regional Open Space District (MROSD) manages the former saltwater evaporation pond (as part of the Ravenswood Reserve) east of the Site (MROSD 2001). A levee, which runs along the tidal slough immediately east of the Site, is used as a bicycle path. This forms the western boundary of the Ravenswood Reserve. Cyclists, hikers and bird watchers use the levee for recreation.

2.6 Meteorological Conditions

The Site is located in a region with a generally dry, mild climate with an average temperature ranging from 46 to 70°F. The average rainfall in the region is 15 inches per year[1]. The rainy season is typically November through March, during which more than 80% of the total annual rainfall occurs.

The winds at the Site are predominantly from the west through northwest year round[2]. Wind speeds typically range from 1 meters per second to 3 meters per second (49% of the time) with most of the winds less than about 5 meters per second (84%). Calm winds (less than one meter per second) occur about 18% of the time. During the night, wind is generally from the northerly through westerly direction (71% of the night), similar to daytime winds (79% of the day)[3].

2.7 References

The City of East Palo Alto. 2001a. A History of East Palo Alto: East Palo Alto Today. Retrieved February 2, 2001, from the World Wide Web: http://www.epa.net/.

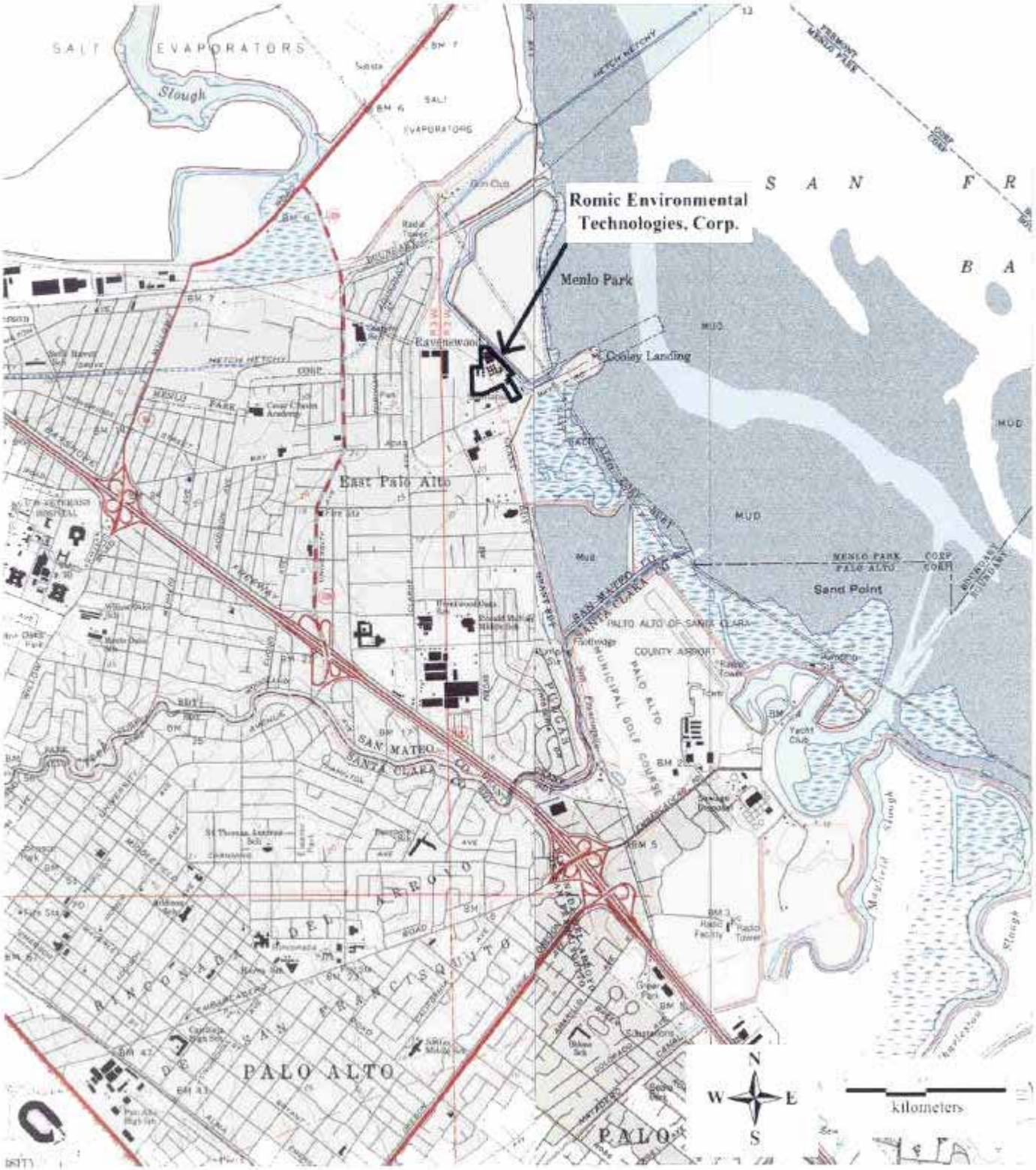
The City of East Palo Alto. 2001b. Zoning Map. Community Development Department. Received by Facsimile from Michael Laughlin on February 2, 2001.

Federal Emergency Management Agency (FEMA). 1999. Flood Insurance Rate Map, City of East Palo Alto, San Mateo County. Community-Panel Number 060708 0001 B. August 23.

Midpeninsula Regional Open Space District (MROSD). 2001. Catalog of Open Space Preserves. Retrieved February 2, 2001, from the World Wide Web: http://www.openspace.org/catalog.html.

[1] Typical temperature and rainfall values are from the Western Regional Climate Center data for Palo Alto, California (Station #046646), and covers data from 1953 to 1998.
[2] Wind characterization is based on wind data from the Moffet Field Naval Air Station and from the BAAQMD San Carlos Station. Data ranges from 1989 to 1997.
[3] Nighttime is defined as 8 p.m. to 7 a.m.

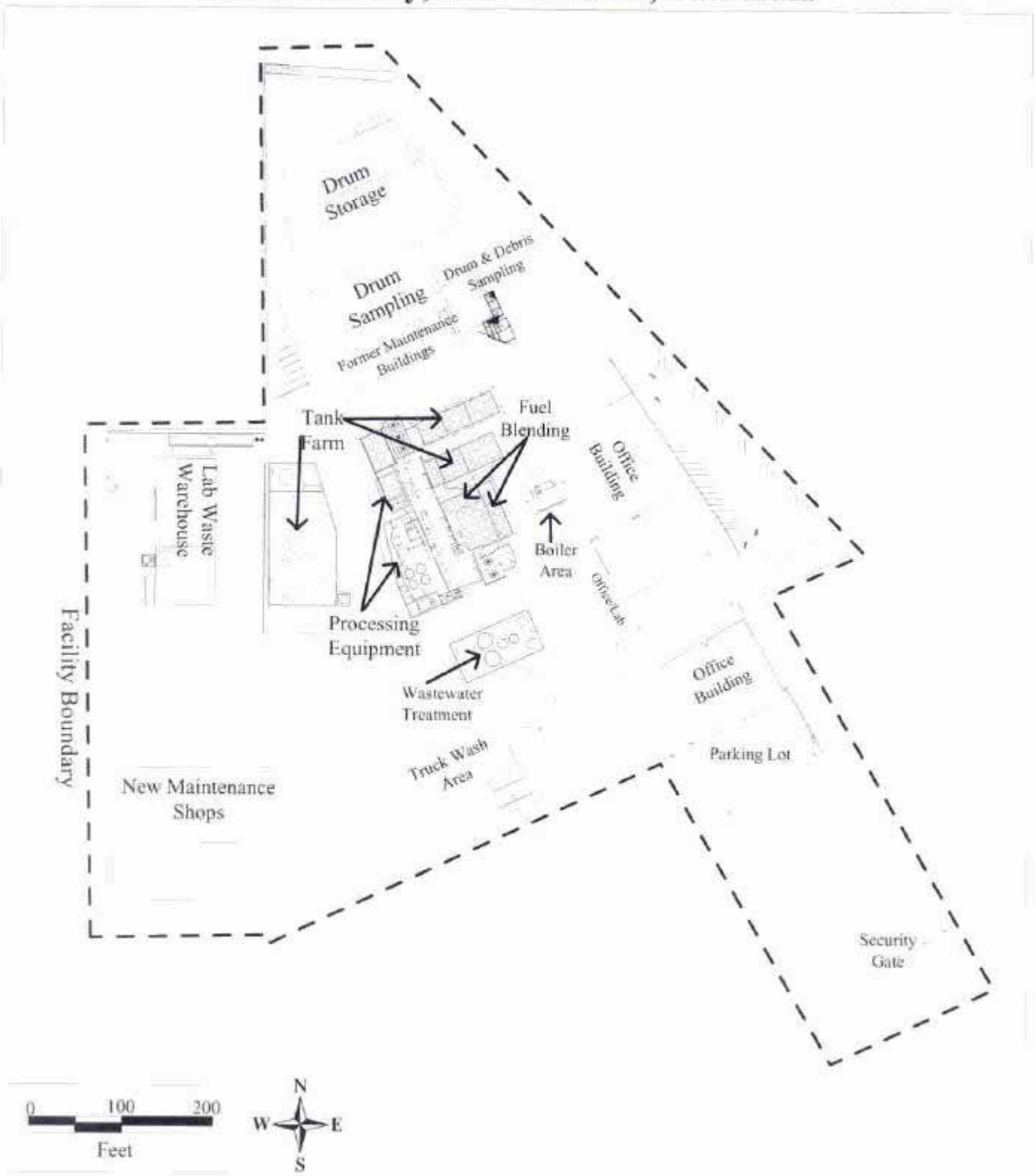
Figure 2.1
Site Location Map
Romic Facility, East Palo Alto, California



martin colaco sp/romic/gis/wrkspcs/report/fig2-1.wor (sbm 8/12/99)

ENVIRON

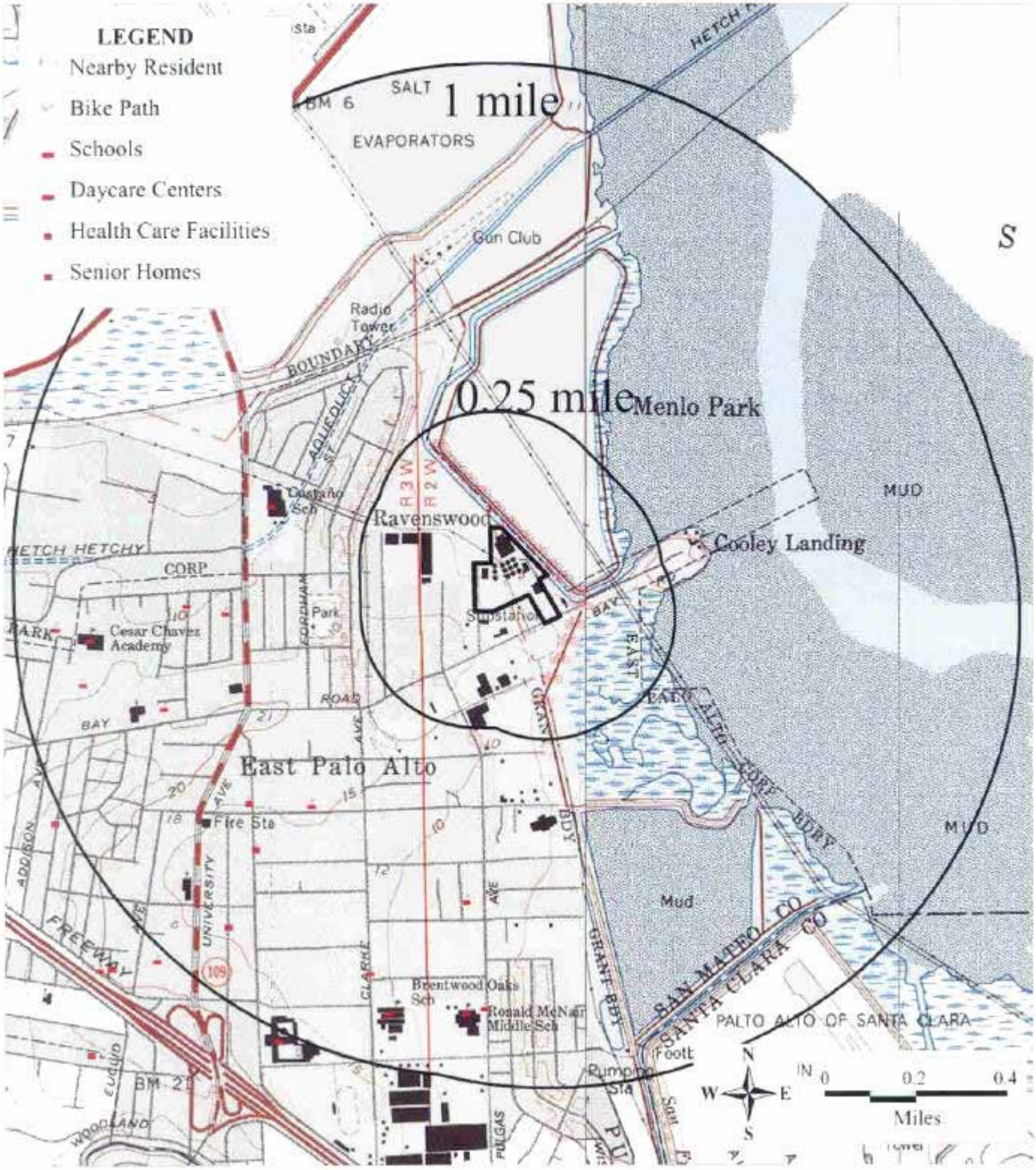
Figure 2.2
Site Layout
Romic Facility, East Palo Alto, California



\martin colaco\sp\romic\gis\wrkspes\report\fig2-2.wor (sbm 8/12/99)

ENVIRON

Figure 2.3
Location of Receptors
Romic Facility, East Palo Alto, California



/martin colacco/sp/romic/gis/wrkspcs report/fig2-3.wor (sbm 8/12/99)

ENVIRON

3.0 HAZARD IDENTIFICATION

The first part of this section identifies the chemicals included in the quantitative risk assessment and odor evaluation. The selection of chemicals is based on selection criteria and methodology recommended by USEPA and DTSC specifically for TSD facilities. The selection process recommended by DTSC (1991, 1995) is a three-step process. Step one is developing a master list of candidate chemicals to be considered for quantitative risk assessment. Step two is using DTSC's preliminary screening criteria to evaluate the chemicals to identify a subset of chemicals that may be addressed in the quantitative risk assessment and, if necessary, Step 3 is using DTSC's refined criteria to identify the final list of chemical to be addressed. The chemical selection process used in this risk assessment is described in detail in Appendix A and is summarized below.

The second part of this section identifies the toxicity values for the chemicals to be evaluated and describes and discusses the basis of the selected toxicity values. The evaluation of odor impacts is presented in Section 8.0.

3.1 Identification of Chemicals from Operation Emissions

As discussed in Section 1.0, an interim deliverable report addressing the selection of chemicals was submitted to DTSC. This report, titled Chemical Selection for the RCRA Part B Permit Health Risk Assessment for Romic Environmental Technologies, Corp., was reviewed and accepted by DTSC and a final report submitted on December 10, 1999. This report, which details the chemical selection process for the risk assessment, has been updated and is included as Appendix A.

In order to select chemicals for evaluation in the risk assessment, potential air emission sources at the Site were evaluated. Emissions from the Site primarily result from its recycling and blending operations, with some additional emissions from ancillary operations (such as truck washing, fuel dispensing, and ground water treatment). Because no dust-generating process operations occur at the Site, only volatile emissions from these sources have been estimated in the risk assessment.

Chemical constituents of emissions from the process streams (i.e., recycling wastes and blending operations) were identified from a database maintained by Romic of the waste streams accepted at the Site and the chemical composition of those waste streams. This database was compiled from waste manifests of materials received at the Site from October 1997 through September 1998. This manifest information, along with marketing and stack test data, was used to develop the master list of chemicals received at the Site. Guidance from DTSC (1996, 1997) recommends the use of relevant manifest data to characterize emissions.

Due to the large size of the database (over 300 entries), a further screening evaluation was conducted to select chemicals for evaluation in the risk assessment as potential emissions from process streams. The preliminary screen was conducted consistent with recommendations provided by DTSC (1991) in their draft guidelines for assessing risks from TSD facilities and in subsequent discussions regarding specific facilities.

Since the preliminary screen resulted in a list of chemicals that was too long to manage efficiently, the chemical list was subjected to a refined screen. The refined screen considers toxicity, concentration, and volatility. A concentration-toxicity screen similar to that described in the USEPA's Risk Assessment Guidance for Superfund (USEPA 1989) is recommended by the DTSC (1991) and was used for this Site to eliminate chemicals present in the process stream at low concentrations. According to the USEPA, "the objective of the concentration-toxicity screen is to identify the chemicals in a particular medium that – based on concentration and toxicity – are most likely to contribute significantly to risks calculated for exposure scenarios involving that medium, so that the risk assessment focuses on the "most significant" chemicals" (USEPA 1989). Volatility was also included in the screen as only volatile chemicals are of concern at the Site.

The preliminary and refined screening evaluations, along with a discussion of the selection of chemicals for each potential air emission source, is presented in detail in Appendix A. The chemicals selected for quantitative evaluation in this risk assessment are summarized in Table 3.1. Column 1 summarizes all chemicals to be evaluated for cancer effects and Column 2 summarized all chemicals to be evaluated for chronic noncancer health effects.

Column 3 of Table 3.1 identifies the chemicals that will be evaluated for potential acute health effects. For potential acute health effects, all chemicals on the master facility chemical list with an acute reference exposure level (REL) developed by Cal/EPA (1999) have been evaluated.

Column 4 of Table 3.1 lists the chemicals that will be evaluated for odor impacts. Based on DTSC guidance (DTSC 1991), all chemicals identified on the master facility chemical list with an odor threshold below 1 part per million (ppm) have been included in the odor impact evaluation.

In addition to the above, personnel air monitoring for workers was also considered for the evaluation of onsite worker exposure. All chemicals detected during worker air monitoring conducted in 1997, 1998, and 1999 have been quantitatively evaluated in the risk assessment. These chemicals are listed in Column 5 of Table 3.1.

3.2 Toxicity Assessment

The purpose of the toxicity assessment is to present the weight-of-evidence regarding the potential for a chemical to cause adverse effects in exposed individuals, and to quantitatively characterize, where possible, the relationship between exposure to a chemical and the increased likelihood and/or severity of adverse effects (dose-response assessment). Well conducted epidemiological studies that show a positive association between exposure to a chemical and health effects are the most convincing evidence for predicting potential hazards for humans. However, human data that would be adequate to serve as the basis for the dose-response assessment are available for only a few chemicals. In most cases, toxicity assessments for a chemical has to rely on information derived from experiments conducted on non-human mammals, such as the rat, mouse, rabbit, guinea pig, hamster, dog, or monkey.

When the dose-response assessment is based on animal studies, it usually requires two types of extrapolation: high-to-low dose extrapolation and interspecies extrapolation. High-to-low dose

extrapolation involves predicting the incidence rate of an adverse effect at low exposure levels based on results obtained at high exposure levels. Interspecies extrapolation involves predicting the likelihood of an adverse effect in humans based on results obtained from animal studies. In the absence of evidence to the contrary, it is assumed that adverse effects observed in animals would also occur in humans.

The remainder of this section discusses chronic toxicity values, acute toxicity values, and occupational standards. The toxicity values and standards used in this risk assessment are summarized in Table 3.2 (Carcinogenic Inhalation Toxicity Data), Table 3.3 (Noncarcinogenic Inhalation Toxicity Data), Table 3.4 (Acute Inhalation Reference Exposure Levels), and Table 3.5 (Occupational Standards – Permissible Exposure Limits).

3.2.1 Chronic Toxicity

Chemicals are usually evaluated for their potential chronic health effects in two categories, carcinogenic and noncarcinogenic. Different methods are used to estimate the potential for carcinogenic and noncarcinogenic health effects to occur. Some chemicals that produce noncarcinogenic effects may or may not also be associated with carcinogenic effects. USEPA and Cal/EPA consider carcinogens to pose a risk for cancer at all exposure levels (i.e., a "no-threshold" assumption); that is, any increase in dose is associated with an increase in the probability of developing cancer. In contrast, noncarcinogens generally are thought to produce adverse health effects only when some minimum exposure level is reached (i.e., a threshold dose).

To evaluate toxicity, chemical-specific cancer slope factors (CSFs), reference doses (RfDs), and reference concentrations (RfCs) were used. The hierarchy of sources for the toxicity values used in this assessment corresponds to the guidelines of the Cal/EPA (1994) as follows:

- Cal/EPA's California Cancer Potency Factors: Update (Cal/EPA 1994)
- California Air Pollution Control Officer's Association's (CAPCOA) Air Toxics "Hot Spots" Program, Revised 1992 Risk Assessment Guidelines (CAPCOA 1993)
- USEPA's Integrated Risk Information System (IRIS) (USEPA 1999)
- USEPA's Health Effects Assessment Summary Tables (HEAST) (USEPA 1997)
- USEPA's National Center for Environmental Assessment (NCEA) (various dates)

The following sections describe the methods used for the chronic toxicity assessment of carcinogens and noncarcinogens, respectively.

3.2.1.1 Carcinogenic Effects

As stated above, current risk assessment practice for carcinogens is based on the assumptions that there is no threshold dose for carcinogenic effects. This "no-threshold" assumption for carcinogenic effects is based on a current hypothesized mechanism about the carcinogenic processes and has generally been adopted by regulatory agencies as a conservative practice to protect public health. In the absence of compelling scientific evidence to the contrary, the "no-threshold" assumption is used in this risk assessment for evaluating carcinogenic effects. Although the magnitude of the risk declines with decreasing exposure, the risk is believed to be zero only at zero exposure.

There are two components to the evaluation of the carcinogenic effects of a chemical: a qualitative determination of the likelihood of it being a human carcinogen (weight-of-evidence), and a quantitative assessment of the relationship between exposure dose and response (i.e., cancer slope factor). Using the weight-of-evidence approach, the USEPA's Carcinogen Assessment Group (CAG) categorizes chemicals into Groups A, B, C, D, and E carcinogens (USEPA 1989). CAG's classification of carcinogens is briefly described below:

- Group A -- Human Carcinogen
  This category indicates that there is sufficient evidence available from human epidemiological studies to support a causal association between exposure to the chemical and the development of human cancer.

- Group B -- Probable Human Carcinogen
  The category indicates that sufficient evidence exists from animal studies to support a causal relationship between exposure to the chemical and the development of cancer in animals. This category is divided into subgroups B1 and B2. Group B1 chemicals also have limited evidence for carcinogenicity from human epidemiological studies. Group B2 chemicals have inadequate or no evidence from epidemiological studies.

- Group C -- Possible Human Carcinogen
  This category is for chemicals that exhibit limited evidence of carcinogenicity in animals.

- Group D -- Not Classifiable as to Human Carcinogenicity
  This category is used for chemicals with inadequate human and animal evidence of carcinogenicity.

- Group E -- Evidence of Noncarcinogenicity for Humans
  This category is used for chemicals that show no evidence of carcinogenicity in at least two adequate animal tests in different species or in both adequate epidemiological and animal studies.

As described earlier, CSFs are used to quantify the response potency of a potential carcinogen. CSFs are typically calculated for carcinogens in group A, B1, and B2. The USEPA decides to derive CSFs for Group C chemicals on a case-by-case basis. The only Group C chemical included in this evaluation is 1,1-dichloroethene.

CSFs may be based on either human epidemiological or animal data and are calculated by applying a mathematical model to extrapolate from responses observed at relatively high exposure doses in the studies to responses expected at lower doses of human exposure to environmental contaminants. A number of mathematical models and procedures have been developed for the extrapolation. In the absence of adequate data to the contrary, the linearized multistage model is employed (USEPA 1989).

In general, the CSF is a plausible upper-bound estimate of the probability of a response per unit intake of a chemical, e.g., $(mg/kg/day)^{-1}$, over a lifetime. The CSF is used in risk assessments to estimate an upper-bound lifetime probability of an individual developing cancer, as a result of exposure to a particular level of a potential carcinogen. The true value of the risk is unknown, and may be as low as zero.

Table 3.2 presents the inhalation CSFs to be used in this risk assessment. Where available, the table presents the weight-of-evidence of carcinogen classification (developed by USEPA) and the basis for the CSF including study type, test animal, and cancer type.

3.2.1.2 Noncarcinogenic Effects

The dose-response assessment for noncarcinogenic effects requires the derivation of an exposure level below which no adverse health effects in humans are expected to occur. USEPA refers to these levels as RfDs for oral exposure and RfCs for inhalation exposure (USEPA 1989). RfDs and RfCs are calculated by dividing a quantitative toxicity index, derived from human or animal studies, by an appropriate safety or uncertainty factor. The quantitative toxicity indices that may be used for the derivation of RfDs or RfCs include the No-Observed-Effect-Level (NOEL), the No-Observed-Adverse-Effect-Level (NOAEL), Lowest-Observed-Effect-Level (LOEL), and the Lowest-Observed-Adverse-Effect Level (LOAEL) (USEPA 1989).

The basis for the application of different safety or uncertainty factors is outlined in the Risk Assessment Guidance for Superfund (USEPA 1989) and is briefly discussed here. A 10-fold factor (i.e., dividing the value by 10) is used to account for variation in sensitivity in the general human population. A 10-fold factor is used when extrapolating data from animal studies to human exposure to account for interspecies variation. A 10-fold factor is used when a toxicity index (e.g., NOAEL) derived from a subchronic (e.g., 3 months) rather than a chronic (lifetime) study is used as the basis for deriving a chronic RfD. A 10-fold factor

is used when a LOAEL is used instead of a NOAEL. An additional uncertainty factor (also called a modifying factor) of between 1 and 10 may be used depending on the quality of the data and severity of the toxic effects. The default value for the modifying factor is one (1) (USEPA 1989).

The chronic inhalation RfC's for chemicals evaluated in this risk assessment are shown in Table 3.3. Where available, this table also presents the confidence level of USEPA's evaluation, the test animal, the critical effect, and the uncertainty factor used for derivation of a specific RfD or RfC.

3.2.2 Acute Toxicity

Acute health effects were also considered in this risk assessment. For those chemicals selected for quantitative analysis, Table 3.4 presents the acute REL developed by Cal/EPA (1999). The acute RELs are the concentration level at or below which no adverse health effects are anticipated for the specified exposure duration. These acute RELs were developed for use in the Air Toxics "Hot Spots" Program.

Table 3.4 indicates the averaging time or exposure duration for the RELs. In many cases, the averaging time is one hour, although for some compounds the averaging time is longer than one hour (e.g., six or seven hours). For this risk assessment, acute health effects were evaluated for a maximum one-hour average concentration. This is a conservative assumption as the maximum one-hour average concentration will always be equal to or greater than a concentration for an averaging time greater than one hour. This is because concentrations not as large as the maximum one-hour concentration would be averaged in the concentration estimation.

Also included in Table 3.4 are the species, toxicological endpoints, severity of effect, target organ, and uncertainty factor used in the key study for the REL development. According to Cal/EPA (1999), since margins of safety are incorporated into these RELs, an exceedance of an REL does not automatically indicate an adverse health impact.

3.2.3 Occupational Standards

In order to assess the on-site worker, measured concentrations of airborne chemicals at the Site were compared with the Permissible Exposure Limits (PELs) derived by the California Occupational Safety and Health Administration (Cal-OSHA) (CCR Title 8, Section 5155, Table AC-1). The Cal-OSHA PELs are required to be as stringent or more stringent than the federal OSHA PELs. A worker's exposure to a chemical in a workday, expressed as an 8-hour time weighted average concentration, must not exceed the PEL for that chemical. Table 3.5 presents the PELs for the chemicals evaluated in this risk assessment.

3.2.4 Toxicity Profiles

Toxicity profiles have been prepared for the key chemicals in this risk assessment (i.e., those chemicals contributing approximately 90 percent of the estimated risk). These chemicals include benzene, carbon tetrachloride, chloroform, gasoline, hydrazine,

methylene chloride, and 2-nitropropane. These profiles, which are presented in Appendix B, include a brief description of the key study used to develop the toxicity value, addressing such aspects of the study as route of administration, dose levels tested, and species tested. For RfD's and RfC's, the toxicity profile describes the uncertainty and modifying factors. For CSFs, the types of tumors seen and the model used to extrapolate the results are identified.

3.3 References

California Air Pollution Control Officers Association (CAPCOA). 1993. Air Toxics "Hot Spots" Program, Revised 1992 Risk Assessment Guidelines. October.

California Environmental Protection Agency (Cal/EPA). 1994. Memorandum. To: Cal/EPA Departments, Boards, and Offices. From: Standards and Criteria Work Group, Office of Environmental Health Hazard Assessment. Subject: California Cancer Potency Factors. November 1.

California Environmental Protection Agency (Cal/EPA). 1999. Determination of Acute Reference Exposure Levels for Airborne Toxicants. Office of Environmental Health Hazard Assessment, Air Toxicology and Epidemiology Section. March.

Department of Toxic Substances Control (DTSC). 1991. Permitting of Treatment, Storage and Disposal Facilities (TSDF). Items to be Considered for Inclusion in a Health Risk Assessment. Memorandum from Chuck Salocks to All TSCP Staff Toxicologists. February 14.

Department of Toxic Substances Control (DTSC). 1995. Guidelines for Planning, Conducting, and Reviewing Human and Ecological Risk Assessments. Memorandum from Judith Parker to the Toxicologists of the Office of Scientific Affairs (OSA). February 21.

Department of Toxic Substances Control (DTSC). 1996. Review of Exposure Information for the Romic Facility. Memorandum from Ann Eli, Associate Air Pollution Specialist of the Northern California Permitting Office, to Henry Chui. October 31.

Department of Toxic Substances Control (DTSC). 1997. Romic Environmental Technologies Corp., East Palo Alto, CA. Memorandum from Cheng L. Liao, Staff Toxicologist of the Human and Ecological Risk Division, to Henry Chui of the Hazardous Waste Management Brand. June 13.

United States Environmental Protection Agency (USEPA). 1989. Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part A). Interim Final. Office of Emergency and Remedial Response. EPA-540/1-89/002. Washington, D.C. December.

United States Environmental Protection Agency (USEPA). 1997. Health Effects Assessment Summary Tables (HEAST).

United States Environmental Protection Agency (USEPA). 1999. Integrated Risk Information System (IRIS). Online database maintained by USEPA. Cincinnati, OH.

TABLE 3.1
Chemicals Selected for Quantitative Risk Evaluation
Romic Facility, East Palo Alto, California

Chemicals	Cancer	Noncancer	Acute	Odors	Worker
1,1,1-TRICHLOROETHANE		X	X		X
1,1-DICHLOROETHENE	X	X			
1,2,4-TRIMETHYLBENZENE					X
1,2-DICHLOROBENZENE				X	
1,2-DICHLOROETHANE	X				
1,3,5-TRIMETHYLBENZENE					X
1,4-DICHLOROBENZENE				X	
1,4-DIOXANE	X		X		
2-BUTANONE		X	X		X
2-ETHOXYETHANOL			X		
2-NITROPROPANE	X				
4-METHYL-2-PENTANONE		X		X	
ACETALDEHYDE				X	
ACETONE		X			X
ACETONITRILE	X	X			
ACRYLIC ACID			X	X	
ACRYLONITRILE		X			
AMMONIA		X	X		
ARSENIC					X
BENZENE	X	X	X		X
BROMINE				X	
CARBON DISULFIDE		X	X	X	
CARBON TETRACHLORIDE	X	X	X		
CHLORINE		X	X	X	
CHLOROBENZENE				X	
CHLOROFORM	X	X	X		X
CUMENE				X	
CYCLOHEXANE		X			X
CYCLOHEXANOL				X	
DIACETONE ALCOHOL				X	
DICHLOROFLUOROETHANE		X			
DIETHYLAMINE				X	
DIETHYLAMINOETHANOL				X	
DIISOBUTYL KETONE				X	
D-LIMONENE					X
DIMETHYL FORMAMIDE		X			
EPICHLOROHYDRIN		X	X	X	
ETHYL ACRYLATE				X	
ETHYL BENZENE					X
ETHYLENE OXIDE		X			
FORMALDEHYDE	X		X	X	
GASOLINE	X	X			
HEXACHLOROETHANE				X	
HEXANE		X			X
HYDRAZINE	X	X			
HYDROCHLORIC ACID		X	X		
HYDROFLUORIC ACID			X		
HYDROGEN SULFIDE		X	X	X	

TABLE 3.1
Chemicals Selected for Quantitative Risk Evaluation
Romic Facility, East Palo Alto, California

Chemicals	Cancer	Noncancer	Acute	Odors	Worker
ISOPROPYL ALCOHOL			X		
M-CRESOL				X	
METHACRYLATE				X	
METHANOL		X	X		
METHYL ISOBUTYL KETONE					X
METHYL METHACRYLATE				X	
METHYLENE CHLORIDE	X	X	X		X
METHYL N-AMYL KETONE					X
METHYL-TERT-BUTYL ETHER					X
NAPHTHALENE				X	
N-BUTYL ACETATE					X
N-BUTYL ALCOHOL				X	
N-HEPTANE					X
N-HEXANE		X			
NITRIC ACID			X		
NITROBENZENE				X	
OSMIUM TETROXIDE				X	
PHENOL			X	X	
PHOSPHINE		X		X	
PROPYLENE DICHLORIDE				X	
PROPYLENE OXIDE	X	X	X		
PYRIDINE		X		X	
STYRENE			X	X	X
SULFURIC ACID			X		
TETRACHLOROETHENE	X	X	X		X
TETRAHYDROFURAN					X
TOLUENE		X	X		X
TOLUENE DIISOCYANATE				X	
TRICHLOROETHENE	X				X
TRIETHYLAMINE		X	X	X	
URETHANE	X				
VINYL ACETATE				X	
VINYL CHLORIDE	X	X	X		X
XYLENE			X		X

TABLE 3.2
Carcinogenic Inhalation Toxicity Data
Romic Facility, East Palo Alto, California

Chemical	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Source	Inhalation Unit Risk $(mg/m^3)^{-1}$	Weight of Evidence	Study Type	Test Animal	Cancer Type
1,1-DICHLOROETHENE	1.2	HEAST	3.43E-01	C	2 years	rat	liver
1,2-DICHLOROETHANE	0.091	IRIS	2.60E-02	B2	78 week/110 week	rat	lung
1,4-DIOXANE	0.027	Cal/EPA	7.71E-03	B2	2 years	male/female rats	Hepatocarcinoma, nasal tumor
2-NITROPROPANE	9.4	HEAST	2.69E+00	B2	22 months	rat	liver
ACRYLONITRILE	1	Cal/EPA	2.86E-01	B1	occupational exposure	human	lung
BENZENE	0.1	Cal/EPA	2.86E-02	A	occupational exposure	male human	lymphomas
CARBON TETRACHLORIDE	0.15	Cal/EPA	4.29E-02	B2	17 week/31 week gavage in olive oil	male, female rat	liver
CHLOROFORM	0.081	HEAST	2.31E-02	B2	7.5 years	dog	liver
FORMALDEHYDE	0.0454	IRIS	1.30E-02	B1	24 months	rat	carcinoma
GASOLINE	0.0056	AB2588	1.60E-03	NA	NA	NA	NA
HYDRAZINE	17.1	Cal/EPA	4.89E+00	B2	130 week	male rats	nasal cavity
METHYLENE CHLORIDE	0.0035	Cal/EPA	1.00E-03	B2	102 week/102 week	rat/mouse	mammary gland, lung, liver
PROPYLENE OXIDE	0.013	HEAST	3.71E-03	B2	2 years	mouse	nasal cavity
TETRACHLOROETHENE	0.021	Cal/EPA	6.00E-03	NA	104 week/104 week (2 studies), 78 week/104 week gavage in corn oil	rat/mouse	liver
TRICHLOROETHENE	0.01	Cal/EPA	2.86E-03	B2	104 week/104 week (2 studies), 78 week/130 week, 104 week/107 week, 78 week/78 week	rat/mouse	liver/lung/lymphoma
URETHANE	1	Cal/EPA	2.86E-01	NA	NA	NA	NA
VINYL CHLORIDE	3.00E-02	Cal/EPA	8.57E-03	A	occupational exposure	workers	liver

Notes:
NA = Not available.

Sources:
California Air Pollution Control Officers Association (CAPCOA). 1993. Air Toxics "Hot Spots" Program. Revised 1992 Risk Assessment Guidelines. October.
California Environmental Protection Agency (Cal/EPA). 2000. California Cancer Potency Value. Office of Environmental Health Hazard Assement (OEHHA). December.
United States Environmental Protection Agency (USEPA). 1995. Health Effects Assessment Summary Tables (HEAST). FY-1995 Annual. EPA/540/R-95/036. Office of Solid Waste and Emergency Response. Washington, D.C. May.
United States Environmental Protection Agency (USEPA). 2000. Integrated Risk Information System (IRIS). Online database maintained by the USEPA. Cincinnati, OH.

TABLE 3.3
Chronic Noncarcinogenic Inhalation Toxicity Data
Romic Facility, East Palo Alto, California

Chemical	Chronic Reference Dose (mg/kg-day)	Confidence Level	Test Animal	Critical Effect	Uncertainty Factor	Reference
1,1,1-TRICHLOROETHANE	0.3	medium	gerbils	neurotoxicity	300	NCEA
1,1-DICHLOROETHENE	0.009	medium	rat	hepatic lesions	1,000	IRIS
1,2-DIBROMO-3-CHLOROPROPANE	0.00006	medium	rabbit	testicular	1,000	IRIS
2-BUTANONE	0.3	low	rat	decrease fetal weight	3,000	IRIS
4-METHYL-2-PENTANONE	0.08	NA	rat	increased kidney and liver weight	3,000	HEAST
ACETONE	1.0E-01	low	rat	liver/nephrotoxicity	1,000	IRIS
ACETONITRILE	0.02	NA	mouse	mortality	100	IRIS
ACRYLONITRILE	0.0006	medium	rat	respiratory/nasal	1,000	IRIS
AMMONIA	0.03	medium	human	respiratory	30	IRIS
BENZENE	0.02	NA[a]	NA	central nervous system	420	AB2588
CARBON DISULFIDE	0.2	medium	rabbit	fetal toxicity	100	IRIS
CARBON TETRACHLORIDE	0.0007	medium	rat	liver lesions	1,000	IRIS
CHLORINE	0.1	medium	rat	none observed	100	IRIS
CHLOROFORM	0.01	medium	dog	liver cyst	1,000	IRIS
DICHLOROFLUOROETHANE	0.2	medium	rat	reduced body weight	100	IRIS
DIMETHYL FORMAMIDE	0.009	medium	occupational human exposure	liver/digestion	300	IRIS
EPICHLOROHYDRIN	0.0003	medium	rat/mouse	nasal	300	IRIS
ETHYLENE OXIDE	0.2	NA	rat	reproductive toxicity	100	AB2588
GASOLINE	0.6	NA[a]	NA	neurotoxicity/respiratory	420	AB2588
HEXANE	0.06	medium	mouse	neurotoxicity/nasal lesions	300	IRIS
HYDRAZINE	0.00007	NA[a]	NA	respiratory/skin	420	AB2588
HYDROCHLORIC ACID	0.006	low	rat	nasal	300	IRIS
HYDROGEN SULFIDE	0.0003	low	pig	gastrointestinal tract	1,000	IRIS
METHANOL	0.5	medium	rat	increase SAP/SGPT	1,000	IRIS
METHYLENE CHLORIDE	0.06	medium	rat	liver toxicity	100	IRIS
PHOSPHINE	0.00009	medium	rat	body weight	100	IRIS
PROPYLENE OXIDE	0.009	medium	rat	nasal cavity	100	IRIS
PYRIDINE	0.001	medium	rat	liver weight	1,000	IRIS
TETRACHLOROETHENE	0.01	medium	mouse	hepatotoxicity	1,000	IRIS
TOLUENE	0.1	medium	rat	liver/kidney weight	1,000	IRIS
TRIETHYLAMINE	0.002	low	rat	none observed	3,000	IRIS
VINYL CHLORIDE	0.03	medium	rat	liver	30	NCEA

Notes:
NA = Not available.
AB2588=CAPCOA 1993

[a] The value is derived from an ACGIH TLV value which has been divided by an uncertainty factor of 420. [4.2 (to extrapolate from a 40 hour work week to a 168 hour full week) times 10 (to extrapoplate from healthy workers to sensitives) times 10 (since adverse health effects are often seen at the TLVs)]. (CAPCOA 1993)

Sources:
National Center for Environmental Assessment (NCEA). 2000. Cited in USEPA Region 9 Preliminary Remediation Goals (PRGs), 2000, San Francisco, CA. November 1.
California Air Pollution Control Officers Association (CAPCOA). 1993. Air Toxics "Hot Spots" Program. Revised 1992 Risk Assessment Guidelines. October.
United States Environmental Protection Agency (USEPA). 1995. Health Effects Assessment Summary Tables (HEAST). FY-1995 Annual. EPA/540/R-95/036. Office of Solid Waste and Emergency Response. Washington, D.C. May.
United States Environmental Protection Agency (USEPA). 2000. Integrated Risk Information System (IRIS). Online database maintained by the USEPA. Cincinnati, OH.

TABLE 3.4
Acute Inhalation Reference Exposure Levels
Romic Facility, East Palo Alto, California

Chemical	Acute REL (a) (mg/m^3)	Averaging Time (hr)	Species	Toxicological Endpoint	Severity	Target Organ	Uncertainty Factor
1,1,1-TRICHLOROETHANE	68,000	1	human	CNS-mild	mild	nervous system	10
1,4-DIOXANE	3,000	1	human	eye and respiratory irritation	mild	respiratory system; eye	60
2-BUTANONE	13,000	1	human	eye and respiratory irritation	mild	respiratory system; eye	60
2-ETHOXYETHANOL	370	6	rat	reproductive/developmental	severe	reproductive/developomental	100
ACRYLIC ACID	6,000	1	rat	respiratory irritation	mild	respiratory system; eye	100
AMMONIA	3,200	1	human	eye and respiratory irritation	mild	respiratory system; eye	30
BENZENE	1,300	6	rat	reproductive/developmental	severe	reproductive/developmental; immune system; hematologic system	100
CARBON DISULFIDE	6,200	6	rat	reproductive/developmental	severe	reproductive/developomental; nervous system	100
CARBON TETRACHLORIDE	1,900	7	rat	reproductive/developmental	severe	reproductive/developmental; nervous system; alimentary tract	1,000
CHLORINE	210	1	human	respiratory irritation	mild	respiratory system; eye	10
CHLOROFORM	150	7	rat	reproductive/developmental	severe	nervous system; reproductive/developmental	1,000
EPICHLOROHYDRIN	1,300	1	human	eye and respiratory irritation	mild	respiratory system; eye	60
FORMALDEHYDE	94	1	human	eye irritation	mild	eye; respiratory system; immune system	10
HYDROCHLORIC ACID	2,100	1	human	eye and respiratory irritation	mild	respiratory system; eye	1
HYDROFLUORIC ACID	240	1	human	eye and respiratory irritation	mild	respiratory system; eye	10
HYDROGEN SULFIDE (b)	42	1	human	respiratory irritation	mild	headache and nausea in response to odor	1
ISOPROPYL ALCOHOL	3,200	1	human	eye and respiratory irritation	mild	respiratory system; eye	10
METHANOL	28,000	1	human	CNS-mild	mild	nervous system	10
METHYLENE CHLORIDE	14,000	1	human	CNS-mild	mild	nervous system	60
NITRIC ACID	86	1	human	respiratory irritation	mild	respiratory system	1
PHENOL	5,800	1	human	eye and respiratory irritation	mild	respiratory system; eye	10
PROPYLENE OXIDE	3,100	1	mouse	eye and respiratory irritation	mild	respiratory system; eye; reproductive/developmental	600
STYRENE	21,000	1	human	eye and respiratory irritation	mild	respiratory system; eye	10
SULFURIC ACID	120	1	human	respiratory irritation	mild	respiratory system	1
TETRACHLOROETHENE	20,000	1	human	CNS-mild, eye and respiratory irritation	mild	nervous system; eye; respiratory system	60

TABLE 3.4
Acute Inhalation Reference Exposure Levels
Romic Facility, East Palo Alto, California

Chemical	Acute REL (a) (mg/m^3)	Averaging Time (hr)	Species	Toxicological Endpoint	Severity	Target Organ	Uncertainty Factor
TOLUENE	37,000	1	human	CNS-mild;eye and respiratory irritation	mild	nervous system ; eye; respiratory system	10
TRIETHYLAMINE	2,800	1	human	CNS-mild;eye irritation	mild	nervous system ; eye	10
VINYL CHLORIDE	180,000	1	human	CNS-mild;eye and respiratory system	mild	nervous system ; eye; respiratory system	10
XYLENE	22,000	1	human	eye and respiratory irritation	mild	eye; respiratory system	10

Notes:
CNS = Central Nervous System

(a) Acute Referenence Levels (RELs) from Cal/EPA 1999.
(b) California Ambient Air Quality Standard.

Source:
California Environmental Protection Agency (Cal/EPA). 1999. Determination of Acute Reference Exposure Levels for Airborne Toxicants. Office of Environmental Health Hazard Assessment. March.

TABLE 3.5
Occupational Standards - Permissible Exposure Limits
Romic Facility, East Palo Alto, California

Chemical	Permissible Exposure Limit (PEL) (a)	
	(ppm)	(mg/m^3)
1,1,1-TRICHLOROETHANE	350	1,900
1,2,4-TRIMETHYLBENZENE	25	125
1,3,5-TRIMETHYLBENZENE	25	125
2-BUTANONE	200	590
ACETONE	750	1,780
ARSENIC	0.003	0.01
BENZENE	1	3.2
CHLOROFORM	2	10
CYCLOHEXANE	300	1,050
D-LIMONENE	NA	NA
ETHYLBENZENE	100	435
HEXANE (b)	50	180
METHYL ISOBUTYL KETONE	50	205
METHYL N-AMYL KETONE	50	235
METHYL TERT BUTYL ETHER	NA	NA
METHYLENE CHLORIDE	25	87
N-BUTYL ACETATE	150	710
N-HEPTANE	400	1,600
STYRENE	50	215
TETRACHLOROETHYLENE	25	170
TETRAHYDROFURAN	200	590
TOLUENE	50	188
TRICHLOROETHYLENE	25	135
VINYL CHLORIDE	1	2.6
XYLENE	100	435

Notes:
NA = not available

(a) California Code of Regulations (CCR) Section 5155. Permissible Exposure Limits (PELs) are time-weighted average concentration limits to which nearly all workers may be exposed daily during a 40-hour workweek for a working lifetime without adverse effects.
(b) The value listed is the PEL for n-Hexane, which reflect the most conservative PEL for Hexane.

4.0 IDENTIFICATION OF POTENTIAL HUMAN EXPOSURE PATHWAYS AND EXPOSED POPULATIONS

The purpose of this section is to identify the current and potential future populations who may be exposed to chemical emissions from the Site and to identify the pathways by which these populations may be exposed. In accordance with USEPA guidance (USEPA 1989), a Conceptual Site Model (CSM) has been prepared for the Site. The CSM is used to show the relationships between potential chemical sources, exposure pathways, exposure routes, and receptors. The CSM for this Site, which is shown in Figure 4.1, is discussed further below.

4.1 Potentially Exposed Populations

Identification of the potentially exposed populations requires evaluating the human activity and land-use patterns at the Site and in the vicinity of the Site. The Site is currently used as TSD facility. Under the revised Part B permit, the Site would continue to operate in this capacity. Therefore, potential current and future on-site receptors would include on-site workers and visitors. On-site workers are expected to be on the Site with greater frequency and duration than visitors. Therefore, only the on-site worker is quantitatively evaluated in the risk assessment. Any health risks to visitors would be lower than those estimated for on-site workers.

Eight-foot high fencing topped with barbed-wire surrounds the Site. The entrance to the Site is monitored with a security camera and access to the Site is through an electronic gate that is manually controlled by Site personnel. Therefore, no trespassers are expected to be present at the facility.

As discussed in Section 2.0, the area immediately surrounding the Site is zoned for industrial operations. Neighbors adjacent to the Site include a salvage yard and a landscaping firm to the north and west, a salvage company to the southwest, and a salvage yard to the southeast. An electrical substation and a chemical manufacturer are located across the street to the south. Beyond this area, the land use is mixed and includes industrial, commercial, and residential areas. Residences are primarily to the west and to the south. The nearest resident is located just under a quarter-mile from the Site.

Wetlands and undeveloped land lie to the north, east and southeast of the Site. Further out to the east is the San Francisco Bay. A bicycle path runs along the levee to the east of the Site. This levee is used for recreational purposes such as cycling, hiking and bird watching.

Based on the land use surrounding the Site, this risk assessment evaluated off-site workers, off-site residents, and off-site recreationists. Potential risks to off-site workers and off-site residents have been estimated at actual worker and residential locations. The off-site recreational user is assumed to be present along the bicycle path in the Ravenswood Reserve in the vicinity of the Site.

In addition to the above populations, the risk assessment also evaluates potential sensitive receptors surrounding the Site. These receptors include schools, daycare centers, health care facilities, and senior homes in the vicinity of the Site. As discussed in Section 2.5, there are no sensitive receptors within a quarter-mile radius of the Site. However, there are a number of

schools and daycare centers within a mile radius. The location of nearby receptors is included in Figure 2.3.

The risk assessment analyzes both current and future emissions from the Site. The current scenario considers emissions from all existing sources at the Site. Therefore, it includes emissions from existing, but currently unregulated tanks and units at the Site and drum storage emissions from drums in the drum sampling areas that are not currently classified as drum storage areas. The future scenario considers all the emissions sources in the current scenario, plus the proposed additional tanks for liquid and aqueous organic waste storage and fuel-blending operations and wastewater treatment units. In addition, the future scenario also includes emissions from leaks from components (pumps, valves, flanges, etc.) on proposed tanks and units.

4.2 Relevant Exposure Pathways

An exposure pathway is defined as "the course a chemical or physical agent takes from the source to the exposed individual" (USEPA 1989). A complete exposure pathway consists of four elements:

- A source of chemical release
- An environmental transport medium (e.g., air) for the release chemicals
- An exposure point (a point of human contact)
- An exposure route (e.g., inhalation) at the exposure or contact point

An exposure pathway is considered complete only if all of these elements are present.

The potential sources of chemical releases from the Site were discussed in Section 3.0. These sources include volatile emissions from recycling and blending operations, wastewater treatment, and ancillary operations. Because no dust-generating operations occur at the Site, only volatile emissions are evaluated in the risk assessment.

The potential transport medium would be the ambient air. For on-site workers, this is best estimated from personnel air monitoring results obtained on an ongoing basis for compliance with worker health and safety regulations. For off-site populations, chemical concentrations in air have been simulated using agency-approved emission and dispersion modeling techniques. The determination of off-site concentrations due to routine air releases from the facility is described in further detail in Section 5.0.

For off-site workers and off-site residents, the point of exposure is assumed to be the actual receptor locations. In order to evaluate potential receptor points surrounding the Site, both gridded and discrete points have been modeled consistent with standard BAAQMD requirements. In addition discrete receptor points have been added to include the facility boundary, census centroids (i.e., a central point within a census block), nearby residences, the bike path in the Ravenswood Reserve in the vicinity of the Site, and the location of sensitive receptors (i.e., schools, daycare centers, health care facilities, and senior homes).

Since emissions include only volatile chemicals, the only relevant exposure route would be inhalation. Because deposition of volatile chemicals will be insignificant, direct contact pathways (such as dermal contact and soil ingestion) and indirect contact pathways (ingestion of contaminated vegetables/meats/fish and mother's milk) are not quantitatively evaluated in the risk assessment. All of the potentially exposed populations, pathways, and routes quantitatively evaluated in the risk assessment are summarized in Figure 4.1.

4.3 Estimation of Intake

The USEPA (1989) defines exposure as "the contact with a chemical or physical agent" and defines the magnitude of exposure as "the amount of an agent available at human exchange boundaries (i.e., lungs, gut, skin) during a specified time." Exposure assessments are designed to determine the degree of contact a person has with a chemical. Thus, estimating human exposure to a chemical requires information regarding the concentration of chemical with which a person will come into contact and the extent of the contact. The methods for estimating chemical concentrations in air are discussed in Section 5.0. This section presents the equations used to estimate inhalation pathway chemical exposures (or intakes). The estimates of intakes will be combined with toxicity values (Section 3.0) to estimate potential human risks (Section 6.0).

The chemical intake equation includes variables that characterize the exposure concentration, contact rate, exposure time, exposure frequency, exposure duration, body weight, and exposure averaging time. The result of the intake calculation is an estimation of the mass of the chemical absorbed by the body per unit body weight per unit time (e.g., milligram per kilogram per day or mg/kg/day). The inhalation intake or exposure is dependent on the exposure concentration and the contact rate and can be calculated using the following equation (USEPA 1989):

$$I = \frac{C \times CR \times ET \times EF \times ED}{BW \times AT}$$

Where:

I	=	Intake of a chemical (mg chemical/kg body weight-day)
C	=	Chemical concentration (mg chemical/cubic meter [m^3] air)
CR	=	Contact Rate; the amount of medium contacted per unit time (m^3 air/hour)
ET	=	Exposure Time (hours/day)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
BW	=	Body Weight (kg)
AT	=	Averaging Time; period over which exposure is averaged (days)

Parameters used to estimate intakes for the potential populations of concern are discussed below.

4.4 Exposure Assumptions for Relevant Receptors and Pathways

The parameters used in the intake equation can be separated into four categories:

- Estimated representative exposure concentrations
- Assumptions regarding human physiology (e.g., body weight)
- Assumptions specific to the exposed populations (e.g., years in which an individual resides or works in the same location)
- Assumptions specific to the exposure route (e.g., the amount of air breathed per day)

The estimation of representative exposure concentrations is presented in Section 5.0. The following sections present the assumptions for physiological parameters, population-specific parameters, and route-specific parameters used to estimate exposure to chemicals potentially emitted from the Site.

For this risk assessment, exposure assumptions corresponding to both an average exposed individual (AEI) and a reasonable maximum exposure (RME) scenario were developed. Intake assumptions for the average exposure scenario are selected to represent the central tendency of exposure while the intake assumptions for the RME scenario represent "the highest exposure that is reasonably expected to occur at a site" (USEPA 1989). According to the USEPA, the intent of the RME scenario is "to estimate a conservative exposure case (i.e., well above the average case) that is still within the range of possible exposures" (USEPA 1989). The RME is estimated by combining "upper-bound and mid-range exposure factors so that the result represents an exposure scenario that is both protective and reasonable; not the worst possible case" (USEPA 1991).

Where available and appropriate, exposure parameter values recommended by the USEPA (USEPA 1989,1991,1997,1999) and Cal/EPA (1992,1994) were used. For some exposure parameters, the USEPA and Cal/EPA do not have recommended values or the default recommendations are not appropriate for the populations being evaluated. In such cases, best professional judgment was used to select parameter values corresponding to the individual pathways. Tables 4.1 and 4.2 summarize the parameter values used in the intake equation for each receptor population for the AEI and RME scenarios, respectively. These parameters are further discussed below.

4.4.1 Human Physiology Assumptions

For estimating exposures to the potentially exposed off-site adult worker, resident and recreationist, the physiological assumptions for a male adult have been used as recommended by USEPA (1991) and Cal/EPA (1992). The physiological assumptions used in this risk assessment include an adult body weight of 70 kg for all three populations.

For the adult worker, the RME breathing rate is 20 m^3 for an 8-hour workday or 2.5 m^3/hour (USEPA 1991, Cal/EPA 1992) and the AEI breathing rate is 12 m^3/day or 1.5 m^3/hour (USEPA 1997). For adult residents, the RME breathing rate is 20 m^3/day or 0.83 m^3/hour (USEPA 1989,1991; Cal/EPA 1992) and the AEI breathing rate is 15.2 m^3/day or 0.63 m^3/hour (USEPA 1997). As the recreationist is assumed to be present on the bike

path for one hour or less per day, only the hourly rate is applicable. For the adult recreationist, it is assumed that the RME breathing rate is 3.2 m^3/hour and the AEI breathing rate is 1.6 m^3/hour. These values are based on USEPA average inhalation rates for heavy activity and moderate activity, respectively (USEPA 1997).

For the child resident and recreationist, physiological assumptions for the average child from infancy to six years (i.e., 0-6 years) have been used. The child is assumed to have a body weight of 15 kg (USEPA 1991, Cal/EPA 1992). For the child resident, the RME breathing rate is 10 m^3/day, or 0.42 m^3/hour (USEPA 1999, Cal/EPA 1994). For the child resident, the assumed AEI breathing rate is 7.2 m^3/day or 0.3 m^3/hour. This breathing rate is based on the age-weighted average for children from 0-6 years (USEPA 1997). For the child recreationist, the assumed RME breathing rate is 1.9 m^3/hour and the AEI breathing rate is 1.2 m^3/hour. These values are based on USEPA average hourly inhalation rates for short-term exposures for children for heavy and moderate activities, respectively (USEPA 1997).

4.4.2 Population-Specific Assumptions

Assumptions regarding population-specific exposure time, exposure frequency, exposure duration, and exposure averaging time are used to estimate the chemical intakes for potentially exposed populations. The exposure time, frequency and duration determine the total time of exposure for each potentially exposed population. Exposure time assumptions have been determined for each of the populations as discussed below. Standard default assumptions recommended by the USEPA (1989, 1991) regarding exposure frequency and duration are used in this risk assessment when applicable.

For both the RME and AEI off-site worker, it is assumed that exposure occurs for 8 hours/day, 250 days/year (USEPA 1991, Cal/EPA 1992). The duration of exposure is assumed to be 25 years for the RME off-site worker (USEPA 1991, Cal/EPA 1992) and 6.6 years for the AEI worker (USEPA 1997).

For the RME and AEI off-site residents, it is assumed that exposure occurs for 24 hours/day (USEPA 1991, Cal/EPA 1992). Consistent with USEPA (1991) and Cal/EPA (1992) guidance, an exposure frequency of 350 days per year is assumed for both the adult and child residents for the RME and AEI scenario. This assumes that residents are present in their home seven days a week for 50 weeks a year (or approximately 96% of the time). Approximately two weeks (or 15 days) are spent away from home on vacation.

The exposure duration for the resident under the RME scenario is assumed to be 30 years (USEPA 1991, 1997; Cal/EPA 1992). According to USEPA (1997), this is the 95th percentile for time spent at one residence. For the AEI scenario, a value of nine years is used. This corresponds to the 50th percentile for time spent at one residence (USEPA 1997).

For the recreationist, the assumed exposure duration is the same as for the resident (i.e., 30 years for the RME and nine years for the AEI). Based on professional judgment, the assumed exposure time and frequency for the RME recreationist is one hour/day, one

day/week, 52 weeks/year (or 52 hours/year) and for the AEI is 0.5 hours/day, one day/week, 52 weeks/year (or 26 hours/year).

The exposure averaging time for estimating chemical intake depends on the type of toxic effect being assessed. In accordance with regulatory guidance (USEPA 1989), intakes for carcinogens are calculated by averaging the dose received over a lifetime (i.e., 70 years or 25,550 days). As indicated in regulatory guidance for noncarcinogens, the averaging time for chronic long-term exposure is the period of potential exposure (USEPA 1989). The basis for the use of different averaging times for carcinogens and noncarcinogens is related to the currently held scientific opinion that the mechanisms of action for the two categories of chemicals are different.

For carcinogenic effects, an age-adjusted intake factor is calculated which takes into account the difference in route-specific intake rates, body weights, and exposure duration for children and adults. The 30-year residential exposure duration for carcinogenic effects is a composite of exposure assumptions for six years as a child and 24 years as an adult. These assumptions allow for the possibility that the 30 years one individual is assumed to live in the area may cover from the period from childhood to adulthood. Regulatory guidance recommends this age-adjusted approach (USEPA 1991, Cal/EPA 1992, 1994). The nine-year residential exposure duration for carcinogenic effects is a composite of exposure assumptions for two years as a child and seven years as an adult.

For noncarcinogenic exposures, the RME adult resident is exposed for 24 years and the child for six years (USEPA 1991). For the AEI scenario, an adult exposure of seven years and child exposure of two years is assumed.

4.4.3 Route-Specific Assumptions

Since only volatile chemicals are emitted from the Site, inhalation is the only pathway evaluated in this risk assessment. All breathing rate assumptions are discussed in Section 4.3.1.

4.5 References

California Environmental Protection Agency (Cal/EPA). 1992. Supplemental Guidance for Human Health Multimedia Risk Assessments for Hazardous Waste Sites and Permitted Facilities. Sacramento, California. July.

California Environmental Protection Agency (Cal/EPA). 1994. Preliminary Endangerment Assessment Manual (PEA). Department of Toxic Substances Control.

United States Environmental Protection Agency (USEPA). 1989. Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part A). Interim Final. Office of Emergency and Remedial Response. EPA-540/1-89/002. Washington, D.C. December.

United States Environmental Protection Agency (USEPA). 1991. Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual. Supplemental Guidance.

Standard Default Exposure Factors. Office of Emergency and Remedial Response. March 25.

United States Environmental Protection Agency (USEPA). 1997. Exposure Factors Handbook. EPA/600/P-95/002Fa. August.

United States Environmental Protection Agency (USEPA). 1999. Region 9 Preliminary Goals (PRGs) 1999. October 1.

TABLE 4.1
Exposure Assumptions - Average Exposed Individual (AEI)
Romic Facility, East Palo Alto, California

Parameter	Populations (a)				
	Off-site Resident		Off-site Commercial Worker	Off-site Recreationist	
	Adult	Child	Adult	Adult	Child
Inhalation of Vapors					
Inhalation Rate (cubic meters/hour)	0.63	0.3	1.5	1.6	1.2
Population-Specific Intake Parameters					
Exposure Time (hours/day)	24	24	8	0.5	0.5
Exposure Frequency (days/year)	350	350	250	52	52
Exposure Duration (years) (b)	7	2	9	7	2
Body Weight (kilograms)	70	15	70	70	15
Averaging Time-Carcinogens (days)	25,550	25,550	25,550	25,550	25,550
Averaging Time-Noncarcinogens (days)	2,555	730	3,285	2,555	730

(a) For further discussion of exposure parameters see Section 4.4 of text.

(b) Exposure duration for lifetime residents is assumed to be nine years total. For carcinogens, exposures are combined for children (two years) and adults (seven years)

TABLE 4.2
Exposure Assumptions - Reasonable Maximum Exposure (RME)
Romic Facility, East Palo Alto, California

	Populations (a)				
	Off-site Resident		Off-Site Commercial Worker	Off-site Recreationist	
Parameter	Adult	Child	Adult	Adult	Child
Inhalation of Vapors					
Inhalation Rate (cubic meters/hour)	0.83	0.42	2.5	3.2	1.9
Population-Specific Intake Parameters					
Exposure Time (hours/day)	24	24	8	1	1
Exposure Frequency (days/year)	350	350	250	52	52
Exposure Duration (years) (b)	24	6	25	24	6
Body Weight (kilograms)	70	15	70	70	15
Averaging Time-Carcinogens (days)	25,550	25,550	25,550	25,550	25,550
Averaging Time-Noncarcinogens (days)	8,760	2,190	9,125	8,760	2,190

(a) For further discussion of exposure parameters see Section 4.4 of text.

(b) Exposure duration for lifetime residents is assumed to be 30 years total. For carcinogens, exposures are combined for children (six years) and adults (24 years).

Figure 4.1
Conceptual Site Model
Romic Facility, East Palo Alto, California

Source	Release Mechanism	Exposure Medium	Exposure Route	Current and Future				
				On-site Worker	Off-site Resident	Off-site Worker	Off-site Recreationalist	Off-site Sensitive Receptors
Recycling and Blending Operations Ancillary Operations (e.g., truck washing, fuel dispensing, ground water treatment)	Volatile Emissions	Ambient Air	Inhalation	X	X	X	X	X

5.0 ESTIMATION OF REPRESENTATIVE EXPOSURE CONCENTRATIONS

This section describes the information and data used to estimate the concentration of chemicals in the ambient air near the Site. In order to estimate the ambient air concentrations, emissions of chemicals from the Site were estimated and the dispersion of the emissions in the air was modeled. In this risk assessment, both current Site operations as well as additional future proposed operations were evaluated. In addition, in order to assess potential on-site worker exposures, area and personal sampling data collected at the Site were evaluated.

As part of Romic's RCRA Part B permit renewal, the Site has proposed to change the designation at existing, but currently unregulated storage tanks and units to a designation of regulated under the permit, add tanks for organic liquid and wastewater storage, add tanks for fuel-blending operations, and add wastewater treatment units. In addition, the Site has proposed to designate current drum sampling areas as drum storage areas.

For the evaluation of ambient air concentrations, two scenarios were considered. The first scenario, the current emissions scenario, considers emissions from all existing sources at the Site. Therefore, it includes emissions from existing, but currently unregulated, tanks and units at the Site and drum storage emissions from drums in the drum sampling areas that are not currently classified as drum storage areas. The second scenario, the future emissions scenario, considers all the emission sources in the current emissions scenario, plus the proposed additional tanks for organic liquid and wastewater storage and fuel-blending operations and wastewater treatment units. In addition, the future emissions scenario also includes emissions from leaks from components (pumps, valves, flanges, etc.) on proposed tanks and units.

The methodology used to estimate ambient air concentrations of the chemicals selected for consideration in this risk assessment consisted of three phases:

(1) Identification and characterization of emission sources at the Site;

(2) Estimation of emissions of chemicals from the identified sources at the Site; and

(3) Estimation of ambient air concentrations resulting from dispersion of Site emissions through the air.

These topics were discussed in a modeling protocol submitted to the BAAQMD. This protocol was approved, with requested revisions, by the BAAQMD during a conference call with Brian Bateman of the BAAQMD on May 28, 1999. The phone call and requested revisions are summarized in a letter to the BAAQMD dated August 31, 1999. Any deviations from the final protocol are noted in the following sections. In particular, deviations from the protocol included the following:

- Additional sources were included that were not mentioned in the protocol including troughs, sieves, the water wash tank, and truck sampling emissions;

- Additional components were identified including components on storage tanks and emissions from potential leaks from the additional components were included;
- The drum sampling, laboratory, lab pack processing, and solid waste consolidation emissions estimation methodologies were revised;
- A unique waste stream for lab pack processing was used;
- The organic liquid waste stream was used to represent the wastewater stream and the fuel product stream;
- Emissions of hydrochloric acid from the boiler were included; and
- A newer version of the air dispersion model was used (99155 versus 98356).

Soil gas has been removed as contaminated groundwater (and associated soil gas emissions) are being addressed under another regulatory program and is not anticipated to be part of the Site's long term air emissions. Groundwater remediation will be further addressed in the EIR.

The sources considered in this risk assessment are described in Section 5.1. As described in that section, the identified sources were characterized on the basis of Site information and data regarding the nature of the material throughput for each source, the quantity and schedule for the operation, and the operating parameters for the sources.

The methodology used to estimate emissions is described in Section 5.2. Site data, including flow rate and material composition data, source test results, source monitoring data, and Site engineering estimates, were used as the basis of the emissions estimated for each identified source. Emissions estimation factors and models, published by USEPA were also used.

The methods used to evaluate the dispersion of emissions in the air are discussed in Section 5.3. Air concentrations of chemicals emitted by the Site were estimated using a USEPA-approved air dispersion model. This model incorporates data and information regarding local meteorology and terrain. Local meteorological data was used to characterize the dispersive characteristics of the atmosphere for long-term and short-term exposures. Operational parameters such as the type of material handled in the unit and hours of operation were considered. Physical parameters of each source, such as height of release, exit gas temperature and exit gas flow rate, were also used.

Section 5.4 summarizes the data from area and personal sampling used to evaluate potential exposure to on-site workers. As worker sampling data was collected in 1997, 1998, and 1999, this data would best represent the current worker exposure at the Site.

5.1 Characterization of Emissions

Sources of air emissions are described in this section and are listed in Table 5.1 and Appendix C, Table C.1. Emissions from the Site primarily result from its recycling, blending, and wastewater treatment operations, with some additional emissions from ancillary operations (such as truck washing, fuel dispensing, and groundwater treatment). Because no dust generating operations occur at the Site, only volatile emissions resulting from liquid waste handling and processing are

evaluated in the risk assessment. The sources modeled in this risk assessment also include the proposed additional sources in the Site's RCRA Part B permit renewal which include additional tanks for organic liquid and wastewater storage and fuel-blending operations, wastewater treatment units, and component leaks from additional tanks and units. These additional tanks, units, and components are listed in Table 5.1 and are identified as "proposed" sources.

Each source of emission included in this risk assessment was divided into source type according to how emissions are calculated. The source types include:

1. Material storage and handling
2. Material sampling and laboratory testing
3. Solid waste consolidation
4. Lab pack processing
5. Fuel-blending operations
6. Drum liquefaction operations
7. Organic liquid material separation
8. Wastewater treatment operations
9. Truck washing operations
10. Vehicle fueling
11. Groundwater treatment

The following subsections will describe each source type evaluated for this risk assessment analysis.

1. Material Storage and Handling. Air emissions could result from the volatilization of chemicals during material transfer processes and material storage. Material brought to the Site for processing is received in tanker trucks, drums, and totes. The Site receives mainly liquid or semi-solid material. Material is stored and combined in storage tanks prior to further processing. Refined product is also stored on-site prior to shipping. The Site has proposed to add additional tanks for organic liquid and wastewater storage.

   Volatile losses resulting from material transfer occur from vapors being displaced as tanks are filled, component leaks from valves and hose/pipe connections, and evaporative losses from any liquid spilled into one of three troughs at the Site. The losses from the tanks as they are being filled are discussed below. The fugitive emissions from component leaks are discussed below. The emissions from components on fuel-blending tanks and material processing units are discussed in the "Fuel-blending Operations" and "Liquid Organic Material Separation" sections. Evaporative losses from the troughs occur if any liquid is spilled when the hoses for transferring material are disconnected from the pipes on the tanks. Although the trough emissions are included in both the current and future emissions scenarios, it is important to note that the Site is developing permanent piping for transferring material between tanks and processing units to eliminate the need for the troughs at the Site. The elimination of the troughs is discussed further in Section 6.9.3.

Volatile losses from material storage occur from evaporation from tanks and drums and component leaks from pumps, valves, flanges, etc. Storage tanks have breathing and working losses if they are vented to the atmosphere. These result from pressure and temperature fluctuations within the tank as well as vapor displacement during tank filling. Tanks at the Site are vented either to the atmosphere or to the Site's emission control system, a triple scrubber/boiler emission abatement system. Storage tanks also have fugitive emissions from component leaks from pumps, valves, flanges, etc.

The drums are located in storage areas and sampling areas. Small amounts of fugitive emissions from storage drums can result from leaking of volatile chemicals from sealed bungholes. Drum losses from leaking caps were considered due to the large number of drums that may be stored at the Site. The Site has proposed in its renewal of its RCRA Part B permit that the formerly designated sampling areas be designated as drum storage areas. The total emissions from drum storage at the Site under current and future conditions would not change because the number of permitted drums in both the storage and sampling areas would not change. Losses from sampling are discussed below.

2. Material Sampling and Laboratory Testing. Material received at the Site for processing is sampled to verify that the contents of the drum or tanker truck is the same as is listed on the hazardous waste manifest. In sampling drums or tanker trucks, trained technicians remove the drum cap or open the tanker truck sampling port and draw a sample using a Coliwassa sampling tube. Samples are sent to the on-site laboratory for verification of the composition. Emissions during sampling result primarily from evaporative losses from the wetted surface of the sampling tube once it is withdrawn from the drum or tanker truck. Fugitive emissions through the sampling ports were assumed to be minimal compared to the evaporative losses due to the very short time that the sampling ports are uncapped. Fugitive emissions occurring during sample handling and analysis in the Site's laboratory are released into the environment through fume hood vents.

3. Solid Waste Consolidation. A small fraction of material received by the Site is solid. This material would typically be debris contaminated with liquids such as solvents or aqueous materials. This material is consolidated, possibly shredded, and sent off-site for disposal. Consolidation activities involve transferring debris that may or may not contain trace amounts of solvents, into larger containers for off-site disposal. Fugitive emissions from the consolidation operation would comprise small, if any, evaporative losses from handling this material. These fugitive emissions from waste consolidation are likely to be minimal, as most of the material is not volatile.

Material is sometimes shredded in an enclosed shredder unit. Emissions from the shredder are controlled by the scrubber system in the drum liquefaction area and are discussed in "Drum Liquefaction Operations" below.

4. Lab Pack Processing. The lab pack area is used to consolidate small quantity waste materials that the Site receives. Site personnel typically go to laboratories and other small quantity users and pack up small quantities of waste in vessels, such as bottles and

jars. These are packed for transport in drums with absorbent material. Once the drums are unpacked at the Site within the lab pack warehouse, chemists consolidate the small quantities in the bottles and other small vessels into 55-gallon drums. According to Site personnel, approximately half of the material handled at the lab pack area consists of semi-volatile and non-volatile material including aqueous solutions of acids, bases, and other material that must be disposed of as hazardous waste. The other half of the material received is volatile organic material and is handled within an area in the warehouse that is enclosed by a plastic curtain. Air emissions from this area are vented via a capture hood and sent through a scrubber.

5. Fuel-blending Operations. The Site can process incoming organic liquid waste material into industrial-grade fuel. To produce industrial-grade fuel, the Site blends incoming organic liquid waste streams to produce a material with a high fuel value suitable for combustion. If necessary, diesel fuel is added to the blending operations to increase the fuel value. The mixture generated by the drum liquefaction unit is also used in blending fuel.

Fuel-blending operations are conducted in mixing tanks that are vented to the triple scrubber/boiler emissions abatement system. Emissions resulting from the fuel-blending tanks are included in the estimated emissions for the triple scrubber/boiler emissions abatement system. The Site has proposed to add additional tanks for fuel-blending operations. It is assumed that a scrubber controls emissions from these tanks. Fugitive emissions could occur from the component (pumps, valves, flanges, etc.) leaks at both the current and future fuel-blending tanks.

6. Drum Liquefaction Operations. Drums received at the Site may have sludge at the bottom. Liquid is drawn off the top of the drums into process storage tanks. The drums are then sent to the drum liquefaction unit to be cleaned. Diesel fuel is used to rinse the drums within the enclosed drum liquefaction unit. Drums are placed on their side within the unit and large brushes scrape the drums. Diesel is power-sprayed into the drums to liquefy any sludge. The sludge is captured and sent to storage tanks for addition to the fuel-blending operations.

Emissions from drum liquefaction occur as a result of evaporative losses of the diesel that is used to clean the drums. Most emissions generated in the drum liquefaction unit are captured and treated by a scrubber system; however, a small fraction of emissions evade the capture system and are emitted as fugitive evaporative emissions. The control system for this unit consists of a diesel scrubber, a nitrogen condenser, and two carbon canisters. Emissions from the shredder are also routed through this scrubber system. Captured condensed vapors from the scrubber system are returned to the process tanks.

7. Organic Liquid Material Separation. As discussed earlier, organic liquid waste material received by the Site can be recycled as an industrial-grade fuel mixture. It can also be refined by processing through a series of distillation operations.

Vapor emissions from the organic liquid waste stream processing area result from the control of process unit emissions and process tank emissions by the triple scrubber/boiler emissions abatement system, fugitive emissions from leaks from components (pipes, valves, flanges, etc.) that contain organic liquid materials, and emissions from two process units (the water wash tank and the sieves). The majority of the process units (except for the water wash tank and the sieves) are controlled by the triple scrubber/boiler emissions abatement system. Emissions are captured from the process units and are treated first in two water scrubbers for removal of chemicals other than chlorinated chemicals, and then in a diesel scrubber to remove chlorinated chemicals from the air exhaust stream. Captured material is condensed and recycled through the process by recombining with raw material. The scrubbed air exhaust stream is then passed through the Site's boiler and combined with natural gas for combustion.

8. Wastewater Treatment Operations. In addition to organic liquid waste streams, the Site also receives wastewater for treatment. The Site's wastewater treatment system currently consists of the distillation columns, an activated biological control system, and a series of open clarifiers and wastewater storage tanks. This system also has two closed treatment tanks that vent to a carbon filter. Emissions that escape the carbon filter as well as fugitive evaporative emissions from the open tanks are considered.

The Site has also proposed other types of wastewater treatment such as metal recovery. The proposed units will be completely enclosed and emissions from the proposed units would be captured and controlled by a scrubber. The Site has also proposed an Ultra Filter R/O Unit. If this unit were installed, the air emissions from this source would vent through a control system and likely vent through the same carbon filter for the two treatment tanks discussed above. The emissions increase from the carbon filter as a result of the exhaust from the Ultra Filter R/O Unit would be de minimis and are not further considered.

9. Truck Washing Operations. Tanker trucks that transport incoming material are rinsed prior to loading refined materials to prevent cross-contamination. The trucks are washed outside using a power washer nozzle operated by a Site worker. Approximately 15% of the Site's trucks are washed with a solvent mixture while the remaining trucks are washed with only water. In both cases, the rinse solution is captured in a closed system and recycled to the Site. Fugitive emissions could be released from the opening on top of the truck during washing.

10. Vehicle Fueling. The Site has a diesel tank and a gasoline tank that service the on-site vehicle fueling station. Fuel is dispensed for on-site vehicles and trucks operated off-site by Romic. Fugitive emissions could result from fueling operations.

11. Ground Water Treatment. Contaminated ground water is treated at the Site by stripping the pumped ground water to remove VOCs. This gas stream is passed through the triple scrubber/boiler emissions abatement system. The emissions that would result from this operation are included in the overall emissions estimated from the boiler.

5.2 Chemical Emission Rates

Chemicals are emitted from the Site from processing and storage operations, with some additional emissions from ancillary operations. The methodology and information sources used to estimate emissions of individual chemicals are discussed in further detail in this section for each source type described in the previous section. Emissions estimates of each of the selected chemicals from each source are presented in Appendix C, Tables C.2a and C.2b. The emissions calculations spreadsheets are also presented in Appendix C and include the assumptions and information used to estimate emissions from each of the identified sources.

(a) Composition of Emissions

The speciation of emissions (i.e., the division of total VOC emissions into emissions of particular chemicals) is based on information regarding the nature of the material handled in each source. Chemical compositional profiles were developed by the Site for the main material streams at the Site. In some cases, profiles for other material streams were taken from published sources, as described below. The VOC composition for all sources can be described as one of the following:

1. Organic liquid waste stream
2. Wastewater stream
3. Lab pack processing
4. Drum Liquefaction
5. Natural gas combustion
6. Truck washing
7. Vehicle fueling

Each source's VOC composition is provided in Appendix C, Tables C.3 through C.6. Individual emission rates of each selected chemical were estimated by evaluating both the composition of the vapor and total vapor emissions from each source. This section describes the source of information used to characterize the composition of the vapors emitted from sources.

1. Composition of Emissions from Organic Liquid Waste Stream. For sources in which organic liquid material is stored, handled or processed, total VOC emissions were estimated as discussed below. The composition of the vapor emissions from sources handling organic liquid waste streams was based on the Site's characteristic waste stream profile. This profile is provided in Appendix A, Table 1. The composition profile was developed by the Site based on the material streams received by the Site historically and the projected future waste streams. The liquid organic waste stream profile is based on the mid-range values of the hazardous waste manifest compositional information. Over 60,000 different waste streams' composition and quantity were used to generate this profile.

   The actual composition of the organic liquid waste streams vary each day, depending on which waste streams were received which day. In these calculations, it was assumed that emissions from sources related to handling, storing, or processing organic liquid waste streams had the same continuous overall composition each day that represented the annual average composition. This includes the emissions from material handling and

storage, material sampling and laboratory testing, solid waste consolidation, fuel-blending operations, and emissions from organic liquid material separation.

The fractions of individual chemicals in total vapor were estimated by taking the ratio of the product of each selected chemical's molar fraction in liquid and its saturated vapor pressure, to the sum of all the molar fractions of the selected chemicals and their respective vapor pressures. This assumes that the liquid behaves as an ideal liquid and the vapor above the liquid behaves as an ideal gas. The molar fraction (and hence partial pressure) of the selected chemical in the vapor phase was calculated as a fraction of the total VOC emissions estimated from the source under consideration. The selected chemicals of concern and the vapor fraction of each chemical in the VOC emissions resulting from evaporative losses of the organic liquid waste stream is presented in Appendix C, Table C.3. The vapor fraction of each chemical in the VOC emissions was estimated using the following equation:

$$y_i = \frac{x_i * P_i^v}{\sum_j (x_j * P_i^v)}$$

Where:

y	=	molar fraction in vapor phase
i	=	selected chemical
χ	=	molar fraction in liquid phase
R^v	=	vapor pressure of chemical (mmHg)
j	=	all chemicals in liquid phase

2. Composition of Emissions from Wastewater Stream. The speciation of the total VOC emissions from wastewater storage tanks and treatment units was based on the same waste stream characterization profile used in characterizing emissions from the organic liquid waste stream. The use of this speciation method is based on the assumption that the fraction of VOCs in wastewater is of the same composition as the overall waste stream accepted by the Site, and that the relative composition does not change during wastewater treatment. The list of the chemicals and fraction of each chemical in the VOC emissions from sources related to wastewater storage and processing is the same as for the organic liquid waste stream and can be found in Appendix C, Table C.3.

3. Composition of Emissions from Lab Pack Processing. The composition of the total VOCs in the vapor emissions from lab pack processing was based on a representative two-week lab pack throughput log provided by the Site. The fraction of individual chemicals in total vapor were estimated by taking the ratio of the product of each selected chemical's molar fraction in liquid and its saturated vapor pressure, to the sum of all the molar fractions of the selected chemicals and their respective vapor pressures as described above in the section titled "Composition of Emissions from Organic Liquid Waste Stream". A list of the chemicals and fraction of each chemical in the emissions from lab pack processing is provided in Appendix C, Table C.4.

4. Composition of Emissions from Drum Liquefaction. The fugitive emissions from drum liquefaction, the scrubber unit controlling the emissions from the drum liquefaction unit, and the shredding unit were assumed to have the composition of diesel fumes. Diesel is used to wash the drums in drum liquefaction, and was assumed to constitute the largest fraction of emissions from these units. Diesel fume composition was determined from the California Air Resources Board (CARB) VOC Profile Handbook (CARB 1991). A list of the chemicals and fraction of each chemical in the emissions from drum liquefaction is presented in Appendix C, Table C.5.

5. Composition of Emissions from Natural Gas Combustion. The emissions from the boiler consist of process unit emissions that are not destroyed during combustion and products of natural gas combustion. The process unit emissions that are not destroyed during combustion were assumed to have the composition of the organic liquid waste stream. The individual chemicals that comprise products from natural gas combustion were based on USEPA AP-42 (USEPA 1998). A list of the chemicals and fraction of each chemical in the natural gas combustion exhaust can be found in Appendix C, Table C.6.

6. Composition of Emissions from Truck Washing. The fugitive emissions from truck washing were assumed to have the composition of the vapors above the organic liquid waste stream (see the section titled "Composition of Emissions from Organic Liquid Waste Stream" above). The list of the chemicals and fraction of each chemical in the emissions from truck washing is the same as for the vapors above the organic liquid waste stream and can be found in Appendix C, Table C.3.

7. Composition of Emissions from Vehicle Fueling. The fugitive emissions from fueling operations are composed of gasoline or diesel fumes. Gasoline fumes were not speciated, but simply modeled as gasoline fumes as toxicity values are available for gasoline fumes. Diesel fume composition was determined as described above and can be found in Appendix C, Table C.3.

(b) Estimation of Annual Emissions

The methodology used to estimate the emissions from the sources at the Site is described in this subsection. Total emissions of volatile chemicals from individual sources is shown in Appendix C, Tables C.7a and C.7b. As discussed earlier, the emissions of individual selected chemicals were estimated by combining information on vapor composition with total emissions of volatile chemicals.

1. Material Storage and Handling. Material is stored at the Site in both tanks and drums. Fugitive emissions from the storage tanks that are not vented to the Site's triple scrubber/boiler emissions abatement system were estimated using the USEPA-approved TANKS model (version 4.05). The TANKS model accounts for both working and breathing losses. The storage vessel parameters used in estimating emissions using the TANKS model are summarized in Appendix C, Table C.8. Storage vessel information used in TANKS, including vessel height, working volume, tank diameter, color, type, average filled fraction, and throughput was provided by the Site. Meteorological

information, such as mean temperature and insolation rate (i.e., the amount of incoming solar radiation) was based on the average of the ten years of local meteorological data that is discussed further in Section 5.3.3.

The chemical composition of the material stored within each tank is also a required input to the TANKS model. TANKS uses the chemical composition to estimate emissions of individual chemicals along with total emissions. Since TANKS directly estimates emissions of individual chemicals, the emissions estimation methodology described above in Section 5.2(a)[4] was not used for the estimation of tank storage emissions for individual chemicals. The chemical composition for the liquid material used in the TANKS model is shown in Appendix C, Table C.9. The composition of the liquid material within the tanks was based on whether the tank stored organic liquid material or wastewater. The Site provided ENVIRON with information that described the fraction of time each tank held liquid or aqueous organic material solutions. This information is summarized for each tank in Appendix C, Table C.10. Then, the percent of each selected chemical stored within the tanks was estimated based on the percent of the chemical within the organic liquid material or wastewater accepted by the Site.[5] The percent of non-selected chemicals was represented by two different non-selected chemicals, ethylene glycol and n-methyl-2-pyrrolidone. Some of the selected chemicals could not be included in the input material stream in TANKS because physical property information required by TANKS was not available. The selected chemicals that could not be represented in TANKS account for 0.3% of the total liquid organic waste stream and 1.4% of the vapor above the liquid organic waste stream. These chemicals are listed in Appendix C, Table C.9. Total emissions from each tank and individual chemical emissions from each tank are also shown in Appendix C, Table C.11.

Emissions from tanks that vent to the Site's triple scrubber/boiler emissions abatement system are included in the emissions estimate for the triple scrubber/boiler emissions abatement system discussed in the section on "Organic Liquid Material Separation".

Fugitive emissions from all component leaks from pumps, valves, flanges, etc. were estimated using organic vapor analyzer (OVA) readings taken by the Site in 1998 as part of the Site's RCRA permit requirements. RCRA requires that component leaks be monitored if the component contacts hazardous waste with organic chemical concentrations of at least 10 percent by weight (40 CFR Part 264 Subpart BB – Air Emission Standards for Equipment Leaks). USEPA guidance was used to convert the OVA readings to VOC emission factors (USEPA 1995a). The emission factor information from the USEPA guidance and the OVA monitoring data are presented in Appendix C, Table C.12. The monitoring data was used to determine an average emission factor from component leaks at the Site (see Appendix C, Table C.13). The Site

[4] The chemical specific emissions estimation methodology described in Section 5.2(a) combines information on vapor composition with total emissions of volatile chemicals to determine individual chemical emission rates. In this alternative methodology, the fractions of individual chemicals in total vapor above the organic liquid and wastewater streams stored in the tanks were estimated by taking the ratio of the product of each selected chemical's molar fraction in liquid and its saturated vapor pressure, to the sum of all the molar fractions of the selected chemicals and their respective vapor pressures (see Section 5.2(a)(1)).

[5] The two chemicals chosen to represent the non-selected chemicals comprise 81.4% of the non-selected chemicals.

recently performed an inventory of all components at the Site and found that there are 4627 components on tanks and units in either organic liquid or wastewater service. This information was used with the average emission factor to determine annual emissions from component leaks. Then the total annual emissions from leaks from all components was evenly divided between the modeled areas containing equipment with leaks.

Evaporative losses from three troughs at the Site occur if any liquid is spilled when material transfer hoses are disconnected from pipes on tanks and units. Emissions estimations for surface evaporative losses from the troughs were estimated in Permit To Operate applications submitted to the BAAQMD by the Site for each of the three troughs.

The drums at the Site are located in five different storage areas and sampling areas around the Site. In total, the Site is allowed up to 6218 drums on-site at any one time (see Appendix C, Table C.14 for the amount of drums in each of the five areas around the Site). Small amounts of fugitive emissions from storage drums can result from leaking of volatile chemicals from sealed bungholes. The small gaps in the seal made by the drum bung on each drum was treated as vapor leakage at flanges. Therefore, an emission factor from USEPA guidance for leaks from flanges was used to estimate total VOC emissions from drums during closed storage (USEPA 1995a) (see Appendix C, Tables C.7a and C.7b).

2. Material Sampling and Laboratory Testing. Emissions from material sampling could result from two sources: evaporative emissions from the sampling tube and evaporative emissions from sample handling under fume hoods in the Site laboratory.

To estimate the emissions resulting from evaporation of sample material on the outside of the sampling tubes, the coating thickness of the material adhering to the outside of the sampling tube was estimated. It was assumed that all the organic liquid material adhering to the outside of the sampling tube evaporates. This is likely an overestimate. The following equation from Perry's Chemical Engineering Handbook for film thickness of fluid from dip coating was used to estimate the film thickness of the material adhering to the sampling tube (Perry 1999):

$$h(\rho g/\sigma)^{1/2} = (0.944 * Ca^{2/3})/(1-\cos\varphi)^{1/2}$$

Where:

h	=	film thickness, m
ρ	=	density, kg/m^3
g	=	acceleration due to gravity, m/s^2
σ	=	surface tension, kg/s^2
Ca	=	$\mu V/\sigma$, (i.e., capillary number)
φ	=	angle of inclination (from horizontal), degrees
μ	=	viscosity, kg-m/s
V	=	speed of withdrawal, m/s

The physical parameters (such as viscosity, density and surface tension) of gasoline were used to represent the material that would adhere to the sampling tube. The volume of material adhering to the sampling tube, and hence, evaporating, was calculated as the product of the film thickness, the circumference of the sample tube and the length of the sample tube.

On average, 300 drums are sampled per day, 365 days per year, although more than one drum may be sampled using a single sample tube. On average, 19 tanker trucks are sampled per day, 365 days per year. The emissions estimation methodology for sampling of material in drums and tanker trucks is further detailed in Appendix C, Tables C.15 and C.16.

Fugitive emissions also occur during sample handling and analysis in the Site's laboratory. Fugitive laboratory emissions are released into the environment through fume hood vents. Currently, regulatory guidance is unavailable for estimating emissions from laboratory operations. It was assumed that 1% of the material handled under the fume hoods is lost via evaporation. The USEPA provides an emission factor of 1% to 2% of solvent for agitated mixing tanks (Page 6.4-1 of AP-42 Section 6.4 "Paint and Varnish") (USEPA 1998). The lower bound emission factor was used since the material in the laboratory is not agitated. Based on the total quantity of material received by the Site, the Site estimated that 200 to 250 samples are analyzed per day. Each material that is sampled has a volume of approximately 200 to 400 milliliters. It was assumed that the material handled in the laboratory was evenly handled between the six fume hood vents. The laboratory operates 24 hours per day, seven days per week.

3. Solid Waste Consolidation. Fugitive emissions resulting from waste consolidation occur as a result of evaporation of volatile chemicals on solid debris. The fugitive emissions from waste consolidation are likely to be minimal, as most of this material is not volatile. In the past, Site personnel have conducted an evaluation of the potential emissions from this source and have estimated that it is less than the BAAQMD permitting threshold of ten pounds per day. For this risk assessment, based on discussions with Site personnel, it was assumed that the total emissions from this activity would be one pound per day.

4. Lab Pack Processing. Vapors from lab pack operations are emitted through the lab pack warehouse scrubber. According to Site personnel, consolidation of material in the lab pack warehouse is conducted two times per week for six hours each time. Approximately ten drums of liquid (55-gallons each) are consolidated per week. The lab pack personnel estimate that approximately half of this material is volatile organic material and would be handled and consolidated within the curtained area within the lab pack warehouse. Fume hoods that vent emissions through a scrubber service the curtained area. Based on a representative two-week throughput log, the annual throughput of selected chemicals through the lab pack operation was estimated. The throughput estimated from the two-week throughput log was less than that estimated by the lab pack personnel, therefore, the risk assessment analysis used the throughput estimated by the lab pack personnel to be conservative. A 1% material loss via

evaporation within the curtained area as a result of handling volatile organic material was assumed. As mentioned above, the USEPA provides an emission factor of 1% to 2% for agitated mixing tanks (Page 6.4-1 of AP-42 Section 6.4 "Paint and Varnish") (USEPA 1998). The lower bound emission factor was used since the material in the lab pack is not agitated. Site personnel estimated that the scrubber has a control efficiency of 95%. The emissions estimation methodology for lab pack processing is further detailed in Appendix C, Table C.17.

5. Fuel-blending Operations. Emissions from fuel-blending tanks are vented to the Site's triple scrubber/boiler emissions abatement system and are included in that source's emissions estimates.

Proposed fuel-blending tanks were also modeled using TANKS as described above in the section discussing "Material Storage and Handling". According to Site personnel, emissions from the proposed fuel-blending tanks will be controlled with an abatement device that has a control efficiency of at least 95% (likely a scrubber and/or carbon filter system).

Fugitive emissions could occur from the component (pumps, valves, flanges, etc.) leaks at the fuel-blending tanks. Fugitive emissions from component leaks in fuel-blending operations service were estimated using OVA readings taken by the Site in 1998 as part of the Site's RCRA permit requirements. This data was converted to an emission rate using the same method described in the "Material Handling and Storage" section and is summarized in Appendix C, Tables C.12 and C.13.

6. Drum Liquefaction Operations. Emissions from drum liquefaction occur as a result of evaporative losses of the diesel that is used to clean the drums. Emissions are largely captured by the unit's scrubber system; however, a small fraction of emissions evade the capture system. Emissions from the scrubber system were estimated based on Site emissions monitoring data, in compliance with the air permit monitoring requirements for this unit. The drum liquefaction operations are typically run 10 hours per day, five days per week. However, because the unit is occasionally run 10 hours per day, seven days per week, if there is high demand, it was assumed that the unit could run seven days per week for this risk assessment. The Site takes OVA readings periodically. These readings were converted to a mass flow rate based on the unit's flow rate. The emissions from the scrubber system for this unit were assumed to be diesel vapor. Although this unit may emit other chemicals found as constituents of the sludge in the drums, it was assumed that the emissions were predominately diesel vapors because of the low volatility of the chemicals in the sludge. In addition, although this scrubber system also services the shredder, emissions from the shredder were assumed to be minimal as compared to the emissions from the drum liquefaction unit. The scrubber emissions were assumed to occur seven days a week, ten hours per day. The emissions estimation methodology for drum liquefaction scrubber emissions is further detailed in Appendix C, Table C.18a.

Vapors may evade the capture system in the drum liquefaction unit. According to the USEPA AP-42 Section 4.8 "Tank and Drum Cleaning" emissions discussion, emissions

from drum washing are considered negligible. However, based on observations at the Site, it was estimated that the fugitive emissions of diesel from this operation may be as high as 1% loss of the diesel usage. This unit uses, on average, 1475 gallons of diesel per month. It was assumed that the fugitive emissions from this unit are composed of diesel fumes. The fugitive evaporative emissions were assumed to occur seven days a week, ten hours per day. The emissions estimation methodology for fugitive emissions from drum liquefaction operations is further detailed in Appendix C, Table C.18b.

7. Organic Liquid Material Separation. Vapor emissions from the liquid organic waste stream processing area result from the control of process unit emissions and process tank emissions by the triple scrubber/boiler emissions abatement system, and fugitive emissions from component (pumps, valves, flanges, etc.) leaks.

Emissions from the process units are vented to the triple scrubber/boiler emissions abatement system. Several tanks are also vented to this system, including the fuel-blending tanks. The units vented to this abatement system are listed in Appendix C, Table C.19. Emissions from this system were estimated using a source test conducted by DaRos Associates on May 10, 1993 and on July 22-23, 1993. A copy of this source test is included in Appendix C, Table C.20. Based on this study's data, it was concluded that over 95% of the total VOCs from the boiler are due to products of natural gas combustion. Therefore, 95% of the total VOCs measured from the boiler were characterized as products of natural gas combustion and 5% of the VOCs were assumed to be emissions resulting from the control of the process equipment. Appendix C, Table C.20, presents the calculations for the emissions from this system based on the study's data. The individual chemicals that comprise products from natural gas combustion were based on USEPA AP-42 (USEPA 1998) (see Appendix C, Table C.21, for emission factors). The risk assessment also considered emissions of hydrochloric acid from the boiler. To be conservative, it was assumed that the emission rate of hydrochloric acid from the boiler is equal to the unit's permit limit of ten pounds per day.

VOC emission factors for the components (pumps, valves, flanges, etc.) were estimated using OVA readings taken by the Site in 1998 in compliance with the Site's RCRA permit requirements. This data was converted to an emission rate using the same method described in the "Material Handling and Storage" section.

VOC emissions occur from both the water wash tank and the molecular sieves. The water wash tank is used as a polishing step with many of the halogenated chemicals recycled at the Site. The chemicals are washed with water to remove the alcohols that form azeotropes. Emissions from the water wash tank were modeled with TANKS as described in the "Material Handling and Storage" section. The molecular sieves are a final polishing step to dehydrate halogenated compounds. There are three sieves at the Site, the THF molecular sieve, the freon molecular sieve, and the portable sieve. During processing in the sieves, any air emissions are vented to waste material storage tanks. After processing in the sieves, material from the sieves is sent to product storage tanks. Next, residual within the sieves is blown-back to waste material storage tanks with the blower-air entering from the top of the sieves and pushing material downwards. Then the

sieves are regenerated by heating them up to evaporate water absorbed by the adsorbent material within the sieves. During the regeneration process, small amounts of remaining vapor may be emitted to the atmosphere, except from the portable sieve which vents to the vacuum pots, which vent to the triple scrubber/boiler emissions abatement system. Emissions during regeneration of the THF and freon molecular sieves were estimated by conservatively assuming that liquid remained in 10% of the volume of the sieves after the residual waste material was blown out. The remaining volume of the sieves contains the adsorbent material used to adsorb water and air blown into the sieve when pushing residual to the waste material storage tank. The emissions estimation methodology for estimating emissions from the sieves is further detailed in Appendix C, Table C.22.

8. Wastewater Treatment Operations. Emissions from distillation columns used for processing wastewater are vented to the Site's triple scrubber/boiler emissions abatement system. These emissions are included in the emissions estimate for the triple scrubber/boiler emissions abatement system discussed in the section on "Organic Liquid Separation". Evaporative losses from the wastewater treatment system's open clarifiers were estimated using the Site's surface OVA readings for these units and a simple box model to estimate the emissions. Assuming an average wind speed, based on the local meteorological data, an emission rate was calculated by assuming that the layer of vapor above the clarifiers was displaced at a rate equivalent to the average wind speed. This approach assumes that the layer of air above the surface of the clarifier liquid is the same concentration as immediately above the surface throughout the layer. Since the clarifier liquid surface is actually below the edge of the clarifier, it has a reduced exposure to wind. In addition, the mass transport through the layer is likely more limited than is assumed in this model. Thus, the emissions from the clarifiers are likely to be far lower than predicted using this estimation method. Using the box model, an emission rate is estimated with the following equation (see Appendix C, Tables C.23a through C.23e, for further detail):

$$E_{VOC} = uhd(C_{OVA})$$

Where:

E_{voc}	=	emission rate of total VOCs, g/s
u	=	average wind speed, m/s
h	=	height (or depth) of edge of clarifier to liquid surface, m
d	=	diameter of clarifier, m
C_{OVA}	=	concentration from OVA reading, g/m^3

Two of the current wastewater treatment units have roofs. Air emissions resulting from working and breathing losses from these two units are vented through a carbon adsorption system. The Site has provided monitoring data from this system. The Site takes OVA concentration readings from the emission point of the carbon adsorption system. OVA concentration data from 1998 was converted to an emission rate by assuming a volume of air at the exit point of this system is displaced at a rate equivalent to the average wind speed (see Appendix C, Table C.24, for further detail). Because the

exit of the system is oriented downwards, the exiting air stream was assumed to have zero velocity in the dispersion modeling.

The Site has proposed the addition of several new wastewater treatment units. Emissions from these units were estimated using the TANKS model, as previously described. According to Site personnel, emissions from the proposed wastewater treatment units will be controlled with an abatement device that has a control efficiency of at least 95% (likely a scrubber and/or carbon filter system).

9. Truck Washing Operations. Emissions from truck washing occur as a result of evaporation of a fraction of the wash fluid. An annual volume of trucks washed was determined based on a review of Site documents from March 2000 to November 2000 by Site personnel which found that an average of 2.4 trucks are washed five days per week. Emissions resulting from truck washing were estimated using emission factors for tank truck cleaning. Emission factors for different truck rinsing chemicals from Table 4.8-2 of AP-42 Section 4.8 "Tank and Drum Cleaning" were reviewed (USEPA 1998) (see Appendix C, Table C.25, for further detail). The emission factor listed for acetone as the truck washing fluid was the most conservative factor and was used in the analysis. This likely overestimates the emissions of selected chemicals from the Site. It was assumed that the total vapor emitted from truck washing had a composition equivalent to the Site's representative organic liquid waste stream.

10. Vehicle Fueling. Emissions from fuel dispensing on-site were estimated using an emission factor for fuel dispensing listed in AP-42 Section 5.2 "Transportation and Marketing of Petroleum Liquids" (USEPA 1998). The Site provided the total annual throughput of fuel through these tanks for use in the emissions calculation.

11. Ground Water Treatment. Emissions from treating ground water are included in the triple scrubber/boiler emissions abatement system. Emissions from the treatment tanks and units are vented to this abatement system.

5.3 Determination of Off-Site Concentration of Chemicals in Routine Air Releases

This section discusses the methodology, data and assumptions used to estimate the off-site ambient air concentrations of chemicals emitted from the Site. The following subsections will discuss the dispersion model used to estimate ambient air concentrations, and the information used in the model. As discussed in Section 4.0, the receptors considered in this risk assessment for which exposure concentrations were estimated are the maximally exposed off-site resident and off-site worker, as well as an off-site recreationist on the bike path and the identified sensitive subpopulations.

5.3.1 Air Dispersion Model

The Industrial Source Complex Short Term Version 3 (ISCST3) dispersion model (Version 99155) was used to estimate off-site ambient air concentrations at the selected receptors (see Appendix D for all model output files). This model is appropriate for use in estimating ground-level short-term ambient air concentrations resulting from non-reactive buoyant emissions from sources located in a relatively flat region. The ISCST3

model is a steady-state Gaussian plume model and assumes a linear relationship between emission rate and ambient air concentration at a given receptor. The aerodynamic downwash effect on emissions released near structures was incorporated where appropriate into the model.

The model uses local hourly meteorological data, including wind speed, wind direction, ambient temperature and atmospheric stability to define the conditions for plume rise, transport and diffusion. Since only volatile emissions were modeled in this risk assessment and not particulate emissions, deposition of emitted chemicals was not included in the dispersion modeling.

The model also incorporates emission source information, such as height of release, type of release (point source, volume source, or area source), temperature of exiting emissions, source parameters, and location of source. The model estimates the time-averaged concentration.

5.3.2 Model Options

The dispersion modeling was conducted using ISCST3 in the regulatory default mode in which USEPA-recommended modeling options were selected. Table 5.2 lists the control parameters used to conduct the dispersion modeling and include:

- stack heights adjusted for stack-tip downwash;
- buoyancy-induced dispersion;
- concentration based on final plume rise;
- calm winds processing algorithm for calculating ground-level concentrations during "calm" conditions; and
- default values for wind profile exponents and vertical potential temperature gradients.

The model also incorporates information regarding the terrain, land use of the region surrounding the emissions sources and the effect of nearby structures on the dispersion of the emissions. The following sections discuss the determination and incorporation of this information:

> Land Use. Auer's method of classifying land-use as either rural or urban was used to analyze the surrounding region (Auer 1978). This method calls for analysis of a three-kilometer radius around a site to determine if the majority of the land can be classified as either rural or urban. ENVIRON's analysis shows that well over 50% of the land is rural, therefore, it is appropriate to use rural dispersion coefficients in the ISCST3 model. Figure 5.1 shows the three-kilometer radius around the Site and the categorization of land as either rural or urban.
>
> Terrain. Terrain elevations, as presented on the United States Geological Survey (USGS) map for the Palo Alto 7.5 Minute Quadrangle, were used in determining that the region surrounding the Site is simple terrain. Figure 5.1 includes terrain

height contours. Simple terrain is defined as terrain in which there are no points that are higher than the effective height of the emission plume. The region in which the Site is located is relatively flat. The dispersion model selected, ISCST3, is appropriate for modeling concentrations in a relatively flat region. Additionally, no terrain elevations will be used in the ISCST3 modeling since there are only slight differences in elevation within the area of concern and these differences result from a small upward surface elevation gradient from the San Francisco Bay to the inland.

Building Downwash. Building downwash effects were incorporated in the dispersion modeling using the USEPA-approved Schulman-Scire method (USEPA 1995b). Building downwash is the effect of nearby structures on the flow of emissions from their respective sources. The USEPA-approved Building Profile Input Program (BPIP) model was used to determine the direction-specific building downwash parameters (USEPA 1993). Building parameters, including building location, length, width, and height, used in the BPIP model were based on historical documents provided by Site personnel and Romic's Part B Permit application and supporting documentation. Figure 5.2 shows the locations of the buildings used to determine the direction-specific building downwash parameters and Table 5.3 presents building parameters.

5.3.3 Meteorological Data

Guidelines for the preparation of health risk assessments for the California Air Toxics "Hot Spots" AB 2588 program from the CAPCOA specify that five years of local meteorological data should be used to represent local meteorological conditions for dispersion modeling (CAPCOA 1993). However, in conferring with the BAAQMD regarding the meteorological data available for this analysis, it was determined that the BAAQMD San Carlos meteorological data and the Moffet Naval Air Station meteorological data were equally appropriate for representing the region in which the Site is located. In order to ensure that the dispersion modeling was conservative, meteorological data from the two local monitoring stations were used to represent the typical atmospheric dispersion characteristics of the ambient air. Five years of surface meteorological data, 1993-1997, were collected at the BAAQMD meteorological station in San Carlos, California (Station #6901). Five years of surface meteorological data from the Moffett Naval Air Station (Station #23244), 1989 to 1993 were provided by the National Climatic Data Center (NCDC). Both sets of data were approved by the BAAQMD for use in this analysis. Figure 5.3 depicts the location of these meteorological stations relative to the Site.

The surface meteorological data consists of hourly wind speed, wind direction, ambient temperature, and atmospheric stability. The surface meteorological data was combined with upper air data for the same time period from the Oakland International Airport (Station #23230). The upper air data from 1989 to 1991 was obtained from USEPA's bulletin board titled Support Center for Regulatory Air Models (SCRAM), data for 1992 was obtained from Trinity Consultants and 1993 data was obtained from NCDC. Upper

air meteorological data consists of twice-daily mixing heights. Surface and upper air data were combined using the PCRAMMET program from the USEPA.

5.3.4 Receptor Locations

Both gridded points and discrete points were used as receptor points in the dispersion modeling as shown in Figure 5.4 and Figure 5.5. A Cartesian grid with receptor points spaced every 100 meters within a 1,900 meter-square (m^2) area was used to represent the region near the Site. A coarse receptor grid with receptors spaced at 500-meter intervals within a 5,500 m^2 area extends further from the Site. In addition, discrete receptor points were also included in the modeling. These points include locations of sensitive subpopulations, such as schools, daycare centers, health care facilities, and senior homes. Discrete receptors were also included to represent the Site's boundary, census centroids, nearby residences, and a recreational bike path in Ravenswood Reserve (east of the Site). Table 5.4 lists the coordinates of all discrete receptors considered in the dispersion modeling. The location of the discrete receptors were found using various sources of information:

- Site plot plans were used to locate the Site boundary and to place representative receptor points along the boundary. Receptors representing the Site's boundary were spaced approximately every 100 meters along the boundary.

- United States Census Bureau information was used to locate the centroids of census block groups within a ten-kilometer radius of the Site (US Department of Commerce 1991).

- The locations of nearby residences were determined during a driving tour of the area and were confirmed by aerial photographs taken in October 1991.

- Receptor points representing the bike path in Ravenswood Reserve were located with the USGS maps for Palo Alto and with a map of bay area trails (ABAG 1994).

- The sensitive subpopulations within a ten-kilometer radius of the Site were identified. Sensitive receptors were located using a database developed with United States Postal Service data, as well as other sources such as local phone books and the Internet.

5.3.5 Source Configuration and Emission Allocation

ENVIRON determined source parameters (e.g., height, exit diameter for point sources and lateral dimensions for area and volume sources, temperature, and emission velocity) for use in ISCST3 for the emission sources identified at the Site. The source locations were determined through information gathered during site visits, from Site plot plans, and in consultation with Site personnel. Please note that the emissions from some sources (troughs, sieves, the wash water tank, tank P, and tank Q) were included in the analysis

after dispersion modeling was performed, and therefore, the emissions from these sources were included with emissions from the nearest sources with similar air dispersion modeling parameters. For dispersion modeling purposes, emission sources are divided into three categories: point sources, volume sources, and area sources. Figure 5.6 shows the locations of sources at the Site. Tables 5.5, 5.6 and 5.7 present the source parameters for the point, volume, and area sources, respectively.

Point sources. Point sources at the Site were modeled individually. The point sources in the dispersion analysis include:

- the vents from laboratory fume hoods;
- the scrubber in the lab pack area;
- the scrubber system for the drum liquefaction operation;
- the control system for the proposed fuel blending tanks
- the control system for the triple scrubber/boiler emissions abatement system;
- the control system for the proposed wastewater treatment units

Stack height, stack gas exit temperature, stack gas exit velocity, and stack inside diameter for each point source were based on data collected during site visits, information and diagrams from Site personnel, Site regulatory documents provided by Site personnel, and from Romic's Part B Permit application and supporting documentation.

Volume sources. Volume sources are appropriate for representing diffuse, low-velocity emissions resulting from a three-dimensional volume of space. The volume sources in the dispersion analysis include:

- fugitive emissions from leaks from components (pumps, valves, flanges, etc.) from existing and proposed tanks and units;
- fugitive emissions from drum storage areas;
- material sampling areas;
- the solid waste consolidation area;
- fugitive emissions from the drum liquefaction area;
- the vent for the carbon control system servicing two existing wastewater treatment tanks; and
- the fueling station.

Volume source parameters were based on information from Site personnel, plot plans, and regulatory documents provided by Site personnel. The release height of emissions from each volume source was assumed to be the center of the volume of space encompassing the source(s). The initial vertical dimension of the volume source was based on the height and USEPA guidance outlined in the ISCST3 User's Guide (USEPA 1995b). The initial lateral dimension of the volume source was based on actual dimensions of the source area and USEPA guidance.

Area sources. Area sources represent sources of Site emissions that are released over a large area but do not have a significant depth component. The fugitive emissions from storage tanks (not vented to an abatement system) were grouped together according to their proximity and represented as area sources. Area sources were also used to model emissions from wastewater treatment operations and truck washing. Model parameters for area sources (release height, length, and width) were based on data collected during site visits, information from Site personnel, process flow diagrams, and site layout diagrams.

5.3.6 Modeling Approach and Results

Using the ISCST3 dispersion model, ambient concentrations over various averaging periods, as appropriate for the receptors under consideration, were estimated. Each of the ten years of meteorological data available were evaluated in the dispersion model to estimate an ambient concentration of each chemical emitted by each source for each year for each receptor. The dispersion model was used to estimate a normalized concentration from each source at each receptor. Because concentration is a linear function of emission rate in the Gaussian plume model, the normalized concentration at a receptor can be multiplied by the emission rate of each chemical from each source to estimate the concentration at a receptor. This allowed the dispersion models to be executed once per source per year of meteorological data, with individual concentrations of selected chemicals estimated by scaling the resultant normalized concentration by the emission rate of each chemical from each source to calculate concentrations of each chemical.

For assessing long term health effects (cancer and chronic noncancer risks), the average annual concentration was modeled for each year of meteorological data. For each set of five years of meteorological data (one set from the Moffet Naval Air Field meteorology station and one set from the San Carlos BAAQMD meteorology station), an average annual concentration was calculated from the annual concentration modeled for each of the five years of meteorological data. The maximum of the two average annual concentrations for each set of five years of meteorological data was determined.

For short term health effects (acute noncancer risks), the maximum one-hour concentration was calculated. This concentration for a receptor is the maximum one-hour concentration based on the ten years of meteorological data evaluated. The one-hour concentration represents worst-case actual meteorological conditions and typical throughput rates and operating conditions.

This risk assessment also considered potential odor impacts from the Site's emissions. The estimated maximum one-hour concentration at each receptor was used to estimate three-minute concentrations, for use in the evaluation of odor impacts. The three-minute concentrations were estimated based on the following methodology (Turner 1970):

$$\chi_s = \chi_k (t_k / t_s)^p$$

Where:

χ_s	=	concentration estimate at time t_s (3-minute)
χ_k	=	concentration estimate at time t_k (60-minute)
t_k	=	time average of modeled concentration, (60-minute)
t_s	=	time average desired, (3-minute)
P	=	power law, between 0.17 and 0.2

To convert a one-hour concentration, estimated with dispersion modeling, to a 3-minute concentration, a power law value of 0.17 was used to be conservative. The ratio of a modeled one-hour concentration to a 3-minute concentration is approximately 0.6. Further discussion of the evaluation of potential odor impacts is provided in Section 8.0.

Actual operating hours were considered in estimating annual average residential concentrations and maximum one-hour concentrations. The Site operates 24-hours per day. Various operations at the Site, such as material sampling, solid waste consolidation, lab pack processing, drum liquefaction operations, truck washing, and vehicle fueling occur for only parts of the day. The operating schedule for individual sources is presented in Appendix C, Tables C.7a and C.7b.

The maximally exposed off-site resident, worker, and recreationist receptors were identified from the results of modeling ten years of meteorological data. The dispersion modeling considered current emissions and future emissions. In addition to the evaluation and identification of individual receptors, the risks at each receptor were used to estimate risk isopleths (contours of equal risk). These isopleths, which delineate areas within which the risk is equal to or greater than the risk value of the contours, are presented in Section 6.0.

Off-site residents. For off-site residents and sensitive populations, annual average concentrations were estimated for use in estimating cancer and chronic noncancer risks. Short-term health risks were also evaluated for residents, based on the maximum one-hour concentration. Residents were represented in the dispersion modeling as discrete receptors (for identified nearby residences) as well as by the fine and coarse receptor grids.

Off-site workers. For off-site workers, long term potential health effects such as cancer and chronic noncancer risks, the annual exposure concentration was estimated based on exposure of eight hours per day. Concentrations for three shifts (daytime, evening, and nighttime) were evaluated. Off-site workers were represented by Site boundary points and the fine and coarse receptor grids.

Off-site recreationist. For off-site recreationists, short-term health risks were evaluated based on one-hour concentrations. Recreationists were represented in the dispersion modeling as discrete receptors on the bikepath in Ravenswood Reserve.

5.4 On-site Worker Sampling Data

Annual vapor monitoring data from area and personal sampling were used to evaluate potential exposures to the on-site worker. Data used in this evaluation includes annual monitoring results from area and personal sampling conducted in 1997 and personal sampling conducted in 1998 and 1999.

In March 1997, four area samples and six personal samples were collected. The area samples included one sample from the liquefaction area, one sample from the trough-area, and two samples from the consolidation area. The personal samples included samples from one individual working in the liquefaction area, two individuals working in the trough area, two individuals in the consolidation area, and one individual working in the drum sampling area.

In December 1998, seven personal air samples were collected from two individuals working in the trough area two individuals working in the liquefaction area, two individuals working in the consolidation area and from one in-plant driver. In February 1999, four personal air samples were collected from two individuals working in the consolidation area and two individuals working in the liquefaction area.

A total of 26 chemicals were detected during the 1997, 1998, and 1999 sampling. These chemicals are summarized on Table 5.8 along with the number of samples taken, the number of detects, and the range of detected 8-hour concentrations.

5.5 References

Association of Bay Area Governments (ABAG). 1994. South Bay Santa Clara County San Francisco Bay Trail Map 3. Website http://www.abag.ca.gov/bayarea/baytrail/maps/map3a.gif.

Auer, Jr., A.H. "Correlation of Land Use and Cover with Meteorological Anomalies". Journal of Applied Meteorology, 17:636-643, 1978.

California Air Pollution Control Officers Association (CAPCOA). 1993. Air Toxics "Hot Spots" Program. Revised 1992 Risk Assessment Guidelines. October.

California Air Resources Board (CARB). 1991. VOC Profile for "Evaporative Emissions-Distillate Fuel". Profile #760. Identification of Volatile Organic Compound Species Profile. August.

Perry, Robert H. and Green, Don W. Perry's Compound Engineers' Handbook. Mc-Graw-Hill. 1999.

Turner, B.D. 1970. Workbook of Atmospheric Dispersion Estimates. Air Resources Field Research Office, Environmental Science Services Administration. Office of Air Programs. U.S. Environmental Protection Agency. Research Triangle Park, NC.

United States Department of Commerce. 1991. CD ROM of 1990 Census of Population and Housing; Public Law 94-171 Data. Bureau of the Census. Washington, D.C. February.

United States Environmental Protection Agency (USEPA). 1993. User's Guide to the Building Profile Input Program. EPA-454/R-93-038. October.

United States Environmental Protection Agency (USEPA). 1995a. Protocol for Equipment Leak Emission Estimates. EPA-453/R-95-017. November.

United States Environmental Protection Agency (USEPA). 1995b. User's Guide for the Industrial Source Complex (ISC) Dispersion Models. Volume I – User Instructions. September.

United States Environmental Protection Agency (USEPA). 1998. Compilation of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources. November.

United States Environmental Protection Agency (USEPA). Support Center for Regulatory Air Models (SCRAM) Website. http://www.epa.gov/scram001/.

Table 5.1
Sources of Emissions
Romic Facility, East Palo Alto, California

Source Description	Process	Current or Proposed Source
Lab A, Fume Hood 1	Fugitive evaporative emissions from testing samples of all streams (i.e., drums and trucks) entering the facility	Currently operating source
Lab B, Fume Hood 2		Currently operating source
Lab C, Fume Hood 3		Currently operating source
Lab C, Fume Hood 4		Currently operating source
Lab E, Fume Hood 6		Currently operating source
Inductively Coupled Plasma Spectroscopy Vent		Currently operating source
Vent for Drum Liquefaction Control System	Controlled emissions from the drum cleaning (Tidy Bowl) and waste shredding area. Sludge in drums is cleaned out with diesel to make blended fuel, and solid waste is shredded and blended with fuel mixture.	Currently operating source
Vent for Scrubber at Lab pack Warehouse	Controlled emissions from lab pack area, where small volumes of incoming waste is consolidated	Currently operating source
Vent for Boiler Control System - VOC emissions	Emissions from the triple scrubber/boiler emissions abatement system, which burns natural gas to control emissions from fuel-blending tanks and processing units	Currently operating source
Vent for Boiler Control System - HCL emissions	Hydrochloric acid emissions from the triple scrubber/boiler abatement system, which burns natural gas to control emissions from fuel-blending tanks and processing units	Currently operating source
Vent for Boiler Control System - NG emissions	Natural gas emissions from the triple scrubber/boiler abatement system, which burns natural gas to control emissions from fuel-blending tanks and processing units	Currently operating source
Control System for Zone E tanks	Controlled emissions from proposed future fuel-blending tanks	Proposed source
Control System for Zone F tanks	Controlled emissions from proposed future wastewater treatment units	Proposed source
T13, B2 Vent	Controlled emissions from wastewater processing tanks	Currently operating source
Drum Sampling Fugitives	Fugitive emissions from drum sampling	Currently operating source
Consolidation Fugitives	Fugitive emissions from solid waste consolidation	Currently operating source
Drum Liquefaction Fugitives	Fugitive emissions from cleaning of drums with diesel to make blended fuel	Currently operating source
Fueling Station Fugitives	Fugitive emissions from fueling station that fuels trucks with gasoline or diesel fuel	Currently operating source
Tanks A-J Fugitives	Fugitive emissions from storage tanks	Currently operating source
Tanks K-M Fugitives	Fugitive emissions from fuel-blending tanks	Currently operating source
Tanks R91-R95 Fugitives	Fugitive Emissions from fuel-blending tanks	Currently operating source

Table 5.1
Sources of Emissions
Romic Facility, East Palo Alto, California

Source Description	Process	Current or Proposed Source
Processing Columns Fugitives	Fugitive emissions from organic processing columns	Currently operating source
Tanks 96-98, N, & O Fugitives	Fugitive Emissions from proposed future fuel-blending tanks	Proposed source
Tanks A-1 to A-5 Fugitives	Fugitive emissions from proposed future wastewater treatment units	Proposed source
Drum Storage Fugitives	Fugitive emissions from drums storing organic liquid	Currently operating source
Drum Storage North Fugitives	Fugitive emissions from drums storing organic liquid	Currently operating source
Drum Storage South Fugitives	Fugitive emissions from drums storing organic liquid	Currently operating source
Drum Storage West 1 Fugitives	Fugitive emissions from drums storing organic liquid	Currently operating source
Drum Storage West 2 Fugitives	Fugitive emissions from drums storing organic liquid	Currently operating source
Truck Sampling - North	Fugitive emissions from truck sampling	Currently operating source
Truck Sampling - South	Fugitive emissions from truck sampling	Currently operating source
Zone 4 Tank Area	Fugitive emissions from organic liquid and wastewater storage tanks and 35" column and 36" column troughs.	Current and proposed tanks
Zone 5 Tank Area	Fugitive emissions from organic liquid and wastewater storage tanks	Currently operating source
Zone 6 Tank Area	Fugitive emissions from organic liquid and wastewater storage tanks and truck loading and unloading liquid transfer area.	Currently operating source
Zone 7a Tank Area	Fugitive emissions from organic liquid storage tanks and sieves.	Current and proposed tanks
Zone 7b Tank Area	Fugitive emissions from organic liquid and wastewater storage tanks	Current and proposed tanks
Zone 8 Tank Area	Fugitive emissions from organic liquid and wastewater storage tanks	Current and proposed tanks
Zone 9a Tank Area	Fugitive emissions from organic liquid storage tanks	Currently operating source
Zone 10 Tank Area	Fugitive emissions from diesel storage tanks	Current and proposed tanks
Zone 11 Tank Area	Fugitive emissions from wastewater treatment tanks	Currently operating source
Truck Washing	Fugitive emissions from truck washing area	Currently operating source

Table 5.2
Dispersion Model (ISCST3) Control Parameters
Romic Facility, East Palo Alto, California

Control Parameter	Value	Comments	Note
Modeling Options	DFAULT	The regulatory default option does not use gradual plume rise (except for building downwash) and includes use of the following: stack-tip downwash and buoyancy-induced dispersion (except for Schulman-Scire downwash), calms processing, default wind speed profile exponents, default vertical potential temperature gradients, and upper-bound concentration estimates for sources influenced by building downwash from super-squat buildings.	-
Modeling Options	CONC	The "CONC" option indicated that the model will calculate concentrations and ignore particulate deposition.	-
Modeling Options	RURAL	Since the facility is located in a rural setting (as determined by Auer's method of determining land usage), the rural dispersion parameters are used in this model.	-
Averaging Period	1 24 ANNUAL	This setting yields 1-hr. maximum, 24-hour maximum, and annual average concentrations for each source at each receptor.	a
Terrain Height	FLAT	Since the terrain around the facility is simple terrain, we set the program to treat the effected area as flat, ignoring all terrain heights on the Receptor pathway.	-

Notes:
a - For running the off-site worker models, only the annual average concentrations were modeled

Table 5.3
Building Downwash Parameters
Romic Facility, East Palo Alto, California

Label	Building Name	Height (meters)		UTM X[a]	UTM Y[a]
BDW #1	Drum Storage Bldg. C'	7.62	d	577101.9	4147953.3
				577108.2	4147939.2
				577065.1	4147919.6
				577064.8	4147936.2
BDW #2	Drum Storage Bldg. B'	7.62	b	577113.5	4147941.0
				577065.1	4147918.7
				577075.3	4147896.6
				577123.7	4147918.8
BDW #3	Drum Sampling Bldg. A'	7.62	b	577110.7	4147912.9
				577075.3	4147896.6
				577084.8	4147875.7
				577120.2	4147892.0
BDW #4	Old Maintenance Bldg. 4' & 5'	7.62	b	577118.0	4147890.9
				577084.8	4147875.7
				577090.0	4147864.2
				577123.1	4147879.8
BDW #5	Drum & Debris Processing Bldg. D'	7.92	b	577128.4	4147903.4
				577117.3	4147898.3
				577124.3	4147883.0
				577135.3	4147888.1
BDW #6	Warehouse Bldg. E'	7.62	b	577043.6	4147841.5
				577023.8	4147841.5
				577023.8	4147793.4
				577043.6	4147793.4
BDW #7A	Office Bldg. #1 Tier 1	4.57	c	577184.8	4147841.2
				577177.2	4147836.5
				577178.1	4147834.7
				577172.3	4147832.0
				577164.0	4147846.6
				577162.1	4147845.5
				577159.1	4147850.8
				577164.9	4147854.1
				577164.6	4147854.7
				577173.8	4147860.0
BDW #7B	Office Bldg. #1 Tier 2	7.62	c	577184.8	4147841.2
				577177.2	4147836.5
				577178.1	4147834.7
				577163.9	4147827.2
				577170.0	4147816.5
				577181.5	4147823.2
				577182.0	4147822.3
				577184.3	4147823.7
				577183.9	4147824.5
				577193.1	4147829.8
BDW #8	Boiler Area	4.57	c	577158.5	4147828.0
				577150.2	4147824.0
				577154.1	4147815.8
				577162.4	4147819.7
BDW #9	Office/Lab Bldg. #3	7.62	c	577174.5	4147804.4

Table 5.3
Building Downwash Parameters
Romic Facility, East Palo Alto, California

Label	Building Name	Height (meters)		UTM X[a]	UTM Y[a]
				577165.0	4147798.9
				577175.2	4147781.2
				577184.7	4147786.7
BDW #10	Office Bldg. #2	7.62	c	577204.4	4147750.2
				577232.6	4147766.6
				577219.3	4147789.8
				577207.3	4147783.0
				577207.9	4147781.8
				577206.1	4147780.8
				577205.4	4147781.9
				577191.1	4147773.5
BDW #11	Trailer 'T1'	2.59	b	577159.9	4147779.0
				577153.7	4147775.4
				577162.8	4147759.5
				577169.0	4147763.2
BDW #12	Acid/Base Warehouse Bldg. F'	7.62	b	577079.5	4147793.4
				577061.2	4147793.4
				577061.2	4147784.3
				577079.5	4147784.3

Notes:
a - Coordinates of building corners were taken from a plot plan of the Site.
b - Personal Communication between Vikesh Khoot/Romic and Stacy Mann/ENVIRON on March 3
c - Information obtained from a site diagram.
d - Assumed the same height as Drum Storage Bldg. B, as the two buildings are attached.

Table 5.4
Receptor Information
Romic Facility, East Palo Alto, California

Receptor Type	UTM (X)	UTM (Y)	Description of Receptor
Grid	576200	4146850	Receptor grid with receptors spaced every 100 meters (395 receptors)
	576200	4148750	
	578100	4146850	
	578100	4148750	
Grid	574400	4145050	Receptor grid with receptors spaced every 500 meters (144 receptors)
	574400	4150550	
	579900	4145050	
	579900	4150550	
Centroid	584327.63	4154880.48	Population Census Centroid
Centroid	584464.18	4153616.96	Population Census Centroid
Centroid	584856.15	4153310.28	Population Census Centroid
Centroid	583748.00	4154530.65	Population Census Centroid
Centroid	567307.63	4148667.26	Population Census Centroid
Centroid	567233.34	4148012.06	Population Census Centroid
Centroid	567557.27	4149501.40	Population Census Centroid
Centroid	570470.93	4148915.34	Population Census Centroid
Centroid	569707.89	4148176.64	Population Census Centroid
Centroid	568251.65	4148919.04	Population Census Centroid
Centroid	569119.91	4148704.30	Population Census Centroid
Centroid	568919.50	4148347.60	Population Census Centroid
Centroid	568524.82	4147956.01	Population Census Centroid
Centroid	567472.55	4149045.82	Population Census Centroid
Centroid	567532.91	4149234.93	Population Census Centroid
Centroid	567875.80	4149470.71	Population Census Centroid
Centroid	570585.77	4149970.35	Population Census Centroid
Centroid	571614.87	4148525.68	Population Census Centroid
Centroid	570378.93	4148293.24	Population Census Centroid
Centroid	570089.21	4148046.70	Population Census Centroid
Centroid	570390.59	4147960.49	Population Census Centroid
Centroid	570673.16	4148007.26	Population Census Centroid
Centroid	571265.86	4147979.03	Population Census Centroid
Centroid	571291.25	4148112.39	Population Census Centroid
Centroid	571719.01	4147727.73	Population Census Centroid
Centroid	571349.72	4147480.47	Population Census Centroid
Centroid	570871.93	4147509.68	Population Census Centroid
Centroid	570496.31	4146962.83	Population Census Centroid
Centroid	570360.38	4147350.00	Population Census Centroid
Centroid	570005.74	4147457.97	Population Census Centroid
Centroid	569697.45	4147311.15	Population Census Centroid
Centroid	570053.59	4147025.66	Population Census Centroid
Centroid	569134.83	4146907.03	Population Census Centroid
Centroid	569181.71	4147650.79	Population Census Centroid
Centroid	568576.62	4147035.56	Population Census Centroid
Centroid	567950.63	4147884.74	Population Census Centroid
Centroid	568289.27	4147565.75	Population Census Centroid
Centroid	567911.82	4148306.03	Population Census Centroid
Centroid	567745.91	4146962.19	Population Census Centroid
Centroid	567464.91	4146715.82	Population Census Centroid
Centroid	568106.26	4146155.20	Population Census Centroid
Centroid	568289.25	4146489.54	Population Census Centroid

Table 5.4
Receptor Information
Romic Facility, East Palo Alto, California

Receptor Type	UTM (X)	UTM (Y)	Description of Receptor
Centroid	567819.10	4145575.91	Population Census Centroid
Centroid	568837.14	4145473.32	Population Census Centroid
Centroid	568496.40	4144960.14	Population Census Centroid
Centroid	568640.02	4144706.14	Population Census Centroid
Centroid	568867.84	4146039.42	Population Census Centroid
Centroid	571217.03	4145415.65	Population Census Centroid
Centroid	570262.77	4144242.58	Population Census Centroid
Centroid	569073.25	4143666.80	Population Census Centroid
Centroid	570108.35	4145772.38	Population Census Centroid
Centroid	569591.67	4146211.85	Population Census Centroid
Centroid	572780.84	4146638.53	Population Census Centroid
Centroid	571082.23	4146701.53	Population Census Centroid
Centroid	572642.77	4147258.65	Population Census Centroid
Centroid	573976.86	4147403.54	Population Census Centroid
Centroid	572982.29	4147871.85	Population Census Centroid
Centroid	574716.76	4147731.90	Population Census Centroid
Centroid	574069.98	4147870.36	Population Census Centroid
Centroid	572489.78	4148577.64	Population Census Centroid
Centroid	573320.98	4148573.82	Population Census Centroid
Centroid	576455.04	4148147.11	Population Census Centroid
Centroid	576159.59	4147578.55	Population Census Centroid
Centroid	576508.92	4148058.84	Population Census Centroid
Centroid	576569.72	4147216.17	Population Census Centroid
Centroid	577230.47	4146534.36	Population Census Centroid
Centroid	577280.77	4145880.21	Population Census Centroid
Centroid	577479.37	4145449.34	Population Census Centroid
Centroid	576642.95	4145985.27	Population Census Centroid
Centroid	576662.44	4146751.02	Population Census Centroid
Centroid	575936.36	4146844.23	Population Census Centroid
Centroid	575369.29	4146961.12	Population Census Centroid
Centroid	575188.52	4147392.20	Population Census Centroid
Centroid	575446.46	4146251.73	Population Census Centroid
Centroid	576299.85	4145782.41	Population Census Centroid
Centroid	574912.33	4146635.24	Population Census Centroid
Centroid	574845.97	4146146.45	Population Census Centroid
Centroid	574523.01	4145666.46	Population Census Centroid
Centroid	574179.65	4145485.88	Population Census Centroid
Centroid	574129.31	4146173.33	Population Census Centroid
Centroid	574371.98	4146730.25	Population Census Centroid
Centroid	573630.41	4146579.42	Population Census Centroid
Centroid	572106.90	4145822.73	Population Census Centroid
Centroid	573410.16	4145479.06	Population Census Centroid
Centroid	573397.25	4144935.29	Population Census Centroid
Centroid	573544.68	4145269.45	Population Census Centroid
Centroid	572940.50	4144565.15	Population Census Centroid
Centroid	572337.64	4144715.23	Population Census Centroid
Centroid	571917.88	4145177.58	Population Census Centroid
Centroid	572492.55	4144195.11	Population Census Centroid
Centroid	571528.13	4144208.96	Population Census Centroid
Centroid	571817.32	4143501.36	Population Census Centroid

Table 5.4
Receptor Information
Romic Facility, East Palo Alto, California

Receptor Type	UTM (X)	UTM (Y)	Description of Receptor
Centroid	571040.79	4143261.71	Population Census Centroid
Centroid	570162.88	4143498.37	Population Census Centroid
Centroid	570467.04	4143101.52	Population Census Centroid
Centroid	571285.06	4142631.39	Population Census Centroid
Centroid	571092.87	4142341.28	Population Census Centroid
Centroid	570007.92	4142986.70	Population Census Centroid
Centroid	570492.89	4142136.48	Population Census Centroid
Centroid	569218.20	4142192.37	Population Census Centroid
Centroid	571783.81	4141226.60	Population Census Centroid
Centroid	569942.81	4142309.36	Population Census Centroid
Centroid	571406.54	4141877.97	Population Census Centroid
Centroid	571231.38	4139590.91	Population Census Centroid
Centroid	580097.77	4143598.99	Population Census Centroid
Centroid	582286.49	4141467.81	Population Census Centroid
Centroid	583473.75	4140447.74	Population Census Centroid
Centroid	582019.32	4138935.46	Population Census Centroid
Centroid	581529.33	4139252.42	Population Census Centroid
Centroid	581950.82	4139600.50	Population Census Centroid
Centroid	582184.78	4140113.18	Population Census Centroid
Centroid	582166.09	4139314.14	Population Census Centroid
Centroid	581225.57	4139537.93	Population Census Centroid
Centroid	581309.76	4139982.57	Population Census Centroid
Centroid	581259.89	4140559.03	Population Census Centroid
Centroid	580814.12	4139977.75	Population Census Centroid
Centroid	579694.05	4140477.36	Population Census Centroid
Centroid	580481.72	4140484.92	Population Census Centroid
Centroid	580679.21	4140198.35	Population Census Centroid
Centroid	580396.53	4140140.14	Population Census Centroid
Centroid	580213.87	4139805.53	Population Census Centroid
Centroid	580506.48	4139752.87	Population Census Centroid
Centroid	580379.34	4141005.41	Population Census Centroid
Centroid	578528.55	4140177.83	Population Census Centroid
Centroid	580111.39	4139416.22	Population Census Centroid
Centroid	579947.03	4139015.21	Population Census Centroid
Centroid	579510.44	4139310.61	Population Census Centroid
Centroid	579569.97	4139566.37	Population Census Centroid
Centroid	579240.06	4139818.42	Population Census Centroid
Centroid	579189.69	4139529.47	Population Census Centroid
Centroid	579379.36	4139131.85	Population Census Centroid
Centroid	581010.32	4138914.51	Population Census Centroid
Centroid	580703.83	4138567.59	Population Census Centroid
Centroid	580366.48	4138664.19	Population Census Centroid
Centroid	580609.62	4139154.72	Population Census Centroid
Centroid	579897.85	4138604.22	Population Census Centroid
Centroid	579679.09	4138335.84	Population Census Centroid
Centroid	578912.22	4138916.61	Population Census Centroid
Centroid	578970.26	4138395.68	Population Census Centroid
Centroid	579310.44	4137999.49	Population Census Centroid
Centroid	578191.17	4139342.53	Population Census Centroid
Centroid	578201.56	4138233.12	Population Census Centroid

Table 5.4
Receptor Information
Romic Facility, East Palo Alto, California

Receptor Type	UTM (X)	UTM (Y)	Description of Receptor
Centroid	577672.24	4138982.65	Population Census Centroid
Centroid	577308.00	4140077.69	Population Census Centroid
Centroid	576832.90	4140727.91	Population Census Centroid
Centroid	576431.91	4141023.80	Population Census Centroid
Centroid	576255.46	4141931.98	Population Census Centroid
Centroid	577046.57	4141550.91	Population Census Centroid
Centroid	577867.61	4140815.16	Population Census Centroid
Centroid	578378.89	4142916.95	Population Census Centroid
Centroid	578764.89	4142332.53	Population Census Centroid
Centroid	579222.26	4141693.34	Population Census Centroid
Centroid	578591.10	4141054.95	Population Census Centroid
Centroid	579043.90	4140903.89	Population Census Centroid
Centroid	578017.15	4141859.51	Population Census Centroid
Centroid	577817.05	4141491.50	Population Census Centroid
Centroid	576655.04	4142745.59	Population Census Centroid
Centroid	577100.30	4142439.03	Population Census Centroid
Centroid	577501.66	4142098.80	Population Census Centroid
Centroid	577667.85	4144208.43	Population Census Centroid
Centroid	577267.91	4143450.24	Population Census Centroid
Centroid	577954.65	4143811.68	Population Census Centroid
Centroid	578214.33	4143481.26	Population Census Centroid
Centroid	577723.45	4142988.47	Population Census Centroid
Centroid	576898.78	4145100.01	Population Census Centroid
Centroid	576608.73	4144897.63	Population Census Centroid
Centroid	576672.78	4144665.22	Population Census Centroid
Centroid	576536.66	4144075.92	Population Census Centroid
Centroid	577147.05	4144081.55	Population Census Centroid
Centroid	575540.44	4145642.34	Population Census Centroid
Centroid	574615.13	4145256.77	Population Census Centroid
Centroid	575436.71	4145375.12	Population Census Centroid
Centroid	575562.44	4145165.45	Population Census Centroid
Centroid	575388.46	4144842.12	Population Census Centroid
Centroid	575895.08	4144580.43	Population Census Centroid
Centroid	575488.57	4144532.35	Population Census Centroid
Centroid	573964.14	4144851.55	Population Census Centroid
Centroid	574344.79	4144821.64	Population Census Centroid
Centroid	574595.24	4144513.22	Population Census Centroid
Centroid	574870.76	4144371.46	Population Census Centroid
Centroid	574979.91	4144039.58	Population Census Centroid
Centroid	575413.17	4144065.68	Population Census Centroid
Centroid	575240.45	4143598.12	Population Census Centroid
Centroid	575719.29	4143480.42	Population Census Centroid
Centroid	575969.13	4143249.69	Population Census Centroid
Centroid	576173.72	4143129.51	Population Census Centroid
Centroid	576386.77	4143053.79	Population Census Centroid
Centroid	575309.19	4142844.28	Population Census Centroid
Centroid	575185.68	4141822.42	Population Census Centroid
Centroid	575835.94	4142327.58	Population Census Centroid
Centroid	574749.91	4142062.59	Population Census Centroid
Centroid	573932.32	4141456.17	Population Census Centroid

Table 5.4
Receptor Information
Romic Facility, East Palo Alto, California

Receptor Type	UTM (X)	UTM (Y)	Description of Receptor
Centroid	574903.33	4140743.66	Population Census Centroid
Centroid	573082.32	4142513.80	Population Census Centroid
Centroid	574033.39	4142034.01	Population Census Centroid
Centroid	576256.51	4139879.40	Population Census Centroid
Centroid	574500.22	4138310.23	Population Census Centroid
Centroid	573923.44	4138460.44	Population Census Centroid
Centroid	576882.43	4138231.97	Population Census Centroid
Centroid	576115.44	4145636.48	Population Census Centroid
Centroid	576043.97	4145713.50	Population Census Centroid
Centroid	573585.45	4144659.58	Population Census Centroid
Centroid	574171.99	4145352.67	Population Census Centroid
Centroid	572945.55	4143988.25	Population Census Centroid
Residential	576878.73	4147451.49	Local Resident Receptor
Residential	577255.42	4147213.26	Local Resident Receptor
Residential	577036.69	4147208.11	Local Resident Receptor
Residential	576740.19	4148439.75	Local Resident Receptor
Residential	576719.12	4148343.03	Local Resident Receptor
Residential	576692.44	4148267.12	Local Resident Receptor
Residential	576650.61	4148187.34	Local Resident Receptor
Residential	576612.56	4148107.59	Local Resident Receptor
Residential	576582.10	4148035.45	Local Resident Receptor
Residential	576551.64	4147963.32	Local Resident Receptor
Residential	576551.40	4147872.38	Local Resident Receptor
Residential	576551.13	4147770.07	Local Resident Receptor
Residential	576554.76	4147709.47	Local Resident Receptor
Residential	576554.58	4147645.06	Local Resident Receptor
Residential	576552.51	4147576.84	Local Resident Receptor
Residential	576556.12	4147512.45	Local Resident Receptor
Residential	576557.85	4147449.94	Local Resident Receptor
Residential	576563.38	4147395.03	Local Resident Receptor
Residential	576572.76	4147364.77	Local Resident Receptor
Residential	576800.00	4147450.00	Local Resident Receptor
Residential	577000.00	4147250.00	Local Resident Receptor
Residential	577800.00	4147950.00	Local Resident Receptor
Recreational/Bikepath	576878.87	4148262.75	Bikepath Receptor
Recreational/Bikepath	576904.70	4148221.01	Bikepath Receptor
Recreational/Bikepath	576941.37	4148182.21	Bikepath Receptor
Recreational/Bikepath	576979.40	4148144.77	Bikepath Receptor
Recreational/Bikepath	577026.29	4148101.24	Bikepath Receptor
Recreational/Bikepath	577075.71	4148047.68	Bikepath Receptor
Recreational/Bikepath	577126.57	4147996.70	Bikepath Receptor
Recreational/Bikepath	577174.79	4147947.08	Bikepath Receptor
Recreational/Bikepath	577223.78	4147899.97	Bikepath Receptor
Recreational/Bikepath	577275.61	4147846.00	Bikepath Receptor
Recreational/Bikepath	577313.79	4147807.95	Bikepath Receptor
Recreational/Bikepath	577370.84	4147754.70	Bikepath Receptor
Recreational/Bikepath	577382.16	4147709.54	Bikepath Receptor
Recreational/Bikepath	577356.10	4147647.66	Bikepath Receptor
Recreational/Bikepath	577331.36	4147589.05	Bikepath Receptor
Recreational/Bikepath	577304.00	4147521.12	Bikepath Receptor

Table 5.4
Receptor Information
Romic Facility, East Palo Alto, California

Receptor Type	UTM (X)	UTM (Y)	Description of Receptor
Recreational/Bikepath	577273.09	4147455.89	Bikepath Receptor
Recreational/Bikepath	577239.17	4147381.98	Bikepath Receptor
Sensitive	577566.09	4141489.05	Birth Centers
Sensitive	577365.49	4142717.20	Child Care
Sensitive	572301.73	4143082.05	Clinic and Medical Centers
Sensitive	579771.99	4139416.74	Clinic and Medical Centers
Sensitive	577105.00	4143088.92	Clinic and Medical Centers
Sensitive	573280.91	4143447.64	Clinic and Medical Centers
Sensitive	574593.50	4144214.74	Clinic and Medical Centers
Sensitive	576016.23	4142353.30	Clinic and Medical Centers
Sensitive	573280.91	4143447.64	Clinic and Medical Centers
Sensitive	568055.02	4149674.88	Clinic and Medical Centers
Sensitive	581702.74	4138963.30	Clinic and Medical Centers
Sensitive	573284.54	4143447.00	Clinic and Medical Centers
Sensitive	574611.53	4143969.15	Clinic and Medical Centers
Sensitive	578938.47	4140240.84	Clinic and Medical Centers
Sensitive	568055.02	4149674.88	Clinic and Medical Centers
Sensitive	575946.40	4142587.66	Clinic and Medical Centers
Sensitive	574271.63	4147153.19	Clinic and Medical Centers
Sensitive	579614.74	4139494.23	Day Care
Sensitive	578048.92	4143883.57	Day Care
Sensitive	576597.13	4141112.30	Day Care
Sensitive	573714.02	4148044.28	Day Care
Sensitive	575910.09	4147348.93	Day Care
Sensitive	579710.08	4138372.20	Day Care
Sensitive	572914.94	4143664.78	Day Care
Sensitive	576627.65	4146436.92	Day Care
Sensitive	577563.12	4140332.57	Day Care
Sensitive	578316.44	4142028.74	Day Care
Sensitive	569384.70	4148760.42	Day Care
Sensitive	575989.25	4147706.02	Day Care
Sensitive	567183.32	4146079.69	Day Care
Sensitive	578666.78	4141043.90	Day Care
Sensitive	574407.41	4144566.24	Day Care
Sensitive	578650.08	4141520.28	Day Care
Sensitive	574607.73	4148166.08	Day Care
Sensitive	579016.45	4141493.68	Day Care
Sensitive	577776.99	4140709.58	Day Care
Sensitive	574276.24	4146557.43	Day Care
Sensitive	570717.45	4143005.45	Day Care
Sensitive	580191.71	4140388.82	Day Care
Sensitive	580057.84	4139969.02	Day Care
Sensitive	579735.19	4138857.74	Day Care
Sensitive	575174.46	4144068.18	Day Care
Sensitive	575235.47	4147059.88	Day Care
Sensitive	577696.47	4142645.71	Day Care
Sensitive	567202.81	4147051.54	Day Care
Sensitive	576874.61	4143269.97	Day Care
Sensitive	568095.88	4149239.29	Day Care
Sensitive	572391.59	4144268.78	Day Care

Table 5.4
Receptor Information
Romic Facility, East Palo Alto, California

Receptor Type	UTM (X)	UTM (Y)	Description of Receptor
Sensitive	568505.10	4145999.92	Day Care
Sensitive	577290.27	4142327.17	Day Care
Sensitive	585123.67	4153620.58	Day Care
Sensitive	567460.39	4148037.30	Day Care
Sensitive	576969.91	4146684.18	Day Care
Sensitive	573703.35	4147440.72	Day Care
Sensitive	575375.97	4141898.02	Day Care
Sensitive	576179.57	4142973.11	Day Care
Sensitive	576618.50	4144931.22	Day Care
Sensitive	577241.00	4141406.93	Day Care
Sensitive	578630.81	4140663.55	Day Care
Sensitive	579302.04	4140971.14	Day Care
Sensitive	567461.93	4148153.26	Day Care
Sensitive	574895.65	4146523.02	Day Care
Sensitive	576125.51	4147679.20	Day Care
Sensitive	569137.38	4145705.25	Day Care
Sensitive	567550.66	4148736.47	Day Care
Sensitive	580124.09	4138211.62	Day Care
Sensitive	570240.95	4142936.85	Day Care
Sensitive	570856.25	4147939.36	Day Care
Sensitive	578766.57	4142257.11	Day Care
Sensitive	568704.38	4146416.41	Day Care
Sensitive	580107.64	4138329.19	Day Care
Sensitive	570773.01	4142933.14	Day Care
Sensitive	583129.25	4139773.36	Day Care
Sensitive	576344.72	4139525.82	Day Care
Sensitive	568467.51	4147075.49	Day Care
Sensitive	581232.02	4139966.49	Day Care
Sensitive	578788.95	4140543.11	Day Care
Sensitive	578850.25	4140210.16	Hospices
Sensitive	574469.09	4146646.22	Hospitals
Sensitive	568279.39	4149298.16	Hospitals
Sensitive	568698.91	4146457.41	Hospitals
Sensitive	573283.31	4143426.92	Hospitals
Sensitive	574708.25	4144104.27	Hospitals
Sensitive	573022.33	4143767.58	Hospitals
Sensitive	573175.47	4143989.15	Hospitals
Sensitive	573283.66	4143447.11	Hospitals
Sensitive	574586.26	4144429.93	Hospitals
Sensitive	572433.27	4144857.85	Long Term Care Centers
Sensitive	567519.94	4147815.55	Long Term Care Centers
Sensitive	567704.54	4146611.26	Long Term Care Centers
Sensitive	574271.70	4143691.73	Long Term Care Centers
Sensitive	570599.98	4143232.79	Long Term Care Centers
Sensitive	570785.81	4146332.75	Long Term Care Centers
Sensitive	574599.40	4145036.84	Long Term Care Centers
Sensitive	580586.08	4141180.26	Long Term Care Centers
Sensitive	575726.58	4146454.98	Long Term Care Centers
Sensitive	580689.04	4140371.97	Long Term Care Centers
Sensitive	568243.25	4147742.35	Long Term Care Centers

Table 5.4
Receptor Information
Romic Facility, East Palo Alto, California

Receptor Type	UTM (X)	UTM (Y)	Description of Receptor
Sensitive	567353.80	4148795.66	Long Term Care Centers
Sensitive	576229.17	4146865.54	Long Term Care Centers
Sensitive	575651.21	4146156.00	Long Term Care Centers
Sensitive	571305.51	4148397.54	Long Term Care Centers
Sensitive	568617.94	4146656.57	Long Term Care Centers
Sensitive	567919.41	4147061.24	Long Term Care Centers
Sensitive	568036.09	4145215.99	Long Term Care Centers
Sensitive	568658.40	4148441.97	Long Term Care Centers
Sensitive	578561.63	4141241.96	Long Term Care Centers
Sensitive	576132.12	4146598.70	Long Term Care Centers
Sensitive	575529.59	4146955.02	Long Term Care Centers
Sensitive	572179.61	4143892.04	Long Term Care Centers
Sensitive	577366.25	4141099.42	Long Term Care Centers
Sensitive	570065.33	4146817.84	Long Term Care Centers
Sensitive	580569.02	4138326.41	Long Term Care Centers
Sensitive	567631.31	4147537.53	Long Term Care Centers
Sensitive	567022.64	4146867.58	Long Term Care Centers
Sensitive	567731.54	4146206.06	Long Term Care Centers
Sensitive	580689.04	4140371.97	Long Term Care Centers
Sensitive	568783.41	4145124.60	Long Term Care Centers
Sensitive	578190.17	4142453.16	Long Term Care Centers
Sensitive	579756.48	4139446.32	Long Term Care Centers
Sensitive	567759.11	4146090.46	Long Term Care Centers
Sensitive	567853.91	4147577.95	Long Term Care Centers
Sensitive	568175.62	4144985.92	Long Term Care Centers
Sensitive	568016.80	4144621.37	Long Term Care Centers
Sensitive	568838.08	4147147.55	Long Term Care Centers
Sensitive	573983.05	4147881.13	Nursing Homes
Sensitive	574939.82	4144562.80	Nursing Homes
Sensitive	576137.19	4147224.30	Nursing Homes
Sensitive	580498.10	4139969.82	Nursing Homes
Sensitive	574500.41	4144929.66	Nursing Homes
Sensitive	571934.26	4145185.83	Nursing Homes
Sensitive	574299.04	4146322.19	Nursing Homes
Sensitive	577739.13	4138549.45	Nursing Homes
Sensitive	570229.35	4141803.29	Nursing Homes
Sensitive	571950.76	4144995.69	Pregnancy Services
Sensitive	577726.06	4141958.76	Pregnancy Services
Sensitive	572686.13	4143148.53	Pregnancy Services
Sensitive	569094.92	4149125.92	Retirement Communities
Sensitive	571881.87	4145219.10	Retirement Communities
Sensitive	575640.03	4142288.41	Retirement Communities
Sensitive	572029.69	4145668.61	Retirement Communities
Sensitive	567841.39	4146206.40	Retirement Communities
Sensitive	575897.92	4144335.26	Retirement Communities
Sensitive	576655.23	4145717.10	Retirement Communities
Sensitive	579421.68	4141168.22	Retirement Communities
Sensitive	572855.21	4144505.26	Retirement Communities
Sensitive	575017.60	4144274.25	Retirement Communities
Sensitive	569245.55	4148396.24	Retirement Communities

Table 5.4
Receptor Information
Romic Facility, East Palo Alto, California

Receptor Type	UTM (X)	UTM (Y)	Description of Receptor
Sensitive	580397.27	4140081.57	Retirement Communities
Sensitive	575293.49	4145219.60	Retirement Communities
Sensitive	576206.39	4147026.10	Retirement Communities
Sensitive	578062.81	4139825.97	Retirement Communities
Sensitive	576042.86	4142197.54	Retirement Communities
Sensitive	568246.99	4148452.46	Retirement Communities
Sensitive	574471.45	4144951.60	Retirement Communities
Sensitive	575053.13	4144494.03	Retirement Communities
Sensitive	571229.18	4144801.87	Schools
Sensitive	575237.28	4144498.02	Schools
Sensitive	575681.49	4146444.47	Schools
Sensitive	578286.36	4139056.06	Schools
Sensitive	576450.31	4140841.55	Schools
Sensitive	573630.17	4148066.84	Schools
Sensitive	574322.45	4147880.05	Schools
Sensitive	576695.08	4146298.85	Schools
Sensitive	575146.14	4143695.91	Schools
Sensitive	580255.01	4138904.77	Schools
Sensitive	576285.96	4148051.92	Schools
Sensitive	575967.67	4145244.36	Schools
Sensitive	580975.00	4140730.13	Schools
Sensitive	579001.95	4141389.24	Schools
Sensitive	578197.43	4143292.48	Schools
Sensitive	576646.17	4144952.42	Schools
Sensitive	577027.80	4142202.92	Schools
Sensitive	572172.46	4146535.82	Schools
Sensitive	574770.40	4141750.89	Schools
Sensitive	570389.92	4148153.98	Schools
Sensitive	577975.24	4141817.29	Schools
Sensitive	573536.20	4147903.79	Schools
Sensitive	576057.69	4138064.20	Schools
Sensitive	572437.69	4144288.27	Schools
Sensitive	576965.35	4146301.35	Schools
Sensitive	578451.17	4142062.63	Schools
Sensitive	570742.68	4147109.15	Schools
Sensitive	576937.51	4143989.63	Schools
Sensitive	575264.51	4146028.62	Schools
Sensitive	567460.39	4145941.58	Schools
Sensitive	576707.84	4144912.07	Schools
Sensitive	575651.59	4147583.79	Schools
Sensitive	579176.02	4141175.09	Schools
Sensitive	576732.29	4139580.52	Schools
Sensitive	575702.96	4144625.51	Schools
Sensitive	568038.11	4147394.83	Schools
Sensitive	575878.94	4144195.62	Schools
Sensitive	578539.09	4141446.34	Schools
Sensitive	567881.02	4145575.20	Schools
Sensitive	576497.53	4140798.27	Schools
Sensitive	571312.09	4143723.81	Schools
Sensitive	569528.00	4148424.11	Schools

Table 5.4
Receptor Information
Romic Facility, East Palo Alto, California

Receptor Type	UTM (X)	UTM (Y)	Description of Receptor
Sensitive	577242.16	4142944.50	Schools
Sensitive	577004.60	4143172.20	Schools
Sensitive	577581.78	4142314.01	Schools
Sensitive	578074.57	4141871.14	Schools
Sensitive	567418.13	4145961.32	Schools
Sensitive	567225.85	4147603.93	Schools
Sensitive	576792.97	4143680.07	Schools
Sensitive	576824.64	4140403.64	Schools
Sensitive	577230.59	4140179.70	Schools
Sensitive	575628.41	4147429.46	Schools
Sensitive	577361.63	4142894.68	Schools
Sensitive	570807.84	4142332.64	Schools
Sensitive	571174.54	4139685.40	Schools
Sensitive	569863.51	4143557.55	Schools
Sensitive	573398.30	4146823.91	Schools
Sensitive	583786.22	4154534.70	Schools
Sensitive	577046.30	4140199.75	Schools
Sensitive	574657.03	4141346.46	Schools
Sensitive	574593.39	4145046.99	Schools
Sensitive	578785.36	4141692.86	Schools
Sensitive	575849.93	4141976.32	Schools
Sensitive	567662.21	4148316.32	Schools
Sensitive	574705.74	4146219.20	Schools
Sensitive	572050.84	4146363.46	Schools
Sensitive	571590.27	4145667.82	Schools
Sensitive	573035.21	4146204.38	Schools
Sensitive	574727.35	4144964.53	Schools
Sensitive	576815.43	4143978.74	Schools
Sensitive	577295.01	4139837.36	Schools
Sensitive	580892.20	4139126.62	Schools
Sensitive	567825.81	4149334.72	Schools
Sensitive	579871.41	4140442.11	Schools
Sensitive	567441.17	4148314.53	Schools
Sensitive	581110.13	4138727.85	Schools
Sensitive	572424.29	4145829.14	Schools
Sensitive	571640.27	4142709.66	Schools
Sensitive	575346.13	4146040.01	Schools
Sensitive	577622.27	4143791.60	Schools
Sensitive	578484.53	4141507.62	Schools
Sensitive	567927.41	4149224.38	Schools
Sensitive	578918.52	4142405.43	Schools
Sensitive	577665.10	4142393.68	Schools
Sensitive	574682.07	4143383.52	Schools
Sensitive	575826.67	4144534.20	Schools
Sensitive	579238.91	4141338.23	Schools
Sensitive	576855.78	4139358.32	Schools
Sensitive	578422.67	4142863.10	Schools
Sensitive	578759.65	4141734.12	Schools
Sensitive	575575.29	4144304.91	Schools
Sensitive	573890.19	4146766.68	Schools

Table 5.4
Receptor Information
Romic Facility, East Palo Alto, California

Receptor Type	UTM (X)	UTM (Y)	Description of Receptor
Sensitive	570530.36	4142571.27	Schools
Sensitive	578854.29	4138798.90	Schools
Sensitive	580033.71	4141460.65	Schools
Sensitive	576302.90	4146202.83	Schools
Sensitive	575535.66	4147621.90	Schools
Sensitive	575882.76	4146476.37	Schools
Sensitive	567540.90	4148130.37	Schools
Sensitive	568210.31	4148805.97	Schools
Sensitive	568101.46	4144826.31	Schools
Sensitive	577029.94	4146316.93	Schools
Sensitive	578451.61	4142401.04	Schools
Sensitive	573700.14	4146025.29	Schools
Sensitive	568563.88	4146197.11	Schools
Sensitive	571820.67	4144591.14	Schools
Sensitive	575749.62	4144903.31	Schools
Sensitive	578164.14	4138977.36	Schools
Sensitive	580510.28	4140478.98	Schools
Sensitive	577797.29	4138758.24	Schools
Sensitive	584285.23	4153738.42	Schools
Sensitive	569132.50	4145770.44	Schools
Sensitive	567561.22	4148654.55	Schools
Sensitive	567651.41	4148295.92	Schools
Sensitive	576425.30	4147014.01	Schools
Sensitive	575699.79	4144799.45	Schools
Sensitive	573812.63	4141649.94	Schools
Sensitive	573511.10	4142386.87	Schools
Sensitive	571420.18	4148316.86	Schools
Sensitive	577370.45	4139709.68	Schools
Sensitive	581080.20	4140022.27	Schools
Sensitive	572301.73	4143082.05	Schools
Sensitive	581067.27	4138820.08	Schools
Sensitive	577701.28	4143780.91	Schools
Sensitive	577280.94	4141403.97	Schools
Sensitive	568874.83	4147216.76	Schools
Sensitive	567736.18	4147668.97	Schools
Sensitive	568939.98	4148863.80	Schools
Sensitive	568871.69	4148814.97	Schools
Sensitive	581232.02	4139966.49	Schools
Sensitive	582610.27	4139451.66	Schools
Sensitive	578138.46	4141720.07	Schools
Sensitive	572978.10	4143725.25	Schools
Sensitive	574655.56	4146342.01	Schools
Sensitive	568186.66	4144252.40	Schools
Facility Boundary	577078.53	4147976.50	Facility Boundary Receptor
Facility Boundary	577096.82	4147977.00	Facility Boundary Receptor
Facility Boundary	577111.83	4147961.67	Facility Boundary Receptor
Facility Boundary	577123.81	4147949.44	Facility Boundary Receptor
Facility Boundary	577138.06	4147934.90	Facility Boundary Receptor
Facility Boundary	577154.35	4147918.27	Facility Boundary Receptor
Facility Boundary	577166.78	4147905.58	Facility Boundary Receptor

Table 5.4
Receptor Information
Romic Facility, East Palo Alto, California

Receptor Type	UTM (X)	UTM (Y)	Description of Receptor
Facility Boundary	577178.66	4147893.44	Facility Boundary Receptor
Facility Boundary	577190.64	4147881.22	Facility Boundary Receptor
Facility Boundary	577205.74	4147865.80	Facility Boundary Receptor
Facility Boundary	577221.60	4147849.60	Facility Boundary Receptor
Facility Boundary	577236.01	4147834.91	Facility Boundary Receptor
Facility Boundary	577249.13	4147821.50	Facility Boundary Receptor
Facility Boundary	577258.98	4147811.45	Facility Boundary Receptor
Facility Boundary	577244.30	4147804.68	Facility Boundary Receptor
Facility Boundary	577228.28	4147797.30	Facility Boundary Receptor
Facility Boundary	577239.72	4147777.64	Facility Boundary Receptor
Facility Boundary	577248.54	4147762.47	Facility Boundary Receptor
Facility Boundary	577257.69	4147746.74	Facility Boundary Receptor
Facility Boundary	577265.95	4147732.54	Facility Boundary Receptor
Facility Boundary	577275.84	4147715.53	Facility Boundary Receptor
Facility Boundary	577282.18	4147704.63	Facility Boundary Receptor
Facility Boundary	577290.43	4147690.45	Facility Boundary Receptor
Facility Boundary	577303.01	4147668.83	Facility Boundary Receptor
Facility Boundary	577286.14	4147661.07	Facility Boundary Receptor
Facility Boundary	577268.03	4147652.73	Facility Boundary Receptor
Facility Boundary	577249.08	4147644.00	Facility Boundary Receptor
Facility Boundary	577235.06	4147637.50	Facility Boundary Receptor
Facility Boundary	577217.88	4147629.75	Facility Boundary Receptor
Facility Boundary	577197.63	4147620.50	Facility Boundary Receptor
Facility Boundary	577175.19	4147610.25	Facility Boundary Receptor
Facility Boundary	577159.13	4147603.00	Facility Boundary Receptor
Facility Boundary	577142.19	4147595.25	Facility Boundary Receptor
Facility Boundary	577124.44	4147587.25	Facility Boundary Receptor
Facility Boundary	577104.69	4147578.25	Facility Boundary Receptor
Facility Boundary	577087.00	4147570.00	Facility Boundary Receptor
Facility Boundary	577069.00	4147562.00	Facility Boundary Receptor
Facility Boundary	577050.00	4147553.25	Facility Boundary Receptor
Facility Boundary	577028.81	4147543.50	Facility Boundary Receptor
Facility Boundary	577008.94	4147534.50	Facility Boundary Receptor
Facility Boundary	577008.00	4147558.50	Facility Boundary Receptor
Facility Boundary	577007.13	4147580.75	Facility Boundary Receptor
Facility Boundary	577006.50	4147597.75	Facility Boundary Receptor
Facility Boundary	577005.69	4147618.50	Facility Boundary Receptor
Facility Boundary	577004.75	4147642.25	Facility Boundary Receptor
Facility Boundary	577003.88	4147666.00	Facility Boundary Receptor
Facility Boundary	577003.17	4147684.20	Facility Boundary Receptor
Facility Boundary	577002.84	4147702.21	Facility Boundary Receptor
Facility Boundary	577002.41	4147726.49	Facility Boundary Receptor
Facility Boundary	577002.02	4147747.58	Facility Boundary Receptor
Facility Boundary	577001.73	4147763.17	Facility Boundary Receptor
Facility Boundary	577001.38	4147782.01	Facility Boundary Receptor
Facility Boundary	577001.10	4147797.65	Facility Boundary Receptor
Facility Boundary	577000.79	4147814.07	Facility Boundary Receptor
Facility Boundary	577000.51	4147829.74	Facility Boundary Receptor
Facility Boundary	577000.32	4147840.67	Facility Boundary Receptor
Facility Boundary	577000.09	4147852.56	Facility Boundary Receptor

Table 5.4
Receptor Information
Romic Facility, East Palo Alto, California

Receptor Type	UTM (X)	UTM (Y)	Description of Receptor
Facility Boundary	577016.91	4147852.87	Facility Boundary Receptor
Facility Boundary	577032.52	4147853.15	Facility Boundary Receptor
Facility Boundary	577050.51	4147853.48	Facility Boundary Receptor
Facility Boundary	577059.38	4147853.64	Facility Boundary Receptor
Facility Boundary	577059.05	4147871.15	Facility Boundary Receptor
Facility Boundary	577058.81	4147884.45	Facility Boundary Receptor
Facility Boundary	577058.50	4147901.70	Facility Boundary Receptor
Facility Boundary	577058.12	4147921.97	Facility Boundary Receptor
Facility Boundary	577057.69	4147945.41	Facility Boundary Receptor
Facility Boundary	577057.34	4147965.00	Facility Boundary Receptor
Facility Boundary	577057.14	4147975.91	Facility Boundary Receptor

Table 5.5

Source Locations and Parameters - Point Sources

Romic Facility, East Palo Alto, California

Model ID	Source Description	UTM X[a]	UTM Y[a]	Stack Height (m)		Temperature (K)		Exit Velocity (m/s)		Diameter (m)	
LABA1	Lab A, Fume Hood 1	577173.48	4147802.23	10.36	b	293	h	1.24	k	0.24	p
LABB2	Lab B, Fume Hood 2	577167.25	4147798.17	10.36	b	293	h	2.51	k	0.24	p
LABC3	Lab C, Fume Hood 3	577177.99	4147786.71	10.36	b	293	h	4.40	k	0.24	p
LABC4	Lab C, Fume Hood 4	577182.85	4147787.01	10.36	b	293	h	1.21	k	0.24	p
LABE6	Lab E, Fume Hood 6	577175.72	4147795.19	10.36	b	293	h	1.02	k	0.24	p
ICPVENT	Inductively Coupled Plasma Spectroscopy Vent	577182.54	4147788.57	10.36	b	293	h	1.52	k	0.24	p
FUELBLND	Vent for Drum Liquefaction Control System	577122.14	4147890.11	9.30	c	293	h	0.1	l	0.1	q
LABPACK	Vent for Scrubber at Labpack Warehouse	577021.83	4147807.51	6.10	d	293	i	5.95	m	0.15	r
BOILER	Vent for Boiler Control System	577149.20	4147837.77	6.71	e	466	j	13.16	n	0.61	s
ZONEE	Zone E	577140.43	4147883.13	9.11	f	293	h	0.1	o	0.1	o
ZONEF	Zone F	577109.88	4147880.88	4.52	g	293	h	0.1	o	0.1	o

Notes:

a Coordinates of point sources obtained from plot plan of the Site.

b Information from Site visit on January 21, 1999.

c Building height of 7.5 meters and stack height of 1.8 meters above building height obtained from SCREEN model run provided by Site personnel.

d Personnel communication between Vikesh Khoot/Romic and Stacy Mann/ENVIRON on March 3, 1999.

e Obtained from SCREEN model run provided by Site personnel.

f Height estimated based on height of tallest tank in Zone E plus an additional assumed 5 feet above tank for height of stack.

g Height estimated based on height of units in Zone F (they are all the same height) plus an additional assumed 5 feet above unit for height of stack.

h Assumed exit gas is at ambient temperature.

i Temperature of 70 F in Romic document (letter from Ann Werth dated August 21, 1997, page 4).

j Temperature of 375 F provided in DaRos source test performed on May 10, 1993.

k Exit velocity was calculated from information regarding average hood flow rates, face area inlets from the hood to the stack, and stack exit areas. These parameters were collected during a site visit (see January 21, 1999 site visit notes) and a subsequent personnel communication between Mary Cavendish/Romic and Stacy Mann/ENVIRON on February 23, 1999.

l Obtained from SCREEN model run provided by Site personnel.

Table 5.5

Source Locations and Parameters - Point Sources

Romic Facility, East Palo Alto, California

m Estimated based on flow rate of 23,000 cfm flow rate provided in Romic document (letter from Ann Werth dated August 21, 1997) and five foot diameter (personal communication between Vikesh Khoot/Romic and Stacy Mann/ENVIRON on March 3, 1999).

n This value comes from averaging the stack flow (in acfm) for three different runs and dividing by the stack area (in sq ft). This data was obtained from DaRos source test performed on May 10, 1993.

o Conservative engineering assumption.

p Information from Site visit on January 21, 1999.

q Obtained from SCREEN model run provided by Site personnel.

r Personal communication between Carol Bonner/Environmental Manager at Romic and Stacy Mann/ENVIRON on September 9, 1999.

s This value comes from the stack area (in sq ft) obtained from the DaRos source test performed on May 10, 1993.

Table 5.6
Source Locations and Parameters - Volume Sources
Romic Facility, East Palo Alto, California

Model ID	Source Description	UTM X[a]	UTM Y[a]	Release Height (m)		Initial Lateral Dimension (m)		Initial Vertical Dimension (m)	
T13B2	T13, B2 Vent	577120.36	4147772.35	3.35	b	0.071	i	0.071	i
SAMPLING	Drum Sampling	577097.78	4147894.21	3.81	c	6.94	j	3.5442	n
CONSOLID	Consolidation	577086.52	4147936.42	3.81	c	6.04	j	3.5442	n
FUGFB	Drum Liquefaction Fugitives	577124.75	4147896.40	3.81	c	2.65	j	3.5442	n
FUELST	Fueling Station Fugitives	577059.25	4147800.32	1.00	d	0.23	k	0.4650	k
PVFAJ	Tanks A-J Fugitives	577120.59	4147839.09	1.22	e	2.17	l	1.1349	o
PVFKM	Tanks K-M Fugitives	577125.31	4147828.10	0.84	e	1.76	l	0.7814	o
PVFR915	Tanks R91-R95 Fugitives	577136.78	4147824.61	0.76	e	2.18	l	0.7070	o
PVFC	Processing Columns Fugitives	577108.12	4147819.03	3.42	e	5.38	l	3.1814	o
PVFZE	Tanks 96-98, N, & O Fugitives	577140.43	4147883.13	3.79	f	2.43	l	3.5265	p
PVFZF	Tanks A-1 to A-5 Fugitives	577109.88	4147880.88	1.50	g	1.80	l	1.3940	q
DSSAMP	Drum Storage Fugitives in the Sampling Area	577097.78	4147894.21	3.81	c	6.94	j	3.5442	n
DSCONS	Drum Storage Fugitives in the Consolidation Area	577086.52	4147936.42	3.81	c	6.04	j	3.5442	n
DSSOUTH	Drum Storage South	577094.40	4147918.60	3.81	c	8.39	j	3.5442	n
DSWEST1	Drum Storage West 1	577070.31	4147788.67	3.81	c	3.01	j	3.5442	n
DSWEST2	Drum Storage West 2	577033.72	4147817.43	3.81	c	7.17	j	3.5442	n
TRKSAMPN	Truck Sampling - North	577113.01	4147866.19	3.05	h	0.11	m	0.071	i
TRKSAMPS	Truck Sampling - South	577142.06	4147836.99	3.05	h	0.11	m	0.071	i

Notes:

a Coordinates of volume sources obtained from plot plan of the Site.
b Release height estimated from observations during site visit (January 21, 1999).
c Release height assumed to be vertical center of height of roof covering the area (see Table 5.3 for building heights).
d Assumed release height of one meter.
e Assumed release height was a fourth of the height of the tanks.
f Assumed release height was half of the height of the tallest tank.
g Assumed release height was half of the height of the units.
h Personnel communication between Carol Bonner/Environmental Manager at Romic and Stacy Mann/ENVIRON on September 9, 1999.
i Assumed an initial dimension of one foot and applied standard USEPA guidance outlined in the ISCST3 Users Guide (USEPA 1995).
j Used dimensions of source and applied standard USEPA guidance outlined in the ISCST3 Users Guide (USEPA 1995).
k Assumed an initial volume of one cubic meter and applied standard USEPA guidance outlined in the ISCST3 Users Guide (USEPA 1995).
l Used dimensions of area where tanks and units are located and applied standard USEPA guidance outlined in the ISCST3 Users Guide (USEPA 1995).
m Personnel communication between Carol Bonner/Environmental Manager at Romic and Stacy Mann/ENVIRON on September 9, 1999.

n Used height of roof covering the area and applied standard USEPA guidance outlined in the ISCST3 User's Guide (USEPA 1995).
o Used height of tanks and applied standard USEPA guidance outlined in the ISCST3 User's Guide (USEPA 1995).
p Used the height of the tallest tank and applied standard USEPA guidance outlined in the ISCST3 User's Guide (USEPA 1995).
q Used the height of the units and applied standard USEPA guidance outlined in the ISCST3 User's Guide (USEPA 1995).

Reference:

United States Environmental Protection Agency (USEPA). 1995. User's Guide for the Industrial Source Complex (ISC) Dispersion Models. Volume I - User Instructions. September.

Table 5.7
Source Locations and Parameters - Area Sources
Romic Facility, East Palo Alto, California

Model ID	Source Description	UTM X[a]	UTM Y[a]	Release Height (m)[b]	Number of Corners[c]
ZONE4	Tank Farm I (This area includes tanks 100-104 and the 35" column and 36" column troughs in the present scenario and 83-85 and 101-109 in the future scenario.)	577108.90 577118.89 577109.95 577106.45 577104.47 577100.51 577104.51 577108.90	4147789.60 4147794.09 4147814.61 4147813.10 4147817.49 4147815.98 4147799.40 4147789.60	5.77	8
ZONE5	Tank Farm L (This area includes tanks A-J, 44-50 and WWT.)	577119.64 577138.18 577134.48 577113.16 577114.23 577117.05 577119.64	4147834.00 4147842.55 4147850.51 4147840.82 4147838.45 4147839.73 4147834.00	4.91	7
ZONE6	Tank Farm B (This area includes tanks 1-8, 10-12 and the truck loading/unloading liquid transfer area.)	577128.28 577137.87 577131.78 577122.31 577128.28	4147811.75 4147815.66 4147828.62 4147824.45 4147811.75	3.53	5
ZONE7A	Tank Farm MNO (This area includes tanks 32-43 and the sieves in the present scenario and tanks P-Q in the future scenario.)	577112.86 577136.81 577133.71 577109.62 577112.86	4147846.31 4147857.16 4147864.08 4147853.28 4147846.31	4.57	5
ZONE7B	Tank Farm H (This area includes tanks 26-31 in the present scenario and tanks 106-109 in the future scenario.)	577096.41 577103.29 577098.21 577091.69 577096.41	4147837.28 4147840.41 4147851.24 4147848.05 4147837.28	4.59	5
ZONE8	Tank Farm Q (This area includes tanks 60-77 in the present scenario and tanks 81, 86-89, 105 in the future scenario.)	577062.87 577080.80 577079.95 577076.26 577062.96 577062.87	4147798.51 4147798.64 4147828.05 4147840.29 4147840.29 4147798.51	6.49	6
ZONE9A	Tank Farm G (This area includes tanks 16-20.)	577102.24 577107.58 577105.96 577100.61 577102.24	4147824.27 4147826.70 4147830.25 4147827.88 4147824.27	3.75	5
ZONE10	Tank Farm D (This area includes tanks 83-84 in the present scenario and tank 101 in the future scenario.)	577139.51 577142.88 577140.09 577136.72 577139.51	4147805.67 4147807.20 4147813.55 4147811.96 4147805.67	6.10	5

Table 5.7
Source Locations and Parameters - Area Sources
Romic Facility, East Palo Alto, California

Model ID	Source Description	UTM X[a]	UTM Y[a]	Release Height (m)[b]	Number of Corners[c]
ZONE11	Tank Farm K (This area is called Tank Farm K. It includes tanks B3-B7, B3A, B4A, and B6A.)	577134.17 577152.57 577146.84 577128.44 577134.17	4147771.48 4147779.84 4147792.17 4147784.12 4147771.48	3.66	5
TRCKWASH	Truck Washing	577123.78 577144.60 577137.56 577116.75 577123.78	4147731.21 4147740.71 4147756.17 4147746.68 4147731.21	4.572	5

Notes:

a Coordinates of area sources obtained from plot plan of the Site.

b Release height determined by taking an average height of the tanks in the modeled source area for the current emissions scenario.

c Number of corners for area sources used in air dispersion model when modeling area sources as polygons.

TABLE 5.8
Area and Personal Worker Sampling Results
Romic Facility, East Palo Alto, California

Chemical	Number of Samples	Number of Detects	Range of Detected 8-Hour TWA Concentrations (ppm)
1,1,1-TRICHLOROETHANE	6	6	0.031 - 1
1,2,4-TRIMETHYLBENZENE	6	3	0.042 - 0.075
1,3,5-TRIMETHYLBENZENE	6	3	0.026 - 0.5
2-BUTANONE	14	10	0.097 - 46
ACETONE	3	3	1.3 - 11
ARSENIC	1	1	0.00017
BENZENE	11	2	0.043 - 0.07
CHLOROFORM	6	3	0.028 - 0.13
CYCLOHEXANE	6	1	0.12
D-LIMONENE	6	1	0.053
ETHYLBENZENE	6	4	0.042 - 0.2
HEXANE	8	4	0.063 - 11
M/P-XYLENE	6	4	0.15 - 0.69
METHYL ISOBUTYL KETONE	3	3	0.18 - 1.2
METHYL n-AMYL KETONE	2	2	0.08 - 0.36
METHYL TERT BUTYL ETHER	6	4	0.028 - 0.7
METHYLENE CHLORIDE	15	13	0.13 - 10
N-BUTYL ACETATE	6	5	0.1 - 1.2
N-HEPTANE	6	4	0.15 - 0.53
O-XYLENE	6	4	0.045 - 0.18
STYRENE	10	1	1.1
TETRACHLOROETHYLENE	14	7	0.1 - 1.4
TETRAHYDROFURAN	3	3	0.22 - 3.8
TOLUENE	14	10	0.093 - 12
TRICHLOROETHYLENE	6	1	0.046
VINYL CHLORIDE	15	13	0.047 - 0.7

TWA = time-weighted average

6.0 RISK CHARACTERIZATION

Risk characterization is the final step of the risk assessment. It is defined as the combination of the exposure assessment and toxicity assessment to produce an estimate of risk and a characterization of uncertainties in the estimated risk (NRC 1983). This section presents the results of the risk assessment for the Site. In Section 6.1, the methods for estimating risk are discussed. Sections 6.2, 6.3, and 6.4 present the estimated cancer risks and chronic noncancer hazard indices for off-site residents, off-site workers, and off-site recreationists, respectively. Section 6.5 presents the cancer risk isopleths for the Site and the estimated risks for the maximum sensitive receptors. Peak air concentrations at the Site boundary are compared to the acute RELs in Section 6.6 and the on-site worker monitoring data is compared to occupational standards in Section 6.7. Uncertainties in the risk estimates that may result from various assumptions used in the risk assessment are discussed in Section 6.8.

6.1 Method for Estimating Risk

Estimating cancer risks and noncancer HIs requires information regarding the level of intake of the chemical and the relationship between intake of the chemical and its toxicity as a function of human exposure to the chemical. The methodology used to derive the cancer risks and noncancer HIs for the selected chemicals is based on guidance provided by USEPA and Cal/EPA.

One can estimate the potential risk associated with a chemical in air using equations that describe the relationships among the estimated intake of site-related chemicals, toxicity of the specific chemicals, and overall risk for carcinogenic and noncarcinogenic health effects. For carcinogenic effects, the relationship is given by the following equation (USEPA 1989):

$$\text{Risk} = I \times CSF$$

Where:

Risk = Cancer Risk; the probability of an individual developing cancer as a result of exposure to a particular cumulative dose of a potential carcinogen (unitless)

I = Intake of a chemical (mg chemical/kg body weight-day)

CSF = Cancer Slope Factor (mg chemical/kg body weight-day)

The relationship for noncarcinogenic effects is given by the following equation (USEPA 1989):

$$HI = \frac{I}{RfD}$$

Where:

HI	=	Hazard Index; an expression of the potential for noncarcinogenic effects, which relates the allowable amount of a chemical (RfD) to the estimated site-specific intake (unitless)
I	=	Intake of chemical (mg chemical/kg body weight-day)
RfD	=	Reference Dose; the toxicity value indicating the threshold amount of chemical contacted below which no adverse health effects are expected (mg chemical/kg body weight-day).

The National Contingency Plan (NCP) (40 CFR 300) is commonly cited as the basis for acceptable incremental risk levels. According to the NCP, lifetime incremental cancer risks posed by a site should not exceed one hundred in a million (1×10^{-4}) to one in a million (1×10^{-6}). For noncancer health hazards, a target HI of one (1) is identified. Individual chemical exposures that yield HIs of less than 1 are not expected to result in adverse noncancer health effects (USEPA 1989).

As discussed previously, cancer risks and chronic noncancer HIs were calculated in this risk assessment for off-site residential, off-site worker, and off-site recreational receptors as the result of potential exposures to the chemicals identified in Section 3.0. These calculations were conducted for an AEI and a RME scenario. These calculations were also conducted for current and future emissions in order to evaluate the impact of proposed changes to the facility as specified in the Site's RCRA Part B permit renewal. A summary of the cumulative cancer risks and noncancer hazard indices calculated in this risk assessment are presented in Tables 6.1 and 6.2 for the current and future emissions, respectively. As shown in these tables, the estimated lifetime incremental cancer risks are less than 1×10^{-5} for all populations and the estimated HIs are less than one for all populations. Each population evaluated is discussed in more detail below.

In the discussion below, estimated cancer risks are expressed using scientific notation (e.g., 1×10^{-6}) and estimated HIs are expressed using decimal notation (e.g., 0.001). Results presented in the text are expressed using one significant figure. The use of one significant figure when reporting risk results is recommended by USEPA (1989). Results prior to rounding are shown in the tables of results. Presentation of results prior to rounding is intended to facilitate the checking of the calculations by reviewers and to show the minor differences between the current and future emissions scenarios for most populations prior to rounding.

6.2 Cancer Risks and Chronic Noncancer Hazard Indices for Off-Site Residents

The off-site residents were evaluated for both current and future emissions. As shown in Tables 6.1 and 6.2, the estimated AEI cancer risk is 7×10^{-7} for the current and future emissions scenarios. The estimated RME cancer risk is 3×10^{-6} for the current and future emissions scenarios. The estimated noncancer HIs are less than 1 for both the current and future emissions scenarios for off-site residents.

Tables 6.3 and 6.4 list the estimated RME cancer risks by chemical and emission source for the current and future emission scenarios, respectively. As shown in this table, no individual chemical has an estimated cancer risk greater than 1×10^{-6}. Seven chemicals have an estimated cancer risk of greater than 1×10^{-7}. These chemicals are as follows:

- benzene (6×10^{-7} current and future),
- gasoline (6×10^{-7} current and future),
- methylene chloride (5×10^{-7} current and future),
- chloroform (4×10^{-7} current and future),
- 2-nitropropane (3×10^{-7} current and future),
- hydrazine (2.1×10^{-7} current and future), and
- carbon tetrachloride (2×10^{-7} current and future).

In addition, no single air emission source has an estimated cancer risk greater than 1×10^{-6}. Six sources have an estimated cancer risk of greater than 1×10^{-7}. These sources are as follows:

- Tank Farm A and Loading Area (8×10^{-7} current and future),
- Drum Storage (6×10^{-7} current and future),
- Tanks Farms C/L/R (4×10^{-7} current and future),
- Tank Farm Q (4×10^{-7} current and future),
- Tank Farms I/J and two troughs (3.0×10^{-7} current, 4×10^{-7} future), and
- Tank Farms M N O/U and sieves (3×10^{-7} current and future).

6.3 Cancer Risks and Chronic Noncancer Hazard Indices for Off-Site Workers

The off-site workers were evaluated under current and future emissions scenarios. As shown in Tables 6.1 and 6.2, the estimated AEI cancer risk is 1×10^{-6} for the current and future emissions scenarios. The estimated RME cancer risk is 7×10^{-6} for the current and future emission scenarios. The estimated noncancer HIs are less than 1 for both the current and future scenarios for off-site workers.

Tables 6.5 and 6.6 list the estimated RME cancer risks by chemical and emission source for the current and future emissions scenarios, respectively. As shown in these tables, two chemicals have an estimated cancer risk of 1×10^{-6}. These chemicals are as follows:

- benzene (1×10^{-6} current and future)
- methylene chloride (1×10^{-6} current and future)

Five chemicals have an estimated cancer risk of greater than 1×10^{-7}. These chemicals are as follows:

- chloroform (8×10^{-7} current, 9×10^{-7} future)
- 2-nitropropane (7×10^{-7} current and future)
- hydrazine (5×10^{-7} current and future)
- carbon tetrachloride (4×10^{-7} current and future)

- 1,1-dichloroethane (2×10^{-7} current and future)

One source has an estimated cancer risk greater than 1×10^{-6}. The estimated cancer risk for current and future emissions from Tank Farm A and Loading Area is 3×10^{-6}.

The estimated cancer risk is greater than 1×10^{-7} for six sources. These sources are as follows:

- Tanks Farms C/L/R (9×10^{-7} current and future),
- Tank Farm Q (7×10^{-7} current, 8×10^{-7} future),
- Tank Farms I/J and two troughs (7×10^{-7} current, 9×10^{-7} future),
- Drum Storage (7×10^{-7} current and future),
- Tank Farms M N O/U and sieves (6×10^{-7} current and future),
- Component Leaks (2×10^{-7} current and future), and

6.4 Cancer Risks and Chronic Noncancer Hazard Indices for Off-Site Recreationists

The off-site recreationists were evaluated under current and future emissions scenarios. As shown in Tables 6.1 and 6.2, the estimated AEI cancer risk is 3×10^{-8} for the current and future emissions scenarios. The estimated RME cancer risk is 4×10^{-7} for the current and future emissions scenarios. As these estimated cancer risks are well below 1×10^{-6}, they were not separated out by chemical and emission source. The estimated noncancer HIs are less than 1 for both the current and future emissions scenarios for off-site recreationists.

6.5 Risk Isopleths and Sensitive Subpopulations

Following DTSC guidance (1991) for facility risk assessments, isopleths of excess inhalation cancer risk were plotted beginning at the 1×10^{-7} excess cancer risk level for all populations evaluated. Isopleths were developed for current and future emissions scenarios for both AEI and RME risks. In addition, the excess cancer risk was estimated at the most exposed location for each kind of sensitive receptor (e.g., health care facilities, schools, day care centers, and senior homes). No isopleths were developed for noncancer effects as all estimated HIs were below one.

6.5.1 Off-Site Residents

Figures 6.1 through 6.4 show the isopleths for off-site residents for the current average risk, current RME risk, future average risk, and future RME risk, respectively. As shown in Figures 6.1 and 6.3, the highest off-site isopleth for the estimated average risk is 1×10^{-6}. However, there are no actual residences located within the 1×10^{-6} isopleth. As discussed in Section 6.2, at the maximum actual receptor location the estimated AEI cancer risk is 7×10^{-7} for the current and future emissions scenarios.

As shown in Figures 6.2 and 6.4, the highest off-site isopleth for the estimated RME risk is 1×10^{-5}. Again, there are no actual residences located with the 1×10^{-5} isopleth. As shown on these figures, there are residences located inside the 1×10^{-6} isopleth. As discussed in Section 6.2, at the maximum actual receptor location the estimated RME cancer risk is 3×10^{-6} for the current and future emissions scenarios.

6.5.2 Off-Site Workers

Figures 6.5 through 6.8 show the isopleths for off-site workers for the current average risk, current RME risk, future average risk, and future RME risk, respectively. As shown in Figures 6.5 and 6.7, the majority of the 1×10^{-6} isopleth for the estimated AEI risk is located within the facility boundary. A small portion of the isopleth extends past the boundary to the east. As discussed in Section 6.3, at the maximum actual receptor location the estimated AEI cancer risk is 1×10^{-6} for the current and future emissions scenarios.

As shown in Figures 6.6 and 6.8, the highest off-site isopleth for the estimated RME risk is also 1×10^{-6}. As discussed in Section 6.3, at the maximum actual receptor location the estimated RME cancer risk is 7×10^{-6} for the current and future emissions scenarios.

6.5.3 Off-Site Recreationist

As discussed in Section 6.4, the estimated average risks for the current and future emissions scenarios is less than 1×10^{-7}. Therefore, no isopleth has been presented for these scenarios. Figures 6.9 and 6.10 show the isopleths for off-site recreationists for the current RME risk and future RME risk, respectively. As shown in these figures, the highest off-site isopleth for the estimated RME risk is 1×10^{-7}. As discussed in Section 6.4, the estimated RME cancer risk is 4×10^{-7} for the current and future emissions scenarios.

6.5.4 Sensitive Receptors

For each type of sensitive receptor located within the 1×10^{-7} isopleth for off-site residents, cancer risks were estimated. The estimated cancer risks, which are summarized in Table 6.7, are conservative as they assume full-time residency at each location. As shown in Table 6.7, the maximum estimated risk for all sensitive receptors is less than 1×10^{-6}.

6.6 Acute Hazard Indices for an Individual at the Site Boundary

In order to evaluate the potential for acute health effects, the maximum one hour concentration estimated at the Site boundary was compared with the acute RELs presented in Section 3. As discussed in Section 3.2.2, the maximum one-hour concentration was conservatively used for comparison even for chemicals with RELs for longer averaging periods than one hour.

The results of this comparison are presented in Table 6.8. As shown in this table, no individual chemical exceeded their corresponding acute REL. The chemicals with the highest HQs were benzene (0.6), chloroform (0.2), formaldehyde (0.2), hydrofluoric acid (0.2), sulfuric acid (0.2), and nitric acid (0.1). The total HI is 1.6 for the current scenario and 1.7 for the future scenario.

Table 6.9 presents the total acute HIs for different toxic endpoints. The maximum total acute HI was estimated to be 0.8 for reproductive/development effects. The major chemical contributor to this HI was benzene.

6.7 On-Site Worker Monitoring Data Compared to Occupational Standards

As discussed in Section 5.4, area and personal sampling results were used to evaluate potential exposure to on-site workers. The sampling results are compared to Cal-OSHA PELs in Table 6.10. As shown on this table, all sampling results were below the chemical-specific PELs. The maximum concentration of vinyl chloride represented the highest percentage of its PEL at approximately 70%. Follow-up monitoring for vinyl chloride has not detected the presence of vinyl chloride. Additional monitoring and evaluation is continuing.

6.8 Uncertainties

The estimated cancer risks and noncancer HIs presented in this risk assessment are based on numerous assumptions, most of which are considered conservative. Both generic and site-specific assumptions are used to estimate the air concentrations, human exposures, chemical toxicity, and associated cancer and noncancer health risks. As a result of the cumulative effects of these conservative assumptions, the calculated risks are likely to overestimate actual risks.

Some of the assumptions used in this risk assessment are particularly uncertain or have a particularly strong influence on the estimated risks. The following section summarizes some of the uncertainties resulting from various assumptions used in the risk assessment.

6.9.1 Characterization of Waste Composition

The characterization of the liquid organic and aqueous organic waste stream was based on one representative year of data. The characterization of the lab pack waste stream was based on one representative two-week sample of data. Although these characterizations are based on discrete time periods, results from longer or more recent time periods are unlikely to be substantially different as both time periods represent receipts from numerous waste generators. Estimated health risks would likely decrease as the trend is to switch from more toxic to less toxic chemicals.

6.9.2 Selection of Chemicals for Risk Assessment

In order to select chemicals for the risk assessment, several different screening methods were used based on a chemical's relative toxicity, abundance in the projected waste stream and volatility. Although the risk assessment did not evaluate all chemicals identified on the master facility chemical list, the selected chemicals account for over 99% of the total screening scores (see Appendix A). Therefore, risks from additional chemicals should contribute only minimally to the total risks presented here.

6.9.3 Estimation of Representative Exposure Concentrations

In order to estimate representative exposure concentrations, emissions were estimated and air dispersion modeling was performed. A number of conservative assumptions were used in the emissions estimation. In addition, three sources of emissions discussed below were included in the future emissions scenario that the facility is likely to eliminate in the near future. The air dispersion modeling also has some conservatism built into the analysis.

In performing emissions estimations, data is gathered from available sources (e.g., facility documents, facility personnel, source tests, etc.) and research is done to determine emission factors (e.g., reviewing local and/or USEPA guidance). When particular information is unavailable for a specific source or a standard emissions estimation methodology/emission factor is not available, assumptions are made to estimate emissions. In this analysis, a number of conservative assumptions were used. These conservative assumptions are noted in Section 5.0 and include the following:

- Used the higher of two estimated throughput amounts for the lab pack processing area;
- Assumed that there were fugitive emissions from drum washing;
- Used the permit limit for emissions of HCl from the boiler;
- Assumed that there was liquid in 10% of the volume of the sieves which may be emitted during regeneration of the sieves; and
- Used the highest emission factor available from the USEPA's AP-42 (USEPA 1998) for emissions from truck washing.

Currently, there are three existing troughs at the Site that are used to catch any potential liquid spills when the hoses used for transferring material between storage tanks and processing units are disconnected from the pipes on the tanks. The three troughs, listed in descending order of annual emission rates, are called the Truck Loading/Unloading Liquid Transfer Area, the 35" Column Trough, and the 36" Column Trough. Currently, the facility is developing a new material transfer system that will not require the removal of hoses from pipe connectors, and therefore, will eliminate liquid spills and the need for the troughs.

According to Site personnel, the elimination of the troughs will occur in two phases. The first phase, "Transfer One", will eliminate the Truck Loading/Unloading Liquid Transfer Area. The facility plans to complete this first phase by June 1, 2001. In the modeled future emissions scenario, the Truck Loading/Unloading Liquid Transfer Area contributes 16% of the estimated RME cancer risk for an off-site resident. Therefore, once the Truck Loading/Unloading Liquid Transfer Area is eliminated, the estimated RME cancer risk for the future scenario for an off-site resident will be 2.6×10^{-6}. The second phase, "Transfer Two", will start to eliminate the 35" Column Trough and the 36" Column Trough. Currently, there is not a projected date for completion of elimination of the 35" Column Trough and the 36" Column Trough. Once all troughs are eliminated, the estimated RME cancer risk for the future scenario for an off-site resident will be 2.4×10^{-6}.

The air dispersion modeling for this risk assessment used 10 years of local meteorological data (five years of data from two sites). Typically, five years of local meteorological data are used in the preparation of health risk assessments in accordance with guidelines from CAPCOA for the California Air Toxics "Hot Spots" AB 2588 program (CAPCOA 1993). However, in conferring with the BAAQMD regarding the meteorological data available for this analysis, it was determined that the BAAQMD San Carlos meteorological data and the Moffet Naval Air Station meteorological data may be

equally appropriate for representing the region in which the Site is located. In order to ensure that the dispersion modeling was conservative, meteorological data from the two local monitoring stations were used and the set that resulted in the highest off-site concentrations was chosen to represent the typical atmospheric dispersion characteristics of the ambient air.

6.9.4 Estimation of Human Exposure to Chemicals

Numerous assumptions are made in the estimation of human exposure to chemicals. These assumptions include parameters such as daily breathing rates and human activity patterns. Most of the exposure assumptions used in the calculation of risks and HIs are default assumptions recommended by USEPA and Cal/EPA, and are often the upper 90th or 95th percentile values. The combination of several upper-bound estimates used as exposure parameters to calculate chemical intake may substantially overestimate chemical intake. The risk and HIs calculated in this risk assessment are therefore likely to be greater than levels to which the evaluated populations would be exposed.

6.9.5 Toxicity Assessment

There are a number of uncertainties in conducting a toxicity assessment. The primary areas of uncertainty include the assumption that adverse effects observed in animal experiments would also be observed in humans (animal-to-human extrapolation), and that the toxic effects observed after exposure by one route would occur following exposure by a different route (route-to-route extrapolation (e.g., ingestion vs. inhalation)). Uncertainties in the toxicological assessments for carcinogens and noncarcinogens are discussed below.

<u>Carcinogens</u>

First, the use of animal data presents an uncertainty in predicting carcinogenicity in humans. While many substances are carcinogenic in one or more animal species, only a small number of substances are known to be human carcinogens, raising the possibility that not all animal carcinogens are human carcinogens and that not all human carcinogens are animal carcinogens. To prevent the underestimation of carcinogenic risk, regulatory agencies generally assume that humans are at least as sensitive to carcinogens as the most sensitive animal species.

Because most CSFs are an upper 95th percentile estimate of potency, and because upper 95th percentiles of probability distributions are not strictly additive, the total estimated cancer risk for an exposure pathway may become artificially more conservative as risks from a number of different carcinogens are summed. Similarly, substances with different weights of evidence for human carcinogenicity are summed equally, giving as much weight to group B or C carcinogens as to group A carcinogens. This too may contribute to an artificially conservative estimate of cancer risk.

An additional uncertainty factor is whether a chemical is a carcinogen or not. As discussed in Section 3.2.1.1, carcinogens are categorized into Groups (A through E) based on a qualitative determination of the likelihood of it being a human carcinogen.

All chemicals included in the quantitative assessment were categorized as Group A or B1/B2 except 1,1-dichloroethene (1,1-DCE) which is categorized as a Group C. This chemical comprises approximately 0.06 percent of the total waste stream received at the Site. Chemicals included in Group C are considered possible human carcinogens by USEPA. According to DTSC (1991), Group C carcinogens may or may not be included in the analysis. This decision is left up to the project officer.

As Cal/EPA does not consider 1,1-DCE to be a carcinogen, this chemical was not included in the quantitative risk assessment. If 1,1-DCE were evaluated using the USEPA CSF, this would increase the estimated risks. For off-site residents, the estimated incremental cancer risk due to exposure to 1,1-DCE itself would be 2×10^{-6} for the AEI under the current and future emissions scenarios (as compared to a total estimated cancer risk of 7×10^{-7} calculated in this assessment) and 8×10^{-6} for the RME under the current and future emissions scenarios (as compared to a total estimated cancer risk of 3×10^{-6} calculated in this risk assessment). For off-site workers, the estimated incremental cancer risk due to exposure to 1,1-DCE itself would be 3×10^{-6} for the AEI under the current and future emissions scenarios (as compared to a total estimated cancer risk of 1×10^{-6}) and 2×10^{-5} for the RME under the current and future emissions scenarios (as compared to a total estimated cancer risk of 7×10^{-6} calculated in this risk assessment).

Finally, the development of CSFs for carcinogens is predicated on the assumption generally made by regulatory agencies that no threshold exists for carcinogens (i.e., that there is some risk of cancer at all exposure levels above zero). The no-threshold hypothesis for carcinogens, however, has not been proven and may not be valid for substances that have been shown to be carcinogenic via other mechanisms (e.g., mechanisms that do not appear to act directly on genetic material).

Noncarcinogens

In order to adjust for uncertainties that arise from the use of animal data, regulatory agencies often base the RfD and RfC for noncarcinogenic effects on the most sensitive animal species (i.e., the species that experiences adverse effects at the lowest dose). The doses are then adjusted via the use of safety or uncertainty factors. The adjustment compensates for the lack of knowledge regarding interspecies extrapolation and guards against the possibility that humans are more sensitive than the most sensitive experimental animal species tested. The use of uncertainty factors is considered to be health protective. In addition, when route-specific toxicity data were lacking, one route was extrapolated to another (i.e., oral to inhalation). Due to the absence of contrary data, equal absorption rates are assumed for both routes.

6.9.6 Calculation of Risks

As discussed in Section 3.0, most CSFs are an upper 95th percentile estimate of potency. Because upper 95th percentiles of probability distributions are not strictly additive, the total estimated cancer risk may become artificially more conservative as risks from a number of different carcinogens are summed. Similarly, we summed the chronic HQs of

chemicals not expected to induce the same type of effects or that do not act by the same mechanism. This tends to overestimate the total estimated chronic HI.

The USEPA (1989) notes that the conservative assumptions used in a risk assessment are intended to assure that the estimated risks do not underestimate the actual risks posed by a site and that the estimated risks do not necessarily represent actual risks experienced by populations at or near a site. By using standardized conservative assumptions in a risk assessment, USEPA further states that:

> "These values [risk estimates] are upperbound 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."

The estimated risks in this risk assessment are based primarily on a series of conservative assumptions related to predicted environmental concentrations, exposure, and chemical toxicity. The use of conservative assumptions tends to produce upper-bound estimates of risk. Although it is difficult to quantify the uncertainties associated with all the assumptions made in this risk assessment, the use of conservative assumptions is likely to result in substantial overestimates of exposure, and hence, risk.

6.10 References

California Air Pollution Control Officers Association (CAPCOA). 1993. Air Toxics "Hot Spots" Program. Revised 1992 Risk Assessment Guidelines. October.

United States Environmental Protection Agency (USEPA). 1989. Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part A). Interim Final. Office of Emergency and Remedial Response. EPA-540/1-89/002. Washington, D.C. December.

United States Environmental Protection Agency (USEPA). 1992. Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised. Office of Air and Radiation, Office of Air Quality Planning and Standards. EPA-454/R-92-019. Research Triangle Park, North Carolina. October.

United States Environmental Protection Agency (USEPA). 1998. Compilations of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources. November.

TABLE 6.1
Summary of Human Health Risk - Current
Romic Facility, East Palo Alto, California

Population	Cancer Risk		Adult Hazard Index		Child Hazard Index	
	Average Exposed Individual (AEI)	Reasonable Maximum Exposure (RME)	Average Exposed Individual (AEI)	Reasonable Maximum Exposure (RME)	Average Exposed Individual (AEI)	Reasonable Maximum Exposure (RME)
Actual Receptor Areas						
Resident	6.8E-07	3.0E-06	0.015	0.023	0.047	0.053
Worker	1.2E-06	6.6E-06	0.041	0.062	-	-
Recreational Visitor	3.0E-08	3.8E-07	0.001	0.002	0.002	0.008

TABLE 6.2
Summary of Human Health Risk - Future
Romic Facility, East Palo Alto, California

Population	Cancer Risk		Adult Hazard Index		Child Hazard Index	
	Average Exposed Individual (AEI)	Reasonable Maximum Exposure (RME)	Average Exposed Individual (AEI)	Reasonable Maximum Exposure (RME)	Average Exposed Individual (AEI)	Reasonable Maximum Exposure (RME)
Actual Receptor Areas						
Resident	7.2E-07	3.1E-06	0.016	0.024	0.049	0.055
Worker	1.2E-06	7.0E-06	0.043	0.066	-	-
Recreational Visitor	3.2E-08	4.1E-07	0.001	0.002	0.002	0.008

Chemical	Emission Source																				Total Risk for Chemical
	Laboratory	Drum Liquefaction	Lab Pack	Triple Scrubber/Boiler Emissions Abatement System	Bio System (Tank Farm K)	Drum Sampling	Consolidation	Fueling Station	Component Leaks	Drum Storage	Truck Sampling	Tank Farms I and J and Two Troughs	Tank Farms C, L, and R	Tank Farm A and Loading Area	Tank Farms M NO and U and Sieves	Tank Farms H and T	Tank Farm Q	Tank Farm G	Tank Farm D	Truck Washing	
1,2-DICHLOROETHANE	6.7E-10	0.0E+00	0.0E+00	1.1E-10	3.7E-10	4.8E-10	3.2E-10	0.0E+00	1.1E-09	1.3E-08	9.1E-11	7.0E-09	1.1E-08	1.8E-08	8.1E-09	4.8E-10	1.1E-08	8.1E-10	1.2E-09	1.9E-10	7.4E-08
1,4-DIOXANE	1.4E-10	0.0E+00	0.0E+00	2.3E-11	7.8E-11	1.0E-10	6.9E-11	0.0E+00	2.4E-10	2.7E-09	1.9E-11	1.4E-09	1.6E-09	3.4E-09	1.1E-09	6.7E-11	1.6E-09	1.1E-10	1.6E-10	4.0E-11	1.3E-08
2-NITROPROPANE	6.0E-09	0.0E+00	0.0E+00	9.9E-10	3.3E-09	4.3E-09	2.9E-09	0.0E+00	1.0E-08	1.1E-07	8.2E-10	4.7E-08	0.0E+00	1.1E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E-09	3.0E-07
ACRYLONITRILE	1.8E-10	0.0E+00	0.0E+00	3.0E-11	1.0E-10	1.3E-10	8.9E-11	0.0E+00	3.1E-10	3.4E-09	2.5E-11	1.4E-09	0.0E+00	3.3E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.2E-11	9.1E-09
BENZENE	5.2E-09	0.0E+00	7.3E-12	1.1E-09	2.9E-09	3.8E-09	2.5E-09	0.0E+00	9.0E-09	9.8E-08	7.1E-10	5.5E-08	9.1E-08	1.4E-07	6.6E-08	3.9E-09	9.1E-08	6.6E-09	9.4E-09	1.5E-09	5.9E-07
CARBON TETRACHLORIDE	1.1E-09	0.0E+00	0.0E+00	1.9E-10	6.3E-10	8.2E-10	5.5E-10	0.0E+00	2.0E-09	2.2E-08	1.6E-10	1.3E-08	2.8E-08	3.5E-08	2.0E-08	1.2E-09	2.8E-08	2.0E-09	2.9E-09	3.2E-10	1.6E-07
CHLOROFORM	3.6E-09	0.0E+00	0.0E+00	5.9E-10	2.0E-09	2.6E-09	1.8E-09	0.0E+00	6.2E-09	6.8E-08	4.9E-10	3.6E-08	5.1E-08	9.2E-08	3.7E-08	2.2E-09	5.1E-08	3.7E-09	5.2E-09	1.0E-09	3.6E-07
FORMALDEHYDE	9.8E-10	0.0E+00	5.2E-10	4.2E-09	5.4E-10	7.0E-10	4.7E-10	0.0E+00	1.7E-09	1.8E-08	1.3E-10	7.6E-09	0.0E+00	1.8E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.8E-10	5.3E-08
GASOLINE	2.5E-09	0.0E+00	6.2E-13	4.1E-10	1.4E-09	1.8E-09	1.2E-09	4.4E-09	4.3E-09	4.7E-08	3.4E-10	3.8E-08	1.2E-07	1.1E-07	8.8E-08	5.2E-09	1.2E-07	8.6E-09	1.2E-08	7.1E-10	5.7E-07
HYDRAZINE	4.2E-09	0.0E+00	0.0E+00	6.9E-10	2.3E-09	3.0E-09	2.0E-09	0.0E+00	7.3E-09	7.9E-08	5.8E-10	3.3E-08	0.0E+00	7.7E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-09	2.1E-07
METHYLENE CHLORIDE	4.5E-09	0.0E+00	1.4E-11	7.5E-10	2.5E-09	3.3E-09	2.2E-09	0.0E+00	7.8E-09	8.6E-08	6.2E-10	4.7E-08	7.5E-08	1.2E-07	5.4E-08	3.2E-09	7.6E-08	5.4E-09	7.7E-09	1.3E-09	5.0E-07
PROPYLENE OXIDE	3.0E-10	0.0E+00	0.0E+00	4.9E-11	1.6E-10	2.1E-10	1.4E-10	0.0E+00	5.1E-10	5.6E-09	4.0E-11	2.3E-09	0.0E+00	5.4E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.4E-11	1.5E-08
TETRACHLOROETHENE	2.6E-10	0.0E+00	0.0E+00	4.2E-11	1.4E-10	1.8E-10	1.2E-10	0.0E+00	4.4E-10	4.8E-09	3.5E-11	2.6E-09	3.5E-09	6.5E-09	2.5E-09	1.5E-10	3.5E-09	2.5E-10	3.6E-10	7.3E-11	2.5E-08
TRICHLOROETHENE	4.9E-10	0.0E+00	0.0E+00	8.1E-11	2.7E-10	3.5E-10	2.4E-10	0.0E+00	8.4E-10	9.3E-09	6.7E-11	5.0E-09	7.5E-09	1.3E-08	5.4E-09	3.2E-10	7.6E-09	5.5E-10	7.8E-10	1.4E-10	5.2E-08
URETHANE	6.0E-10	0.0E+00	0.0E+00	9.8E-11	3.3E-10	4.3E-10	2.9E-10	0.0E+00	1.0E-09	1.1E-08	8.2E-11	4.8E-09	8.0E-10	1.1E-08	5.6E-10	3.3E-11	7.8E-10	5.8E-11	8.4E-11	1.7E-10	3.3E-08
VINYL CHLORIDE	1.8E-11	0.0E+00	0.0E+00	3.0E-12	1.0E-11	1.3E-11	8.8E-12	0.0E+00	3.1E-11	3.4E-10	2.5E-12	1.4E-10	0.0E+00	3.3E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.2E-12	9.1E-10
Total for Source	3.1E-08	0.0E+00	5.5E-10	9.4E-09	1.7E-08	2.2E-08	1.5E-08	4.4E-09	5.3E-08	5.8E-07	4.2E-09	3.0E-07	3.9E-07	7.6E-07	2.8E-07	1.7E-08	3.9E-07	2.8E-08	4.0E-08	8.8E-09	3.0E-06

Chemical	Emission Source																							Total Risk for Chemical
	Laboratory	Drum Liquefaction	Lab Pack	Triple Scrubber/Boiler Emissions Abatement System	Bio System (Tank Farm K)	Drum Sampling	Consolidation	Fueling Station	Component Leaks	Drum Storage	Truck Sampling	Tank Farms I and J and Two Troughs	Tank Farms C, L, and R	Tank Farm A and Loading Area	Tank Farms M NO and U and Sieves	Tank Farms H and T	Tank Farm Q	Tank Farm G	Tank Farm D	Tank Farm E	Tank Farm F	Truck Washing	Soil Gas	
1,2-DICHLOROETHANE	6.7E-10	0.0E+00	0.0E+00	1.1E-10	3.7E-10	4.8E-10	3.2E-10	0.0E+00	1.8E-09	1.3E-08	9.1E-11	8.9E-09	1.1E-08	1.8E-08	8.6E-09	1.7E-09	1.2E-08	8.1E-10	6.7E-10	9.8E-11	4.5E-13	1.9E-10	0.0E+00	7.8E-08
1,4-DIOXANE	1.4E-10	0.0E+00	0.0E+00	2.3E-11	7.8E-11	1.0E-10	6.9E-11	0.0E+00	3.8E-10	2.7E-09	1.9E-11	1.6E-09	1.6E-09	3.4E-09	1.2E-09	2.3E-10	1.6E-09	1.1E-10	9.3E-11	1.4E-11	6.2E-14	4.0E-11	0.0E+00	1.3E-08
2-NITROPROPANE	6.0E-09	0.0E+00	0.0E+00	9.9E-10	3.3E-09	4.3E-09	2.9E-09	0.0E+00	1.6E-08	1.1E-07	8.2E-10	4.7E-08	0.0E+00	1.1E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E-09	0.0E+00	3.1E-07
ACRYLONITRILE	1.8E-10	0.0E+00	0.0E+00	3.0E-11	1.0E-10	1.3E-10	8.9E-11	0.0E+00	4.9E-10	3.4E-09	2.5E-11	1.4E-09	0.0E+00	3.3E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.2E-11	0.0E+00	9.3E-09
BENZENE	5.2E-09	0.0E+00	7.3E-12	1.1E-09	2.9E-09	3.8E-09	2.5E-09	0.0E+00	1.4E-08	9.8E-08	7.1E-10	7.0E-08	9.1E-08	1.4E-07	6.9E-08	1.3E-08	9.6E-08	6.6E-09	5.4E-09	8.0E-10	3.7E-12	1.5E-09	0.0E+00	6.2E-07
CARBON TETRACHLORIDE	1.1E-09	0.0E+00	0.0E+00	1.9E-10	6.3E-10	8.2E-10	5.5E-10	0.0E+00	3.0E-09	2.2E-08	1.6E-10	1.8E-08	2.8E-08	3.5E-08	2.1E-08	4.2E-09	2.9E-08	2.0E-09	1.7E-09	2.5E-10	1.1E-12	3.2E-10	0.0E+00	1.7E-07
CHLOROFORM	3.6E-09	0.0E+00	0.0E+00	5.9E-10	2.0E-09	2.6E-09	1.8E-09	0.0E+00	9.6E-09	6.8E-08	4.9E-10	4.5E-08	5.1E-08	9.2E-08	3.9E-08	7.6E-09	5.3E-08	3.7E-09	3.0E-09	4.5E-10	2.1E-12	1.0E-09	0.0E+00	3.8E-07
FORMALDEHYDE	9.8E-10	0.0E+00	5.2E-10	4.2E-09	5.4E-10	7.0E-10	4.7E-10	0.0E+00	2.6E-09	1.8E-08	1.3E-10	7.6E-09	0.0E+00	1.8E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.8E-10	0.0E+00	5.4E-08
GASOLINE	2.5E-09	0.0E+00	6.2E-13	4.1E-10	1.4E-09	1.8E-09	1.2E-09	4.4E-09	6.6E-09	4.7E-08	3.4E-10	5.8E-08	1.2E-07	1.1E-07	9.3E-08	1.8E-08	1.3E-07	8.6E-09	7.1E-09	1.1E-09	5.0E-12	7.1E-10	0.0E+00	6.1E-07
HYDRAZINE	4.2E-09	0.0E+00	0.0E+00	6.9E-10	2.3E-09	3.0E-09	2.0E-09	0.0E+00	1.1E-08	7.9E-08	5.8E-10	3.3E-08	0.0E+00	7.7E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-09	0.0E+00	2.1E-07
METHYLENE CHLORIDE	4.5E-09	0.0E+00	1.4E-11	7.5E-10	2.5E-09	3.3E-09	2.2E-09	0.0E+00	1.2E-08	8.6E-08	6.2E-10	6.0E-08	7.5E-08	1.2E-07	5.7E-08	1.1E-08	7.9E-08	5.4E-09	4.4E-09	6.7E-10	3.1E-12	1.3E-09	0.0E+00	5.3E-07
PROPYLENE OXIDE	3.0E-10	0.0E+00	0.0E+00	4.9E-11	1.6E-10	2.1E-10	1.4E-10	0.0E+00	7.9E-10	5.6E-09	4.0E-11	2.3E-09	0.0E+00	5.4E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.4E-11	0.0E+00	1.5E-08
TETRACHLOROETHENE	2.6E-10	0.0E+00	0.0E+00	4.2E-11	1.4E-10	1.8E-10	1.2E-10	0.0E+00	6.8E-10	4.8E-09	3.5E-11	3.2E-09	3.5E-09	6.5E-09	2.7E-09	5.1E-10	3.6E-09	2.5E-10	2.1E-10	3.0E-11	1.4E-13	7.3E-11	0.0E+00	2.7E-08
TRICHLOROETHENE	4.9E-10	0.0E+00	0.0E+00	8.1E-11	2.7E-10	3.5E-10	2.4E-10	0.0E+00	1.3E-09	9.3E-09	6.7E-11	6.3E-09	7.5E-09	1.3E-08	5.7E-09	1.1E-09	7.9E-09	5.5E-10	4.5E-10	6.5E-11	3.0E-13	1.4E-10	0.0E+00	5.5E-08
URETHANE	6.0E-10	0.0E+00	0.0E+00	9.8E-11	3.3E-10	4.3E-10	2.9E-10	0.0E+00	1.6E-09	1.1E-08	8.2E-11	4.9E-09	8.0E-10	1.1E-08	5.9E-10	1.1E-10	8.1E-10	5.8E-11	4.8E-11	6.4E-12	3.0E-14	1.7E-10	0.0E+00	3.3E-08
VINYL CHLORIDE	1.8E-11	0.0E+00	0.0E+00	3.0E-12	1.0E-11	1.3E-11	8.8E-12	0.0E+00	4.9E-11	3.4E-10	2.5E-12	1.4E-10	0.0E+00	3.3E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.2E-12	0.0E+00	9.3E-10
Total for Source	3.1E-08	0.0E+00	5.5E-10	9.4E-09	1.7E-08	2.2E-08	1.5E-08	4.4E-09	8.2E-08	5.8E-07	4.2E-09	3.7E-07	3.9E-07	7.6E-07	3.0E-07	5.8E-08	4.1E-07	2.8E-08	2.3E-08	3.5E-09	1.6E-11	8.8E-09	0.0E+00	3.1E-06

Chemical	Emission Source																				Total Risk for Chemical
	Laboratory	Drum Liquefaction	Lab Pack	Triple Scrubber/Boiler Emissions Abatement System	Bio System (Tank Farm K)	Drum Sampling	Consolidation	Fueling Station	Component Leaks	Drum Storage	Truck Sampling	Tank Farms I and J and Two Troughs	Tank Farms C, L, and R	Tank Farm A and Loading Area	Tank Farms M NO and U and Sieves	Tank Farms H and T	Tank Farm Q	Tank Farm G	Tank Farm D	Truck Washing	
1,2-DICHLOROETHANE	1.6E-09	0.0E+00	0.0E+00	6.6E-12	1.4E-09	3.2E-10	1.3E-10	0.0E+00	3.7E-09	1.5E-08	1.2E-10	1.7E-08	2.6E-08	5.8E-08	1.7E-08	1.1E-09	2.1E-08	2.2E-09	2.7E-09	5.0E-10	1.7E-07
1,4-DIOXANE	3.4E-10	0.0E+00	0.0E+00	1.4E-12	3.1E-10	6.8E-11	2.7E-11	0.0E+00	7.9E-10	3.1E-09	2.7E-11	3.2E-09	3.6E-09	1.1E-08	2.3E-09	1.5E-10	2.9E-09	3.0E-10	3.8E-10	1.1E-10	2.9E-08
2-NITROPROPANE	1.4E-08	0.0E+00	0.0E+00	6.0E-11	1.3E-08	2.9E-09	1.1E-09	0.0E+00	3.4E-08	1.3E-07	1.1E-09	1.1E-07	0.0E+00	3.5E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.5E-09	6.7E-07
ACRYLONITRILE	4.3E-10	0.0E+00	0.0E+00	1.8E-12	3.9E-10	8.7E-11	3.4E-11	0.0E+00	1.0E-09	4.0E-09	3.4E-11	3.4E-09	0.0E+00	1.1E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-10	2.0E-08
BENZENE	1.2E-08	0.0E+00	0.0E+00	6.7E-11	1.1E-08	2.5E-09	9.8E-10	0.0E+00	2.9E-08	1.1E-07	9.8E-10	1.3E-07	2.1E-07	4.6E-07	1.4E-07	8.7E-09	1.7E-07	1.8E-08	2.2E-08	4.0E-09	1.3E-06
CARBON TETRACHLORIDE	2.7E-09	0.0E+00	0.0E+00	1.1E-11	2.5E-09	5.5E-10	2.2E-10	0.0E+00	6.4E-09	2.5E-08	2.1E-10	3.2E-08	6.4E-08	1.1E-07	4.2E-08	2.7E-09	5.2E-08	5.4E-09	6.7E-09	8.6E-10	3.6E-07
CHLOROFORM	8.6E-09	0.0E+00	0.0E+00	3.6E-11	7.8E-09	1.7E-09	6.8E-10	0.0E+00	2.0E-08	7.9E-08	6.8E-10	8.6E-08	1.2E-07	3.0E-07	7.7E-08	4.9E-09	9.5E-08	9.9E-09	1.2E-08	2.7E-09	8.2E-07
FORMALDEHYDE	2.3E-09	0.0E+00	0.0E+00	2.5E-10	2.1E-09	4.7E-10	1.8E-10	0.0E+00	5.5E-09	2.1E-08	1.8E-10	1.8E-08	0.0E+00	5.8E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.4E-10	1.1E-07
GASOLINE	5.9E-09	0.0E+00	0.0E+00	2.5E-11	5.4E-09	1.2E-09	4.7E-10	5.7E-09	1.4E-08	5.4E-08	4.7E-10	9.0E-08	2.7E-07	3.5E-07	1.8E-07	1.2E-08	2.3E-07	2.3E-08	2.9E-08	1.9E-09	1.3E-06
HYDRAZINE	1.0E-08	0.0E+00	0.0E+00	4.2E-11	9.1E-09	2.0E-09	7.9E-10	0.0E+00	2.4E-08	9.2E-08	7.9E-10	7.8E-08	0.0E+00	2.5E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.2E-09	4.7E-07
METHYLENE CHLORIDE	1.1E-08	0.0E+00	0.0E+00	4.5E-11	9.8E-09	2.2E-09	8.6E-10	0.0E+00	2.5E-08	9.9E-08	8.5E-10	1.1E-07	1.7E-07	3.9E-07	1.1E-07	7.2E-09	1.4E-07	1.4E-08	1.8E-08	3.4E-09	1.1E-06
PROPYLENE OXIDE	7.0E-10	0.0E+00	0.0E+00	2.9E-12	6.4E-10	1.4E-10	5.6E-11	0.0E+00	1.7E-09	6.4E-09	5.5E-11	5.5E-09	0.0E+00	1.7E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.2E-10	3.3E-08
TETRACHLOROETHENE	6.1E-10	0.0E+00	0.0E+00	2.6E-12	5.6E-10	1.2E-10	4.8E-11	0.0E+00	1.4E-09	5.6E-09	4.8E-11	6.1E-09	8.0E-09	2.1E-08	5.2E-09	3.3E-10	6.5E-09	6.8E-10	8.4E-10	1.9E-10	5.7E-08
TRICHLOROETHENE	1.2E-09	0.0E+00	0.0E+00	4.9E-12	1.1E-09	2.3E-10	9.2E-11	0.0E+00	2.8E-09	1.1E-08	9.2E-11	1.2E-08	1.7E-08	4.2E-08	1.1E-08	7.2E-10	1.4E-08	1.5E-09	1.8E-09	3.7E-10	1.2E-07
URETHANE	1.4E-09	0.0E+00	0.0E+00	5.9E-12	1.3E-09	2.8E-10	1.1E-10	0.0E+00	3.3E-09	1.3E-08	1.1E-10	1.1E-08	1.8E-09	3.7E-08	1.2E-09	7.5E-11	1.4E-09	1.6E-10	1.9E-10	4.5E-10	7.3E-08
VINYL CHLORIDE	4.3E-11	0.0E+00	0.0E+00	1.8E-13	3.9E-11	8.7E-12	3.4E-12	0.0E+00	1.0E-10	4.0E-10	3.4E-12	3.4E-10	0.0E+00	1.1E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-11	2.0E-09
Total for Source	7.3E-08	0.0E+00	0.0E+00	5.7E-10	6.7E-08	1.5E-08	5.8E-09	5.7E-09	1.7E-07	6.7E-07	5.8E-09	7.2E-07	8.9E-07	2.5E-06	5.9E-07	3.7E-08	7.3E-07	7.5E-08	9.3E-08	2.3E-08	6.6E-06

Chemical	Emission Source																							Total Risk for Chemical
	Laboratory	Drum Liquefaction	Lab Pack	Triple Scrubber/Boiler Emissions Abatement System	Bio System (Tank Farm K)	Drum Sampling	Consolidation	Fueling Station	Component Leaks	Drum Storage	Truck Sampling	Tank Farms I and J and Two Troughs	Tank Farms C, L, and R	Tank Farm A and Loading Area	Tank Farms M NO and U and Sieves	Tank Farms H and T	Tank Farm Q	Tank Farm G	Tank Farm D	Tank Farm E	Tank Farm F	Truck Washing	Soil Gas	
1,2-DICHLOROETHANE	1.6E-09	0.0E+00	0.0E+00	6.6E-12	1.4E-09	3.2E-10	1.3E-10	0.0E+00	4.7E-09	1.5E-08	1.2E-10	2.1E-08	2.6E-08	5.8E-08	1.8E-08	3.7E-09	2.2E-08	2.2E-09	1.6E-09	9.3E-11	5.6E-13	5.0E-10	0.0E+00	1.8E-07
1,4-DIOXANE	3.4E-10	0.0E+00	0.0E+00	1.4E-12	3.1E-10	6.8E-11	2.7E-11	0.0E+00	1.0E-09	3.1E-09	2.7E-11	3.8E-09	3.6E-09	1.1E-08	2.5E-09	5.1E-10	3.0E-09	3.0E-10	2.2E-10	1.3E-11	7.8E-14	1.1E-10	0.0E+00	3.0E-08
2-NITROPROPANE	1.4E-08	0.0E+00	0.0E+00	6.0E-11	1.3E-08	2.9E-09	1.1E-09	0.0E+00	4.2E-08	1.3E-07	1.1E-09	1.1E-07	0.0E+00	3.5E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.5E-09	0.0E+00	6.7E-07
ACRYLONITRILE	4.3E-10	0.0E+00	0.0E+00	1.8E-12	3.9E-10	8.7E-11	3.4E-11	0.0E+00	1.3E-09	4.0E-09	3.4E-11	3.4E-09	0.0E+00	1.1E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-10	0.0E+00	2.1E-08
BENZENE	1.2E-08	0.0E+00	0.0E+00	6.7E-11	1.1E-08	2.5E-09	9.8E-10	0.0E+00	3.7E-08	1.1E-07	9.8E-10	1.7E-07	2.1E-07	4.6E-07	1.4E-07	3.0E-08	1.8E-07	1.8E-08	1.3E-08	7.5E-10	4.6E-12	4.0E-09	0.0E+00	1.4E-06
CARBON TETRACHLORIDE	2.7E-09	0.0E+00	0.0E+00	1.1E-11	2.5E-09	5.5E-10	2.2E-10	0.0E+00	8.0E-09	2.5E-08	2.1E-10	4.3E-08	6.4E-08	1.1E-07	4.4E-08	9.3E-09	5.5E-08	5.4E-09	3.9E-09	2.3E-10	1.4E-12	8.6E-10	0.0E+00	3.8E-07
CHLOROFORM	8.6E-09	0.0E+00	0.0E+00	3.6E-11	7.8E-09	1.7E-09	6.8E-10	0.0E+00	2.5E-08	7.9E-08	6.8E-10	1.1E-07	1.2E-07	3.0E-07	8.1E-08	1.7E-08	1.0E-07	9.9E-09	7.0E-09	4.2E-10	2.6E-12	2.7E-09	0.0E+00	8.6E-07
FORMALDEHYDE	2.3E-09	0.0E+00	0.0E+00	2.5E-10	2.1E-09	4.7E-10	1.8E-10	0.0E+00	6.9E-09	2.1E-08	1.8E-10	1.8E-08	0.0E+00	5.8E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.4E-10	0.0E+00	1.1E-07
GASOLINE	5.9E-09	0.0E+00	0.0E+00	2.5E-11	5.4E-09	1.2E-09	4.7E-10	5.7E-09	1.7E-08	5.4E-08	4.7E-10	1.4E-07	2.7E-07	3.5E-07	1.9E-07	4.1E-08	2.4E-07	2.3E-08	1.6E-08	1.0E-09	6.3E-12	1.9E-09	0.0E+00	1.4E-06
HYDRAZINE	1.0E-08	0.0E+00	0.0E+00	4.2E-11	9.1E-09	2.0E-09	7.9E-10	0.0E+00	3.0E-08	9.2E-08	7.9E-10	7.8E-08	0.0E+00	2.5E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.2E-09	0.0E+00	4.7E-07
METHYLENE CHLORIDE	1.1E-08	0.0E+00	0.0E+00	4.5E-11	9.8E-09	2.2E-09	8.6E-10	0.0E+00	3.2E-08	9.9E-08	8.5E-10	1.4E-07	1.7E-07	3.9E-07	1.2E-07	2.5E-08	1.5E-07	1.4E-08	1.0E-08	6.3E-10	3.8E-12	3.4E-09	0.0E+00	1.2E-06
PROPYLENE OXIDE	7.0E-10	0.0E+00	0.0E+00	2.9E-12	6.4E-10	1.4E-10	5.6E-11	0.0E+00	2.1E-09	6.4E-09	5.5E-11	5.5E-09	0.0E+00	1.7E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.2E-10	0.0E+00	3.3E-08
TETRACHLOROETHENE	6.1E-10	0.0E+00	0.0E+00	2.6E-12	5.6E-10	1.2E-10	4.8E-11	0.0E+00	1.8E-09	5.6E-09	4.8E-11	7.5E-09	8.0E-09	2.1E-08	5.5E-09	1.1E-09	6.8E-09	6.8E-10	4.9E-10	2.8E-11	1.7E-13	1.9E-10	0.0E+00	6.0E-08
TRICHLOROETHENE	1.2E-09	0.0E+00	0.0E+00	4.9E-12	1.1E-09	2.3E-10	9.2E-11	0.0E+00	3.5E-09	1.1E-08	9.2E-11	1.5E-08	1.7E-08	4.2E-08	1.2E-08	2.5E-09	1.5E-08	1.5E-09	1.0E-09	6.2E-11	3.8E-13	3.7E-10	0.0E+00	1.2E-07
URETHANE	1.4E-09	0.0E+00	0.0E+00	5.9E-12	1.3E-09	2.8E-10	1.1E-10	0.0E+00	4.2E-09	1.3E-08	1.1E-10	1.2E-08	1.8E-09	3.7E-08	1.2E-09	2.5E-10	1.5E-09	1.6E-10	1.1E-10	6.1E-12	3.7E-14	4.5E-10	0.0E+00	7.4E-08
VINYL CHLORIDE	4.3E-11	0.0E+00	0.0E+00	1.8E-13	3.9E-11	8.7E-12	3.4E-12	0.0E+00	1.3E-10	4.0E-10	3.4E-12	3.4E-10	0.0E+00	1.1E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-11	0.0E+00	2.0E-09
Total for Source	7.3E-08	0.0E+00	0.0E+00	5.7E-10	6.7E-08	1.5E-08	5.8E-09	5.7E-09	2.2E-07	6.7E-07	5.8E-09	8.7E-07	8.9E-07	2.5E-06	6.2E-07	1.3E-07	7.7E-07	7.5E-08	5.4E-08	3.3E-09	2.0E-11	2.3E-08	0.0E+00	7.0E-06

Table 6.7
Estimated Cancer Risk for Maximum Sensitive Receptors
Romic Facility, East Palo Alto, California

Sensitive Receptor Type	Total Cancer Risk			
	RME		Average	
	Current	Future	Current	Future
School	6.0E-07	6.3E-07	<1E-7	<1E-7
Daycare Center	6.6E-07	7.0E-07	1.5E-07	1.6E-07
Health Care Facility	<1E-7	<1E-7	<1E-7	<1E-7
Senior Home	2.3E-07	2.4E-07	<1E-7	<1E-7

Table 6.8
Acute Hazard Indices for an Individual at the Site Boundary
Romic Facility, East Palo Alto, California

Chemical	Acute Reference Exposure Level (µg/m^3)	(µg/m^3)		Acute Hazard Quotient		Does Maximum Concentration Exceed the Acute REL?
		Current	Future	Current	Future	
1,1,1-TRICHLOROETHANE	68,000	94	99	0.001	0.001	No
1,4-DIOXANE	3,000	2.9	3.1	0.001	0.001	No
2-BUTANONE	13,000	0.29	0.29	0.00002	0.00002	No
2-ETHOXYETHANOL	370	11	12	0.03	0.03	No
ACRYLIC ACID	6,000	0.0049	0.0049	0.000001	0.000001	No
AMMONIA	3,200	1.5	1.5	0.0005	0.0005	No
BENZENE	1,300	787	788	0.6	0.6	No
CARBON DISULFIDE	6,200	5.8	6.0	0.0009	0.001	No
CARBON TETRACHLORIDE	1,900	5.5	5.8	0.003	0.003	No
CHLORINE	210	1.1	1.1	0.005	0.005	No
CHLOROFORM	150	27	28	0.2	0.2	No
EPICHLOROHYDRIN	1,300	0.0090	0.0093	0.00001	0.00001	No
FORMALDEHYDE	94	19	19	0.2	0.2	No
HYDROCHLORIC ACID	2,100	43	43	0.02	0.02	No
HYDROFLUORIC ACID	240	42	46	0.2	0.2	No
HYDROGEN SULFIDE	42	0.060	0.061	0.001	0.001	No
ISOPROPYL ALCOHOL	3,200	83	87	0.03	0.03	No
METHANOL	28,000	512	535	0.02	0.02	No
METHYLENE CHLORIDE	14,000	818	857	0.06	0.06	No
NITRIC ACID	86	10.5	10.6	0.1	0.1	No
PHENOL	5,800	0.23	0.24	0.00004	0.00004	No
PROPYLENE OXIDE	3,100	9.6	9.9	0.003	0.003	No
STYRENE	21,000	0.074	0.076	0.000004	0.000004	No
SULFURIC ACID	120	22	22	0.2	0.2	No
TETRACHLOROETHENE	20,000	7.2	7.6	0.0004	0.0004	No
TOLUENE	37,000	206	215	0.006	0.006	No
TRIETHYLAMINE	2,800	7	8	0.003	0.003	No
VINYL CHLORIDE	180,000	0.26	0.26	0.000001	0.000001	No
XYLENE (MIXED ISOMERS)	22,000	45	47	0.002	0.002	No
Total Hazard Index				1.6	1.7	

Table 6.9
Acute Hazard Quotient for an Individual Summed by Toxic Endpoint
Romic Facility, East Palo Alto, California

Chemical	Repiratory System	Central Nervous System	Reproductive/ Development Effects	Eye Irritation
1,1,1-TRICHLOROETHANE		0.001		
1,4-DIOXANE	0.001			0.001
2-BUTANONE	0.00002			0.00002
2-ETHOXYETHANOL			0.03	
ACRYLIC ACID	0.0000002			
AMMONIA	0.0003			0.0003
BENZENE			0.6	
CARBON DISULFIDE			0.001	
CARBON TETRACHLORIDE			0.003	
CHLORINE	0.005			
CHLOROFORM			0.2	
EPICHLOROHYDRIN	0.000007			0.000007
FORMALDEHYDE				0.1
HYDROCHLORIC ACID	0.01			0.01
HYDROFLUORIC ACID	0.2			0.2
HYDROGEN SULFIDE	0.001			
ISOPROPYL ALCOHOL	0.03			0.03
METHANOL		0.02		
METHYLENE CHLORIDE		0.06		
NITRIC ACID	0.1			
PHENOL	0.00004			0.00004
PROPYLENE OXIDE	0.003			0.003
STYRENE	0.000004			0.000004
SULFURIC ACID	0.2			
TETRACHLOROETHENE	0.0004	0.0004		0.0004
TOLUENE	0.006	0.006		0.006
TRIETHYLAMINE		0.003		0.003
VINYL CHLORIDE	0.000001	0.000001		0.000001
XYLENE (MIXED ISOMERS)	0.002			0.002
Total for Target Organ	0.6	0.09	0.8	0.4

TABLE 6.10
Comparison of Measured Concentrations to Permissible Exposure Limits (PELs) for an On-Site Worker
Romic Facility, East Palo Alto, California

Chemical	Number of Samples	Number of Detects	Range of Detected 8-Hour TWA Concentrations (ppm)	PEL (ppm)[a]	% of PEL[b]
1,1,1-TRICHLOROETHANE	6	6	0.031 - 1	350	0.3%
1,2,4-TRIMETHYLBENZENE	6	3	0.042 - 0.075	25	0.3%
1,3,5-TRIMETHYLBENZENE	6	3	0.026 - 0.5	25	2%
2-BUTANONE	14	10	0.097 - 46	200	23%
ACETONE	3	3	1.3 - 11	750	1%
ARSENIC	1	1	0.00017	0.003	6%
BENZENE	11	2	0.043 - 0.07	1	7%
CHLOROFORM	6	3	0.028 - 0.13	2	7%
CYCLOHEXANE	6	1	0.12	300	0.04%
D-LIMONENE	6	1	0.053	—[d]	—
ETHYLBENZENE	6	4	0.042 - 0.2	100	0.2%
HEXANE[c]	8	4	0.063 - 11	50	22%
M/P-XYLENE[e]	6	4	0.15 - 0.69	100	0.7%
METHYL ISOBUTYL KETONE	3	3	0.18 - 1.2	50	2%
METHYL n-AMYL KETONE	2	2	0.08 - 0.36	50	1%
METHYL TERT BUTYL ETHER	6	4	0.028 - 0.7	—[d]	—
METHYLENE CHLORIDE	15	13	0.13 - 10	25	40%
N-BUTYL ACETATE	6	5	0.1 - 1.2	150	0.8%
N-HEPTANE	6	4	0.15 - 0.53	400	0.1%
O-XYLENE[e]	6	4	0.045 - 0.18	100	0.2%
STYRENE	10	1	1.1	50	2%
TETRACHLOROETHYLENE	14	7	0.1 - 1.4	25	6%
TETRAHYDROFURAN	3	3	0.22 - 3.8	200	2%
TOLUENE	14	10	0.093 - 12	50	24%
TRICHLOROETHYLENE	6	1	0.046	25	0.2%
VINYL CHLORIDE	15	13	0.047 - 0.7	1	70%

Notes:

[a] California Code of Regulations (CCR) Section 5155.

[b] % of PEL = Maximum 8-hour air concentration / PEL x 100

[c] The value listed is the PEL for n-Hexane, which reflect the most conservative PEL for Hexane.

[d] A PEL was not available for this chemical.

[e] The xylene PEL was used for m & p-xylene and o-xylene.

7.0 EVALUATION OF NON-ROUTINE RELEASES

This section presents the evaluation of off-site impacts that could result from potential accidental or "non-routine" releases. The evaluation consists of identifying potential accidental release scenarios, estimating the ambient air concentrations that could result from these release scenarios, and comparing the estimated ambient air concentrations to health levels of concern. This evaluation followed the methodology outlined in the approved HRA work plan (ENVIRON 1999a) and non-routine releases modeling protocol (ENVIRON 2000). This evaluation parallels the federal risk management plan program methodology (USEPA 1999).

Section 7.1 describes the characterization of the non-routine release scenarios including the selection of a worst-case chemical and the characterization of a potential release. Section 7.2 presents a discussion of the emissions and dispersion modeling conducted to estimate the potential off-site impacts. This section also includes a discussion of the procedures followed. Section 7.3 presents the results of the evaluation and a discussion of the selected threshold levels of concern.

7.1 Description of Non-Routine Release Scenarios

The HRA work plan described the "non-routine" release analysis as an evaluation of the impacts of three types of "non-routine" releases associated with operations at the Site. The three types of potential "non-routine" releases are:

(1) A spill from a truck transporting material to or from the Site
(2) An accidental release of material at the Site from a tank
(3) An explosion or fire at the Site

In characterizing the hypothetical scenario for evaluation, the maximum credible scenario was considered for each type of release. A maximum credible scenario was selected on the basis of its potential as a scenario, as described in the approved work plan. In selecting the appropriate scenario to be considered, ENVIRON reviewed with Romic personnel the facility's operations and layout, emergency response protocols, as well as the response protocol that would be followed by transporters of materials to and from the Site.

The methodology used for selecting the representative chemical and the release quantity of each chemical is discussed in detail for each scenario. The methodology is based on the available facility information regarding its processes, storage, and transportation logistics. The local emergency responders' protocols and the facility's emergency response protocols have also been considered in characterizing the scenarios.

7.1.1 Scenario 1: Off-Site Release

The first potential scenario considered was an off-site spill that could occur as result of a truck accident. Based on current operations, most of the total volume of materials shipped to and from the Site consists of blended fuel, lacquer wash, wastewater or refined product. Materials are transported either as mixtures to the Site or as processed product from the Site via truck, typically in 55-gallon drums or in tankers. Large bulk volume

products, such as blended fuel, are transported via tanker truck in volumes of 2,500 or 5,000 gallons. Reclaimed products, such as solvents, are transported in either 55-gallon drums or in tankers. Wastewater typically comes in 55-gallon drums or tankers from customers. A release from a truck could result in a pool of liquid on the ground outside the truck. Evaporation of material and wind entrainment from the pool before the spill is mitigated would result in ambient air concentrations of the spilled material.

The trucks delivering and shipping material from the facility use a route through a neighborhood that is partially residential (see Figure 7.1). To maximize the potential exposure to chemicals emitted from any spill, the location of the hypothetical spill scenario was placed at the intersection of two main roads along the route between the highway exit/entrance and the Site.

We have taken into consideration, in modeling the reasonable worst-case spill scenario, the physical aspects of a typical intersection. For example, most intersections (including the subject intersection) are slightly sloped towards the corners to promote drainage from the intersection. Most intersections also have storm sewer drains or other means of carrying away rainwater from the intersection. In modeling the spill, we have assumed that the spill would cover one quarter of the intersection. We assumed that the spill would not spread into other sections of the intersection because of the inherent design of a typical intersection.

A driver of any motor vehicle transporting hazardous materials must receive training that covers general awareness/familiarization with his duties, safety and any function-specific aspects of his job, such as transport of hazardous waste. In addition, the driver must receive training on the safe operation of the motor vehicle that will be transporting hazardous materials (49 CFR 177.816). Romic drivers have undergone the required training.

The reasonable worst-case receptor for this scenario was assumed to have the following exposure to vapors emitted from the spill. At the time of the hypothetical spill, the receptor would be ten meters from the spill and would be exposed for up to five minutes to the five-minute peak average concentration. We assumed that emergency responders would clear bystanders from the area up to five minutes after the spill occurred and move the hypothetical reasonable worst-case receptor to at least 100 meters from the spill. The receptor could be exposed up to 25 minutes to the 25-minute peak concentration at 100 meters from the spill. A thirty-minute time-weighted average concentration would estimated from these two phases of the receptor's exposure as follows:

$$\frac{[\text{5-minute peak concentration}] \times [\text{5 minutes}] + [\text{25-minute peak concentration}] \times [\text{25 minutes}]}{\text{30 minutes}}$$

We also considered a receptor that would be exposed up to 55 minutes to the 55-minute peak concentration at 100 meters from the spill. A 60-minute time-weighted average would be estimated in the same manner as the 30-minute time-weighted average.

The typical chemicals, quantity and unit volume for transport for the various material

streams received and shipped by the Site were based on operations data, waste manifest data and evaluations conducted by Romic personnel.

As discussed in further discussed in Section 7.2, the chemical selected for this scenario was a tanker truck of 100% methanol.

7.1.2 Scenario 2: On-Site Release

The second scenario considered is the release of a chemical on-site from a storage tank. The effect of passive mitigation measures (such as dikes or berms) and emergency response protocols (such as prompt spill removal by vacuum truck) were considered in the evaluation of this scenario. The facility has emergency response protocols in place for promptly responding to any spills. Since Romic personnel are constantly present in all process and storage areas of the Site 24 hours per day, it is likely that identification and response to any spill would be rapid. The use of a vacuum truck to remove any spilled substance is the standard facility spill response protocol.

For this scenario, we considered the storage in tanks of liquids at the facility. For example, refined product solvents are stored in the tank farm closest to potential off-site receptors (Tank Farm Q). Blended fuel is typically stored in Tank Farm I, which is also close to the boundary closest to residential receptors. We considered the material stored in both these tank farms in selecting the chemical to be modeled for this scenario. Based on the chemical ranking for this scenario, Tank Farm Q as the site for the hypothetical spill because the chemical selected is stored here in the volume considered in the ranking. Figure 7.2 depicts the location of Tank Farm Q.

The reasonable worst-case receptor for this scenario was assumed to be the closest residential receptor. This point is approximately 410 meters from the edge of the tank farm, west of the Site.

As discussed further in Section 7.2, this scenario will consider the release of 12,000 gallons of 100% 1,1,1-trichloroethane into the bermed area of Tank Farm Q.

7.1.3 Scenario 3: Fire/Explosion

The third non-routine release scenario considered is a fire and/or explosion at the Site. As discussed in this section, analyses conducted as part of the facility's safety program conclude that a scenario in which more than three safety systems or features fail simultaneously to be unlikely[6]. The discussion presented here is an overview of Romic's site history and safety systems. This evaluation parallels the federal risk management program, in that the site history, process safety management and potential for off-site consequence impacts were considered.

[6] ENVIRON has discussed the facility's safety systems and safety studies with various facility personnel, including Mr. Bob Platz and Ms. Regina Colbert of Colbert and Associates.

First, a discussion of the site history of fire and explosions for the past five years is presented. Then process safety management at the Site is discussed including the safety systems implemented at the Site and inherent in the Site's design. Finally, the potential for off-site consequence impacts resulting from a fire and/or explosion at the Site is discussed.

7.1.3.1 Site History

Since 1995, the Site has not had a fire or explosion with significant off-site impacts. In December 1999, the Site did have two smoldering roll-off boxes. The Menlo Park Fire Department and the South County Fire District conducted investigations. The cause of the smoldering was believed to be the inadvertent combination of solid materials contaminated with incompatible solvents. The combination of these materials resulted from an inaccurate characterization by the waste generator. No off-site impacts from this incident were reported by any regulatory agency. The response time by both fire departments was six minutes.

The Site has implemented additional safety procedures for the consolidation of solid hazardous waste into roll-off boxes to prevent future incidents, as follows:

- Romic will require customers that use generic solid-like terms (e.g., bottles, rags, plastic, etc.) to extensively list all hazardous constituents on the profile.

- Romic has re-examined and revised the current list of approved and disapproved hazard categories for consolidation.

- Romic's Standard Operating Procedures have been revised as follows:

  -The waste tracking of containers during the consolidation process will occur on a real-time basis.

  -If at any time during the sorting process, hazardous waste does not conform to the profile or procedures, Romic will stop the sorting process, place the waste back into the container, and resolve the issue with the customer.

  -Romic will continue to consolidate hazardous waste with less than 20% by weight VOCs. They also will use roll-off containers with closures to meet the requirements of "Subpart CC" Level 1 Control Standards.

  -At the request of DTSC inspectors (Tuesday, February 22, 20000, Romic will no longer continually purge the roll-off containers with nitrogen. Instead, Romic will conduct one initial purge of the headspace within the roll-off containers prior to sealing at appropriate intervals during the processing day and after working hours. Nitrogen purging is conducted to

ensure that there is no buildup of potentially combustible gases within the space inside the roll-off box.

7.1.3.2 Process Safety Systems and Design Features

According to Romic engineering staff, Romic's safety systems and operational features are designed and implemented to prevent fires and explosions. They are comprised of four categories:

- Fire/explosion prevention systems and process unit design features
- Fire/explosion suppression and response systems
- Process safety program elements implemented to prevent fire/explosions
- Material profiling and management

The following descriptions of these four basic categories of fire/explosion preventative systems are based on information from facility personnel:

<u>Fire/Explosion Prevention Systems and Process Unit Design Features</u>:
The inherent design of the Site prevents fires and explosions by addressing the potential ignition and fuel sources. Potential ignition sources could include sparking from metal to metal contact, sparking from electrical contacts, and high temperature surfaces. Possible fuel sources for a fire and/or explosion include vapor pockets in and out of units.

The units at the Site can be categorized as either storage units or process units. Each unit has several inherent design features to prevent fire and/or explosion. In addition, piping and transfer devices between units have back flow protection to prevent the spread of any fires. Process lines have automatic valve shutoffs for isolating problems in the line or in a unit. Secondary containment, also referred to as bermed tank farms, prevent the spread of liquids and isolate groups of tanks.

Storage units are not heated or pressurized. They are typically ambient pressure tanks with self-sealing pressure relief valves and vacuum breakers to prevent incidents related to pressure changes in excess of the tanks' design parameters. Some small pressure changes occur in tanks, resulting from operational activities (such as filling and emptying) and storage conditions (resulting from ambient temperature changes). These small pressure changes are normal and are incorporated into the safety design of a storage tank.

Storage tanks are located within secondary containment. There are no mechanical ignition or sparking sources near any tanks. Any instrumentation or electrical devices (such as pumps and motors) used at or near the tanks are intrinsically safe. Electric devices certified as "intrinsically safe", as defined by American Petroleum Institute (API) standards and Underwood Laboratory (UL) standards, means that they are either low-voltage and/or non-sparking. All electric devices used in the plant are certified "intrinsically safe".

Storage tanks are grounded so as to prevent the build-up of static electrical charge. Access ways on a tank are all rubber- or Teflon-gasketed so as to prevent sparks upon closing the port door. Sampling ports on tanks have either valves or are made of aluminum to prevent the generation of sparks in opening and closing the sampling port doors.

Process units can be heated and/or under pressure or vacuum. All heating systems in process units are indirect. This means that heated process units are heated with water/steam via a heat exchanger or with submerged steam coils within the unit. There is no direct flame or electric heating elements used in process units. The only combustion unit at the Site is the boiler. The boiler burns natural gas to produce steam. The boiler is a certified unit, commonly used in industry and deemed to be a very safe type of operation. The boiler is not involved in directly processing hazardous materials. Materials in the boiler are confined to natural gas, water/steam and scrubbed exhaust streams from the triple scrubber system.

Steam produced at the plant is water saturated steam at a maximum pressure of 135 pounds per square inch (psi). At this pressure, the maximum temperature of the steam is approximately 325°F. This is not hot enough to ignite any of the materials handled by Romic. In addition, the steam delivery system at the Site uses valves that fail closed. This means that in the event of a power failure or a line failure, the valves on the steam delivery lines automatically close and hence isolate any problem. In the event of a problem down line, the boiler would discharge steam via a condensate tank that vents to the atmosphere, hence eliminating the potential for pressure build-up. All steam piping is specified to withstand up to 350 psi, almost three times the maximum steam pressure produced at the Site. In addition, all valves on steam lines are over-designed to withstand pressures far in excess of the maximum steam pressure at the Site. Steam lines are not located near any storage tanks and are isolated both to minimize heat loss and to ensure there are no exposed hot surfaces.

There are also process units that are under a slight pressure (e.g., the reboilers). Although the pressure in these units does not reach "pressure vessel" levels, the vessel design does conform to pressure vessel standards set by the American Society of Mechanical Engineers (ASME). Furthermore, process units that are pressurized have pressure differential monitors that sound alarms if the pressure increases inside the units above the setpoint. The alarm setpoint is set to well below the vessel's rupture point. In addition, these units have re-sealable pressure relief devices to vent in the case of excess pressure. Process units also have level controls to prevent over-filling.

The drum liquefaction system are nitrogen-blanketed and maintained under positive pressure to further mitigate the potential for a fire. A nitrogen blanket system pumps nitrogen gas into a closed unit continuously, thereby lowering or entirely displacing oxygen in the vapor space within the unit and preventing

reactive vapors from oxidizing (burning). Nitrogen flow meters are used to ensure a constant flow of nitrogen.

Fire/Explosion Suppression and Response Systems:
Automatic and manual water and/or aqueous film forming foam (AFFF) sprinkler systems are in all parts of the Site: process lines, tank farms, warehouses and office buildings. The fire suppression systems are intrinsically safe. The warehouse and process line systems are both automatic and are set off by heat sensors, as well as manually triggered. The tank farm systems are manual (i.e., are turned on by an operator in response to a fire). There are Romic personnel at all times in and around all tank farms and the warehouses. All fire suppression systems are automatically tied into the Menlo Park and Palo Alto Fire Departments response networks.

In addition, the Site has an emergency response team in place for communicating with emergency responders. Fire trucks and emergency responders can be at the Site in the event of an emergency in less than two minutes. The Site also has manual compressed nitrogen fire extinguishers located in several locations. The Site emergency response plan is coordinated with the Menlo Park and Palo Alto Fire Departments. The fire department conducts an annual routine inspection as well as several surprise inspections per year.

Process Safety Program:
The Site has a Process Safety Management (PSM) program in place, including safe operating procedures for handling the different types of materials processed by Romic. The program also includes a process hazard analysis, training for employees and contractors, a mechanical integrity program, a hot work permit program, management of change procedures, as well as an incident investigation program. Each of these program components is discussed below.

Process Hazard Analysis. Romic, in developing its PSM program, undertook a process hazard analysis in which units at the Site were evaluated for potential causes of upset conditions. All aspects of a process were reviewed to identify possible operational hazards. The process hazard analysis was conducted using a Hazard Operability Study (HAZOP) methodology and a "what-if" checklist. Safe work practices and operations procedures incorporate the results of the process hazard analysis.

Training. Employees are trained in the identification of preventative measures to reduce the likelihood of fire/explosion at the Site. Employees receive extensive training prior to assuming duties, as well as annual refresher courses. All employees have received HAZWOPER training and refresher courses are conducted annually. Employees are trained in hazardous materials handling procedures. In the labpack operations where small quantities of a wide range of chemicals are received and handled, professional chemists handle the material to ensure a high level of safety. Employees are also trained on the automatic and

manual fire response systems, and undergo extensive material release response training. Contractors are also trained in Romic's safety rules and emergency alarms. Heavy tools used by employees and contractors must be non-sparking (i.e., either brass or rubber-coated). Electric devices (such as radios, tools and instrumentation) must be certified intrinsically safe. Operation of vehicles is restricted in the process area.

All Romic drivers go through a 24-hour HAZWOPER training course which meets the requirement of 49 CFR Part 172 Subpart G. This training includes among other things: proper maintenance of shipping papers and manifests; labels, placards and markings required for shipping; pre-transportation packaging; loading, transporting; unloading, and how to respond in the event of a spill, leak or other emergency.

The driver must receive thorough training in the applicable requirements of 49 CFR Parts 390 to 397 (Federal Motor Carrier Safety Regulations) and the procedures necessary for the safe operation of the motor vehicle. The driver's training includes the following:

- Pre-trip inspection
- Use of vehicle controls and equipment, including operation of emergency equipment;
- Operation of maneuvering tunnels, bridges, and railroad crossings;
- Operation of vehicle, i.e., safe turning, backing, braking and parking
- Requirement pertaining to attendance of vehicles, parking, smoking, routing and incident reporting, and
- Loading and unloading materials (compatibility and segregation of cargo in a mixed load, package handling methods and securement)

Maintenance and Inspection. A mechanical integrity program is implemented at the Site in order to ensure standardized work practices and equipment design maintenance. Under this program, the Site operates an extensive preventative maintenance program in which all equipment is inspected on a routine basis. Every process unit is mechanically inspected at least quarterly. The facility's certified electrician conducts a thorough inspection of all motors and other electric devices annually, checking for burns and fraying. The electrician also conducts visual non-intrusive inspections of all electric units monthly. The boiler is inspected at least annually. Visual inspections of all storage and process units are conducted daily.

Hot Work. Any spark-producing activity requires a Hot Work Permit if conducted outside the welding shop. Prior to Hot Work Permit activities, the work area is taped off. This usually means that the entire tank farm is cordoned off. The work area is thoroughly wet down and a fire extinguisher is placed nearby. Lock-out and tag-out procedures are in place to prevent the operation of electric equipment during maintenance of these units. Tanks are emptied and

steam-cleaned prior to any repair work. A monitor is used inside and outside the tank to monitor oxygen, carbon monoxide and organic vapors. The monitor is continuously operated throughout the activity. Once the hot work is completed, a fire watch conducts final gas testing of the area and remains on-site a minimum of thirty minutes to ensure no smoldering or fire breaks out.

Management of Change. Management of change procedures have been developed and are in place in order to ensure that changes which are not "in-kind" are evaluated on the basis of process safety. Changes include unit changes as well as process stream changes. A management of change report is filed in advance of any change and is reviewed by a committee to ensure that the change is consistent with current operating procedures and safety precautions.

Incident Investigation. The incident investigation program ensures that any incidents or "near misses" are thoroughly investigated, documented and if necessary, appropriate changes to procedures are implemented to prevent future incidents. The safety committee convenes monthly and review any incidents related to worker or operations safety. Any reported incidents are discussed and preventative measures are discussed and implemented in order to avoid future incidents.

Materials Profiling and Management:
Prior to receiving any hazardous waste at the Site, a material is profiled and pre-approved by Romic for processing. The material's physical parameters and compatibility with other materials is ascertained and a treatment method is identified for the material. This information is in Romic's materials database and is accessed whenever the material is handled by Romic operators via a barcode system. Once the material is received by Romic, the material is sampled to confirm the profile. If the analysis does not fully confirm the materials' composition and physical parameters (such as specific gravity), the material is isolated and is either returned to the generator or is profiled appropriately.

Each unit of material received at the Site is uniquely labeled with a barcode and electronically verified with hand-held computers that are tied into the facility's main database. Because each quantity of hazardous waste is profiled with respect to its contents, physical characteristics and parameters, the material is handled appropriately at all points of transfer in the process. The unique label accompanies the material throughout the process and is verified by computer prior to combining with any other material. The computer will also flag any incompatible combinations prior to transferring the material, thus ensuring that chemical reactions that could lead to fire and/or explosions do not occur.

7.1.3.3 Potential for Off-Site Impacts.
Romic conducted a hazard evaluation of their processes. Facility staff personnel interviewed by ENVIRON concluded that it is unlikely that more than three safety systems could fail simultaneously causing a fire or explosion at the Site,

especially as several of these systems are intrinsic design features of the units themselves. Romic does not believe that it is likely that the worst-case scenario, in the event of less than three safety system failures, would be a fire and/or explosion. Based on discussions with plant safety personnel, it appears unlikely that three simultaneous safety system failures could occur; hence, a quantitative evaluation of the potential impacts that could result from a fire and/or explosion at the Site was not conducted.

7.2 Air Dispersion Modeling - Non-Routine Releases

7.2.1 Chemical Selection

The selection of the chemical and the quantity of the chemical released in the hypothetical scenarios considered in this evaluation were selected based on a ranking system. The ranking score for each chemical for each scenario was the product of the typical quantity of chemical (either pure or in a mixture) handled and/or stored, the vapor pressure of the chemical (either saturated if pure form or partial pressure if in a mixture) and the inverse of the ERPG-3 level. The chemical with the highest ranking was selected to be modeled in the scenario. Tables 7.1 and 7.2 present the ranking of chemicals considered for each scenario and the parameters that were used in the ranking.

The chemicals considered for each scenario were selected from the master list of chemicals submitted to DTSC (ENVIRON 1999b). The master list of chemicals was developed by Romic based on a review of manifests from the 1997 and 1998 fiscal years, along with marketing projections and test data. The selection focused on chemicals that could volatilize during an accidental release. A list of the typical quantities shipped on and off-site via truck was prepared for the first scenario. A list of typical quantities stored on-site in the various tank farms close to the boundaries of the facility was developed for second scenario. Table 7.1 and 7.2 list this information for each chemical for the first and second scenario respectively.

The acute toxicity values used to rank these chemicals are the American Industrial Hygiene Association (AIHA) Emergency Response Planning Guidelines Level 3 (ERPG-3) exposure limit. Table 7.1 and 7.2 lists the ERPG-3 for each chemical that was considered in this evaluation for each scenario.

Because the emissions of a chemical that would result from a spill is directly proportional to the chemical's vapor pressure and quantity, a ranking based on the product of these two variables will indicate the potential for exposure relative to the other chemicals. In addition, by including the inverse of the ERPG-3 level, a measure of the acute toxicity is incorporated into the ranking in order to ensure that highly toxic chemicals will retain a high ranking and will be considered for modeling. The chemical with the highest ranking was evaluated. Tables 7.1 and 7.2 present the relative ranking for each chemical for Scenario 1 and 2, respectively.

7.2.2 Source Parameters

Scenario 1. The size of the pool was assumed to be one-quarter of the area of the street intersection, assuming that street curbs would limit the extent of the pool area and the inherent design of the intersection, common to many intersections, would maintain the liquid in a corner of the intersection. Many intersections of main roads are designed to promote drainage of rainwater so as to prevent flooding. Storm water sewers also assist in the draining of liquids in an intersection.

A release from a truck could result in a pool of liquid on the ground outside the truck. As a component of a maximum credible scenario, response time of emergency crews from both the facility and from community emergency responders has been considered. The Menlo Park Fire Department is only a few blocks from Romic's truck route, for example. We assumed that it would take up to five minutes for emergency responders to appear on the scene of the spill and evacuate the area and commence mitigation of the spill. In actuality, it is likely that the driver, who carries spill mitigation materials, would have already commenced containment and mitigation of the spill. We assumed it could take up to 60 minutes to mitigate and suppress all emissions from the spill. This is highly conservative. In actuality, it would only take a few minutes to spread foam or absorbent onto a liquid spill, essentially limiting evaporative emissions from the spill.

Scenario 2. The release of the contents of a tank of 1,1,1-trichloroethane (a refined product) typically stored in a 12,000 tank in Tank Farm Q was evaluated. This tank farm is the closest tank farm to the residential receptors. Figure 7.2 depicts the location of a potential tank release in Tank Farm Q.

The Site has emergency response protocols in place for promptly responding to any spills. Since Romic personnel are constantly present in all process and storage areas of the plants 24 hours per day, it is likely that identification and response to any spill would be rapid. The use of a vacuum truck to remove any spilled substance is the standard spill response protocol. A spill from a ruptured tank would be limited in size by the berm walls around the tank farm. All tank farms at the Site are bermed. Hence, the exposed area from which volatilization could occur would be the bermed area minus the cross sectional area of any tanks within the berms. We assumed that, despite the likelihood of immediate clean-up by on-site vacuum trucks, that the evaporation resulting from this spill could last up to one hour.

7.2.3 Meteorological Conditions

The meteorological conditions used in this evaluation were based on historical meteorological data from BAAQMD approved monitoring sites. Ten years of consecutive, local historical meteorological data were evaluated. Five years of data were from the San Carlos BAAQMD meteorological station in San Carlos, California and five years were from the Moffet Field Naval Air Station in Mountain View, California. This meteorological data has been approved by the BAAQMD for conducting the dispersion modeling for the evaluation of routine releases in the HRA.

The meteorological conditions that affect the evaporation and dispersion of the spilled material in the atmosphere include temperature, wind speed and atmospheric stability (degree of turbulence in the atmosphere). As it is a combination of these three parameters that characterizes the conditions that lead to volatilization and release of emissions from spills, three possible combinations were considered.

High temperatures would typically lead to a large degree of turbulence in the atmosphere. Emissions into this type of atmosphere would be quickly diluted and dispersed leading to low atmospheric concentrations. However, high temperatures would also lead to a greater rate of evaporative emissions, leading to high atmospheric concentrations.

Wind speed is another meteorological parameter that would impact the resulting ambient concentrations by two different mechanisms. A high wind speed can increase the rate of evaporation, and hence the rate of emission into the atmosphere, leading to high ambient concentrations. However, a high wind speed would also typically increase the rate of dilution and dispersion of the emissions in the atmosphere, leading to lower ambient concentrations.

Atmospheric stability would also affect the ambient concentrations that could result from evaporation of a spilled chemical. Atmospheric stability is a measure of the turbulence in the atmosphere. An unstable atmosphere will generally lead to dilution of the emissions in the atmosphere and rapid dispersion. A stable atmosphere will generally lead to less dilution in the atmosphere and a slower dispersion of the emissions.

The Site typically accepts and receives material from 7 a.m. to 3:30 p.m. unless specially arranged. Therefore, meteorological conditions during daytime hours (7 a.m. to 4 p.m.) were evaluated in modeling the dispersion of emissions for the off-site spill scenario. All hours of meteorological data were considered for the on-site spill scenario.

The first set of meteorological conditions considered was the hour with the maximum windspeed. All the meteorological conditions during the selected hour, including the atmospheric stability and temperature, have been used to characterize the meteorology for both scenarios.

The second set of meteorological conditions considered was the maximum temperature. Again, the other meteorological conditions occurring during this hour, including the windspeed and atmospheric stability were used in the evaluation.

The third set of meteorological conditions considered were based on identifying the hour during the ten years of historical meteorological data under consideration that recorded the most stable atmosphere (i.e. minimum dilution) coincident with the highest temperature recorded for that stability class. Table 7.3 and 7.4 present the potential meteorological conditions that were selected in modeling the emissions and dispersion of emissions from a spill off-site and on-site, respectively. The same meteorological scenarios were considered for each scenario.

It was found that the third set of meteorological conditions (most stable atmosphere, 1 m/s windspeed and an ambient temperature of 21.65°C), resulted in the highest off-site impacts resulting from both a potential off-site spill and from a potential on-site spill. This set of meteorological conditions occurred at least once in the ten years of historical meteorological data reviewed in the early morning.

7.2.4 Emissions Model

To model the emission rate of the selected chemical that would result from the evaporation of spilled material, USEPA approved emissions estimation methodologies were used. The federal Risk Management Program (RMP) plan off-site consequence analysis guidance outlines a methodology for estimating emissions from pools (USEPA 1999). This method is based on the area of the pool, the vapor pressure of the chemical in the solution released, and the meteorological conditions.

$$Q = \frac{0.284 \times U^{0.78} \times MW^{2/3} \times A \times VP}{82.05 \times T}$$

Where:

Q	=	emission rate (pounds per minute)
U	=	wind speed (meters per second)
MW	=	molecular weight
A	=	area of the pool (square feet)
VP	=	vapor pressure (millimeters mercury)
T	=	temperature of the substance (degrees Kelvin)

7.2.5 Dispersion Model

The dispersion of the emissions resulting from the release was modeled using SCREEN3. SCREEN3 is an USEPA-approved screening level Gaussian plume model in which source characteristics such as size, relative distance to a receptor and height of release, as well as meteorological conditions are used to estimate maximum one-hour concentrations. Because a spill would likely be mitigated within less than an hour, this methodology provides a conservative evaluation of the potential exposure in the event of an off-site spill. Table 7.3 and 7.4 summarize the parameters that were used in the dispersion modeling for an off-site spill and an on-site spill, respectively.

7.2.6 Short-term Averaging Periods

The short-term averaging periods of less than one hour were estimated on the basis of the one-hour averages estimated using SCREEN3. The method used (USEPA 1992) to estimate concentration averages less for time periods (t) less than 30 minutes is as follows:

$$C_t = C_{60} \; [60/t]^{0.2}$$

For estimating concentrations for time durations between 30 and 60 minutes, USEPA guidelines (USEPA 1992) recommend using the one hour concentration to represent these shorter durations.

7.3 Non-Routine Releases: Exposure Assessment Results

7.3.1 Level of Concern

The level of concern (LOC) selected for comparing one hour average concentrations that could result in either scenario was the Emergency Response Planning Guidelines – Level 3 (ERPG-3) (AIHA 1994). For comparison to a half-hour average concentration, we selected the Immediately Dangerous to Life and Health (IDLH) (NIOSH 1990).

The IDLH concentration represents the maximum concentration from which an exposed individual could escape within 30 minutes without a respirator or without experiencing any permanent health effects or effects would impair their ability to escape.

The ERPG-3 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing life-threatening health effects.

7.3.2 Summary of Results

The first scenario considered an off-site spill of a material being transported to or from the facility via truck. The highest ranked chemical was a 100% solution of methanol. As we discussed, we modeled a reasonable worst-case exposure scenario consisted of a two-part exposure to receptors. First, we assumed a receptor would be exposed to a five-minute peak concentration average for five minutes from a distance at least 10 meters from the spill, until evacuated to a more distant location at least 100 meters from the spill. From this distant location, we assumed a further exposure of 25 to 55 minutes to a 25-minute (or 55-minute) peak concentration average. From this exposure scenario, we estimate a 30-minute average exposure and a 60-minute average exposure. We compared the 30-minute average exposure to the IDLH. The IDLH for methanol is 6,000 ppm. The value of the 30-minute average exposure modeled for the off-site spill scenario is 2,715 ppm. This is less than half the IDLH. We compared the 6-minute average exposure to the ERPG-3. The ERPG-3 for methanol is 5,000 ppm. The value of the 60-minute average exposure modeled for the off-site spill scenario is 1,565 ppm. This is approximately 30% of the ERPG-3.

The second scenario considered was an on-site release of material resulting from a rupture of a storage tank. The highest ranked chemical for this scenario was 100% 1,1,1-trichloroethane. We assumed that the reasonable worst-case receptor was the closest residential receptor located at approximately 410 meters from the tank area that would store 1,1,1-trichloroethane. The IDLH for 1,1,1-trichloroethane is 700 ppm. The 30-minute concentration modeled for the on-site release scenario would be 68 ppm. This is less than 10% of the IDLH. The ERPG-3 for 1,1,1-trichloroethane is 3,500 ppm. The

60-minute concentration modeled for the on-site release scenario is 65 ppm. This is less than 20% the ERPG-3.

The third potential scenario, a fire or explosion, was not analyzed quantitatively as it does not appear likely that three simultaneous safety system failures could occur, based on discussions with plant safety personnel regarding operations and programs in place to both prevent incidents and to quickly mitigate potential incidents before they develop.

7.4 References

American Industrial Hygiene Association (AIHA). 1999. 1999 Emergency Response Planning Guidelines.

ENVIRON. 1999a. Work Plan for Human Health Risk Assessment and Ecological Risk Assessment, Part B Permit for Romic's East Palo Alto Facility. January 6.

ENVIRON. 1999b. Chemical Selection for the RCRA Part B Permit Health Risk Assessment for Romic Environmental Technologies, Corp. December 10.

ENVIRON. 2000. Romic Environmental Technologies Corporation Health Risk Assessment Modeling Protocol for Assessing "Non-Routine" Releases. March 29.

National Institute of Occupational Safety and Health (NIOSH). 1994. Pocket Guide to Chemical Hazards. Public Health Service, Center for Disease Control.

United States Environmental Protection Agency (USEPA). 1999. Risk Management Program Guidance For Off-Site Consequence Analysis. April.

United States Environmental Protection Agency. 1992 Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants (Revised) (Appendix D). EPA-454/R-92-024. December.

Table 7.1
Ranking of Chemicals for Scenario #1
Romic Facility, East Palo Alto, California

Material	Concentration[a]			Bulk Quantity Typically Transported		Specific Gravity of Mixture	Conversion Factor to Pounds	Mass of Chemical in Potential Spilled Volume (lb)[d]	Vapor Pressure in Solution (mmHg)[b]	ERPG-3 (ppm)[c]	Ranking Calculation (vapor pressure x mass of constituent/ERPG-3)	Relative Ranking[e]
	Value	Units	Note	Value	Units							
METHANOL	100	%	-	2000	gallons - tanker	0.79	8.47	1.34E+04	1.3E+02	5000	3.49E+02	1
TOLUENE	21	%	-	5000	tanker (5000 gallons) as part of lacquer wash	0.80	8.47	7.11E+03	5.4E+00	1000	3.81E+01	2
1,1,1-TRICHLOROETHANE	100	%	-	55	gallons (drum)	1.34	8.47	6.24E+02	1.2E+02	3500	2.14E+01	3
PERCHLOROETHYLENE	100	%	-	55	gallons (drum)	1.62	8.47	7.55E+02	1.8E+01	1000	1.36E+01	4
HYDROFLUORIC ACID	5	%	-	55	gallons (drum of aqueous solution)	1.00	8.47	2.33E+01	1.0E+01	50	4.66E+00	5
STYRENE	1	%	f	2500	gallons - tanker (blended fuel)	0.98	8.47	2.08E+02	5.7E-02	1000	1.17E-02	6
FORMALDEHYDE	10	%	-	55	gallons (drum of aqueous solution)	1.00	8.47	4.66E+01	1.3E+00	25	2.42E+00	7
DIMETHYLFORMAMIDE	5	%	-	2500	gallons - tanker (blended fuel)	0.98	8.47	1.04E+03	3.2E-01	200	1.65E+00	8
BENZENE	2	%	-	2500	gallons - tanker (blended fuel)	0.98	8.47	4.15E+02	3.1E+00	1000	1.30E+00	9
METHYLENE CHLORIDE	1	%	-	5000	gallons - tanker; as part of typical blended fuel	0.98	8.47	4.57E+02	7.2E+00	4000	8.27E-01	10
TRICHLOROETHENE	1	%	-	2500	gallons - tanker (blended fuel)	0.98	8.47	2.08E+02	5.8E-01	5000	2.39E-02	11
CARBON DISULFIDE	0.1	%	-	2500	gallons - tanker (blended fuel)	0.98	8.47	2.08E+01	5.2E-01	500	2.14E-02	12
CHLOROFORM	0.50	%	-	2500	gallons - tanker (blended fuel)	0.98	8.47	1.04E+02	8.8E-01	5000	1.83E-02	13
ACRYLIC ACID	1	%	-	2500	gallons - tanker (blended fuel)	0.98	8.47	2.08E+02	5.8E-02	750	1.60E-02	14
PHENOL	1	%	f	55	gallons (drum) blended fuel	0.98	8.47	4.57E+00	3.9E-03	200	8.86E-05	15
CHLOROFORM	1	%	-	2500	gallons (drum of aqueous solution)	1.00	8.47	1.06E+02	1.5E-01	5000	3.15E-03	16
CARBON TETRACHLORIDE	1000	ppm	-	2500	gallons - tanker (blended fuel)	0.98	8.47	2.08E+01	7.8E-02	750	2.14E-03	17
HYDROCHLORIC ACID	10	%	-	55	gallons (drum of aqueous solution)	1.00	8.47	4.66E+01	6.7E-03	150	2.08E-03	18
HYDROGEN SULFIDE	10	ppm	-	2500	gallons - tanker (blended fuel)	0.98	8.47	2.08E-01	5.9E-01	100	1.22E-03	19
HEXACHLOROBUTADIENE	1000	ppm	-	2500	gallons - tanker (blended fuel)	0.98	8.47	2.08E+01	7.5E-05	30	5.22E-05	20
ACRYLONITRILE	20	ppm	-	2500	gallons - tanker (blended fuel)	0.98	8.47	4.15E-01	4.1E-03	75	2.25E-05	21
PROPYLENE OXIDE	100	ppm	-		55 gallon drum (blended fuel)	0.98	8.47	4.57E-02	1.0E-01	750	6.08E-06	22
ACETALDEHYDE	10	ppm	-	2500	gallons - tanker (blended fuel)	0.98	8.47	2.08E-01	2.2E-02	1000	4.63E-06	23
SULFURIC ACID	94	%	-	55	gallons (drum of aqueous solution)	1.83	8.47	8.51E+02	2.8E-08	30	7.81E-07	24
VINYL ACETATE	10	ppm	-	2500	gallons - tanker (blended fuel)	0.98	8.47	2.08E-01	1.7E-03	500	7.20E-07	25
EPICHLOROHYDRIN	10	ppm	-	2500	gallons - tanker (blended fuel)	0.98	8.47	2.08E-01	1.8E-04	100	3.80E-07	26
ETYHLENE OXIDE	1	ppm	-	2500	gallons - tanker (blended fuel)	0.98	8.47	2.08E-02	3.3E-03	500	1.35E-07	27
SULFURIC ACID	5	%	-	5000	gallons - (tanker of aqueous solution)	1.00	8.47	2.12E+03	4.9E-10	30	3.43E-08	28
DIMETHYLFORMAMIDE	60	%	-	55	gallon drum	0.98	8.47	2.74E-04	4.0E-06	200	5.44E-12	29
CARBON TETRACHLORIDE	20	%	-	55	gallon drum	0.98	8.47	9.13E-05	1.5E-05	750	1.89E-12	30

Notes:

a - The concentration of each compound is based on the either the typical composition of lacquer wash, blended fuel, or as a pure compound. Dimethylformamide and carbon tetrachloride were evaluated as both components of blended fuel as well as components of typical 55-gallon drums in which the compounds are typically in a larger percentage.

b - The vapor pressure of each chemical in solution was estimated using Raoults law (mole fraction of the compound in solution times the pure compound vapor pressure). The molar weight of the solution would be estimated using the weighted average of the solution based on its typical composition.

c - The reference exposure levels shown are the AIHA (American Industrial Hygienists Association) Emergency Response Planning Guidelines Level 3 (ERPG-3) values.

d - The mass of the chemical used in the ranking calculation is the mass of the individual constituent in the volume of the chemical mixture that could be spilled in this scenario. Mass of chemical is calculated as the product of the concentration in the mixture, volume of mixture, and the typical specific gravity of the mixture. Specific gravity of dilute aqueous mixtures was assumed to be that of water. The facility provided the typical specific gravity of blended fuel and lacquer wash, based on measurements taken at the facility.

mass of constituent = [spill volume x specific gravity of mixture x fraction of constituent x conversion to pounds]

e - The relative ranking score are based on the product of the vapor pressure, total quantity spilled and the inverse of the reference exposure level.

f - The typical concentration of styrene and phenol in fuel blend was revised to 1% from 20% and 10%, respectively, by the facility. Styrene is not likely to be ever handled at such high concentrations, nor is phenol.

Table 7.2
Ranking of Chemicals for Scenario #2
Romic Facility, East Palo Alto, California

Material	Concentration[a]		Storage Area	Solution	Specific Gravity of Mixture	Conversion Factor to Pounds	Mass of Chemical in Potential Spilled Volume (lb)[d]	Vapor Pressure in Solution (mmHg)[b]	ERPG-3 (ppm)[c]	Ranking Calculation (vapor pressure x mass of constituent/ERPG-3)	Relative Ranking
	Value	Units									
1,1,1-TRICHLOROETHANE	100	%	Tank farm Q	refined product	1.34	8.47	1.36E+05	1.2E+02	3500	4.67E+03	1
METHANOL	100	%	Tank farm Q	refined product	0.79	8.47	8.04E+04	1.3E+02	5000	2.09E+03	2
TOLUENE	21	%	Tank farm Q	component of lacquer wash	0.80	8.47	1.71E+04	5.5E+00	1000	9.31E+01	3
TOLUENE	8.7	%	Tank farm I	component of blended fuel	0.98	8.47	8.67E+03	3.4E+00	1000	2.94E+01	4
STYRENE	1	%	Tank farm I	component of blended fuel	0.98	8.47	9.96E+02	5.7E-02	1000	5.63E-02	5
DIMETHYLFORMAMIDE	5	%	Tank farm I	component of blended fuel	0.98	8.47	4.98E+03	3.2E-01	200	7.92E+00	6
BENZENE	2	%	Tank farm Q	component of lacquer wash	0.80	8.47	1.63E+03	2.0E+00	1000	3.30E+00	7
METHYLENE CHLORIDE	1.10	%	Tank farm I	component of blended fuel	0.98	8.47	1.10E+03	7.4E+00	4000	2.02E+00	8
CHLOROFORM	0.50	%	Tank farm I	component of blended fuel	0.98	8.47	4.98E+02	8.8E-01	5000	8.77E-01	9
TRICHLOROETHENE	1	%	Tank farm I	component of blended fuel	0.98	8.47	9.96E+02	5.8E-01	5000	1.15E-01	10
CARBON DISULFIDE	0.1	%	Tank farm I	component of blended fuel	0.98	8.47	9.96E+01	5.2E-01	500	1.03E-01	11
1,1,1-TRICHLOROETHANE	0.5	%	Tank farm I	component of blended fuel	0.98	8.47	4.98E+02	6.0E-01	3500	8.53E-02	12
CHLOROFORM	1	%	Tank farm Q	component of lacquer wash	0.80	8.47	4.07E+02	6.9E-01	5000	5.59E-02	13
CARBON TETRACHLORIDE	1000	ppm	Tank farm I	component of blended fuel	0.98	8.47	9.96E+01	7.8E-02	750	1.03E-02	14
PROPYLENE OXIDE	100	ppm	Tank farm I	component of blended fuel	0.98	8.47	9.96E+00	1.0E-01	100	9.94E-03	15
HEXACHLOROBUTADIENE	1000	ppm	Tank farm I	component of blended fuel	0.98	8.47	9.96E+01	7.5E-05	30	2.50E-04	16
ACRYLONITRILE	20	ppm	Tank farm I	component of blended fuel	0.98	8.47	1.99E+00	4.1E-03	75	1.08E-04	17
EPICHLOROHYDRIN	10	ppm	Tank farm I	component of blended fuel	0.98	8.47	9.96E-01	1.8E-04	100	1.82E-06	18
ETYHLENE OXIDE	1	ppm	Tank farm I	component of blended fuel	0.98	8.47	9.96E-02	3.3E-03	500	6.48E-07	19
VINYL ACETATE	10	ppm	Tank farm I	component of blended fuel	0.98	8.47	9.96E-01	1.7E-03	500	3.46E-07	20

Notes:

a - The concentration of each compound is based on the either the typical composition of lacquer wash, blended fuel or as a pure compound. Toluene is a typical component of both lacquer wash and blended fuel, therefore was evaluated as a component of each mixture.

b - The vapor pressure of each chemical in solution was estimated using Raoults law (mole fraction of the compound in solution times the pure compound vapor pressure). The molar weight of the solution would be estimated using the weighted average of the solution based on its typical composition.

c - The reference exposure levels shown are the AIHA (American IIndustrial Hygienists Association) Emergency Response Planning Guidelines Level 3 (ERPG-3) values.

d - The mass of the chemical used in the ranking calculation is the mass of the individual constituent in the volume of the chemical mixture that could be spilled in this scenario. Mass of chemical is calculated as the product of the concentration in the mixture, volume of mixture, and the typical specific gravity of the mixture. Representative tank volume for Tank Farm I and Q is 12,000 gallons. The facility provided the typical specific gravity of blended fuel and lacquer wash, based on measurements taken at the facility.

mass of constituent = [spill volume x specific gravity of mixture x fraction of constituent x conversion to pounds]

e - The relative ranking score are based on the product of the vapor pressure, total quantity spilled and the inverse of the reference exposure level.

f - The closest receptor is approximately 410 m from the center of Tank Farm Q and 420 m from the center Tank Farm I. We assumed that a tank spill in either Tank farms would be catastrophic (complete release of contents) and that the spill would be contained by the berm walls. The closest point to the facility boundary from the center of Tank Farm Q was estimated to be 24 m and from the center of Tank Farm I was estimated to be 66 m.

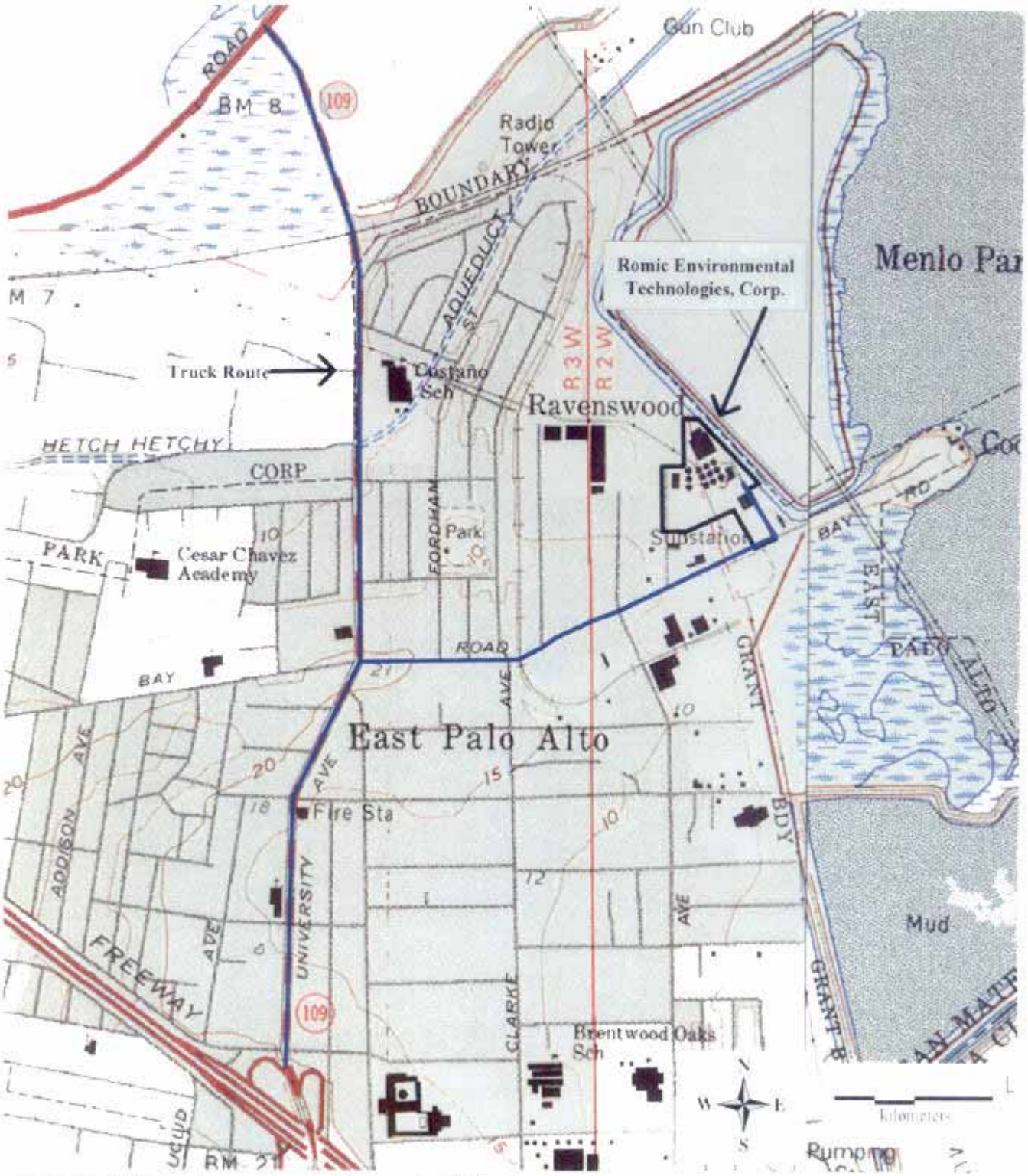
Table 7.3
Emissions and Dispersion Modeling Parameters for Scenario #1
Romic Facility, East Palo Alto, California

Scenario #1 Parameters	Value	Units/Description
Meteorological Scenario #1	13.3	meters per second
	D	stability class
	25.7	degrees Celsius
Meteorological Scenario #2	3.6	meters per second
	B	stability class
	39.5	degrees Celsius
Meteorological Scenario #3	1	meters per second
	E/F	stability class
	21.7	degrees Celsius
SCREEN3 dispersion modeling parameters	urban	dispersion coefficients
	10	meters to closest receptor from edge of spill for five minutes
	100	meters to receptor from edge of spill after evacuation for 25 - 55 minutes
	10.36 m x 15.7 m	spill area (1/4 of intersection)

Table 7.4
Emissions and Dispersion Modeling Parameters for Scenario #2
Romic Facility, East Palo Alto, California

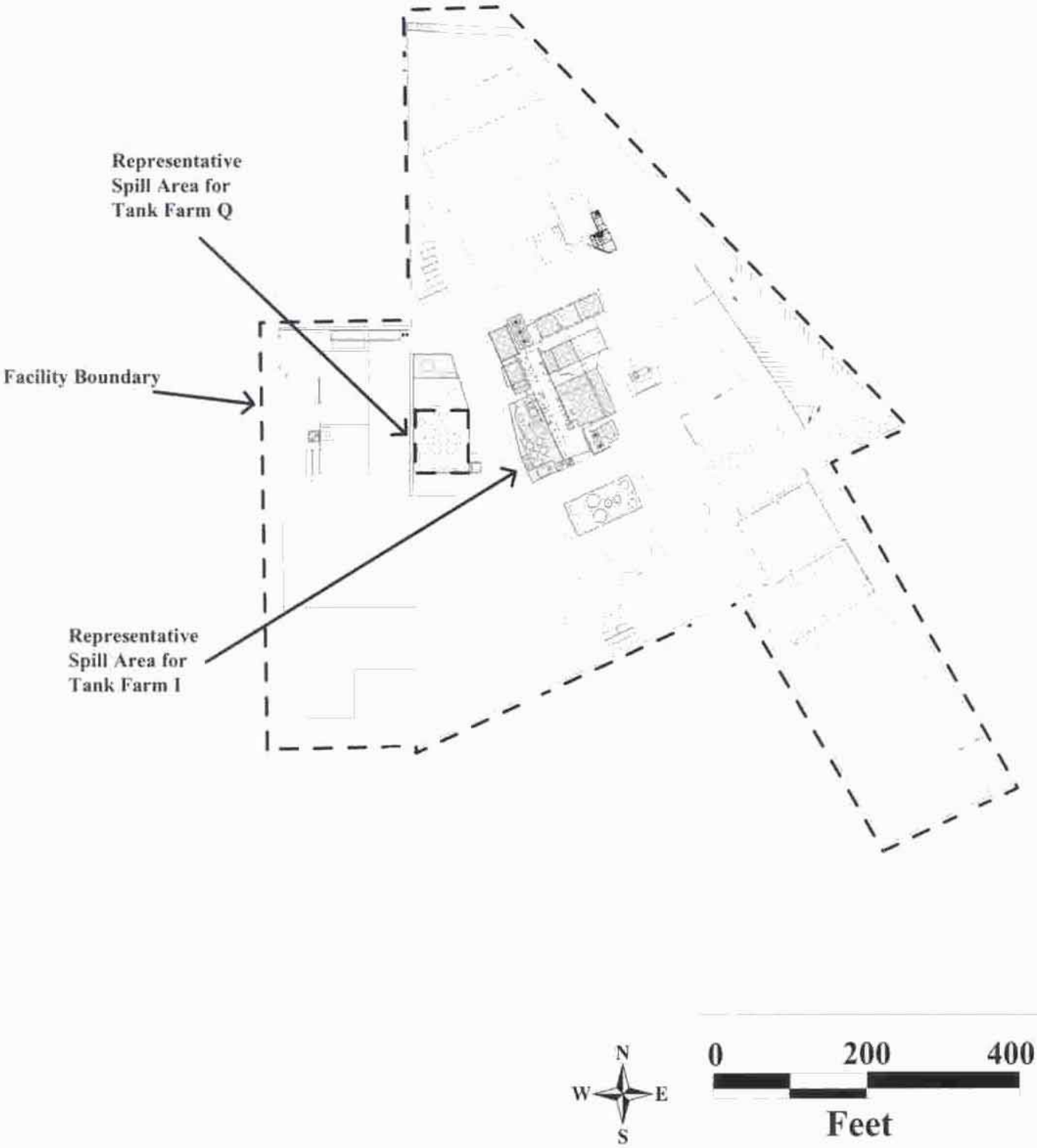
Scenario #2 Parameters	Value	Units/Description
Meteorological Scenario #1	14.6	meters per second
	D	stability class
	17.0	degrees Celsius
Meteorological Scenario #2	3.6	meters per second
	B	stability class
	39.5	degrees Celsius
Meteorological Scenario #3	1	meters per second
	E/F	stability class
	21.7	degrees Celsius
SCREEN3 dispersion modeling parameters	urban	dispersion coefficients
	410	meters to closest residential receptor
	381	m^2 (Area of spill of a tank in Tank Farm Q)

Figure 7.1
Truck Route
Romic Facility, East Palo Alto, California



ENVIRON

Figure 7.2
On-Site Representative Spill Area Locations
Romic Facility, East Palo Alto, California



8.0 EVALUATION OF ODOR IMPACTS

In accordance with guidance from Cal/EPA (DTSC 1991), estimates of ambient air concentrations were compared to odor thresholds to evaluate whether or not emissions from the Site could pose an odor nuisance to individuals in the vicinity of the Site. This section presents the ambient air concentrations used to evaluate odor impacts and compares these air concentrations with chemical-specific odor thresholds.

8.1 Methodology and Results

A chemical need only be present at concentrations above the odor threshold for the period of time that it takes to inhale (i.e., a few seconds) to result in a perceived odor. Therefore, for appropriate comparison to odor thresholds, ambient air concentrations must be predicted for average time periods on the order of a few seconds. Most ambient air dispersion models, however, predict ambient air concentrations for a minimum averaging time of one hour.

Using methods provided by Turner (1970), one can predict ambient air concentrations for periods of time as short as three minutes from one-hour average concentrations. Predicting peak excursions for periods of time on the order of one to five seconds would require more sophisticated modeling (Hogstrom 1972). Hogstrom also notes that while the difference between the instantaneous concentrations and the somewhat longer averages may be important at locations very near to the source, the difference decreases with distance from the source, as a result of the mixing process. He states that it "seems unlikely that the very short term variations in concentrations are of any importance compared to variations on the time scale of several minutes." For this risk assessment, the three-minute average ambient air concentrations are compared with odor thresholds to evaluate the likelihood of odor impacts.

The one-hour average ambient air chemical concentrations modeled at the Site boundary were used to predict the three-minute ambient air chemical concentrations at this same location using the methods of Turner. In order to extrapolate from a concentration averaged over one hour to a concentration averaged over three minutes a factor of 1.64 was applied to the hourly concentrations (Turner 1970). Table 8.1 presents the three-minute peak concentrations for the chemicals selected for odor evaluation in Section 3.0.

As described in Section 3.0, chemicals with odor thresholds less than one ppm were selected for odor evaluation. A total of 35 chemicals met the criteria. Based on DTSC guidance (1991), the odor thresholds were identified based on a compilation of odor thresholds by Amoor and Huatala (1983). These odor thresholds are presented in Table 8.1. For comparison, the 3-minute air concentration was divided by the odor threshold. The resulting ratio is shown as a percentage of the odor threshold for each chemical in Table 8.1. For all of the chemicals evaluated, the estimated 3-minute concentrations are less than the corresponding odor thresholds. Moreover, for most of the chemicals under evaluation, the estimated three-minute air concentration is less than one-tenth of a percent (<0.1%) of their odor thresholds. The estimated three-minute concentrations for 4-methyl-2-pentanone, carbon disulfide, and formaldehyde represent the highest percentage of their odor thresholds at approximately 3%.

Because the modeled air concentrations at the Site boundary are substantially less than the odor thresholds for each chemical, emissions of these chemicals from routine operations of the facility are not expected to cause an odor nuisance. Furthermore, if odor impacts from these chemicals are not expected at the Site boundary, odor impacts are also not expected at more distant residents or workplaces in the vicinity of the Site.

There have been no citations for odor violations (at least three years). There have been very few odor complaints regarding Romic, maybe three in the last two years. The source of the odors was not confirmed as having come from Romic.

8.2 References

Amoore, J and E. Hautala. 1983. Odor as an Aid to Chemical Safety: Odor Thresholds Compared with Threshold Limit Values and Volatilities for 214 Industrial Chemicals in Air and Water Dilution. Journal of Applied Toxicology. Volume 3, Number 6.

Department of Toxic Substances Control (DTSC). 1991. Permitting of Treatment, Storage and Disposal Facilities (TSDF). Items to be Considered for Inclusion in a Health Risk Assessment. Memorandum from Chuck Salocks to All TSCP Staff Toxicologists. February 14.

Hogstrom, U. 1972. A method for predicting odor frequencies from point sources. Atmos. Env. 16:103-121.

Turner, B.D. 1970. Workbook of Atmospheric Dispersion. Air Resources Field Research Office, Environmental Science Services Administration. Office of Air Programs. United States Environmental Protection Agency. Research Triangle Park, NC.

Table 8.1
Comparison of Estimated Peak Air Concentrations (3-Minute Average) at Boundary to Odor Threshold
Romic Facility, East Palo Alto, California

Compound	Odor Threshold		Modeled Concentration (µg/m^3)		Percentage of Odor Threshold		Does Maximum Concentration Exceed the Odor Threshold?
	ppm (v)	µg/m^3	Current	Future	Current	Future	
1,2-DICHLOROBENZENE	0.30	1803	2.9	3.1	0.2%	0.2%	No
1,4-DICHLOROBENZENE	0.18	1082	0.48	0.52	<0.1%	<0.1%	No
4-METHYL-2-PENTANONE	0.68	2785	85	91	3.1%	3.3%	No
ACETALDEHYDE	0.50	900	0.021	0.022	<0.1%	<0.1%	No
ACRYLIC ACID	0.09	277	0.008	0.008	<0.1%	<0.1%	No
BROMINE	0.051	333	0.0042	0.0043	<0.1%	<0.1%	No
CARBON DISULFIDE	0.11	342	9.6	9.8	2.8%	2.9%	No
CHLORINE	0.31	899	1.9	1.9	0.2%	0.2%	No
CHLOROBENZENE	0.68	3131	0.89	0.94	<0.1%	<0.1%	No
CUMENE	0.088	433	0.0031	0.0032	<0.1%	<0.1%	No
CYCLOHEXANOL	0.15	615	0.00031	0.00032	<0.1%	<0.1%	No
DIACETONE ALCOHOL	0.28	1330	0.26	0.27	<0.1%	<0.1%	No
DIETHYLAMINE	0.13	389	0.000089	0.000092	<0.1%	<0.1%	No
DIETHYLAMINOETHANOL	0.011	53	0.0016	0.0016	<0.1%	<0.1%	No
DIISOBUTYL KETONE	0.11	640	0.0035	0.0036	<0.1%	<0.1%	No
EPICHLOROHYDRIN	0.93	3518	0.015	0.015	<0.1%	<0.1%	No
ETHYL ACRYLATE	0.0012	4.9	0.0049	0.0050	<0.1%	0.1%	No
FORMALDEHYDE	0.83	1019	30	31	3.0%	3.0%	No
HEXACHLOROETHANE	0.15	1452	0.11	0.11	<0.1%	<0.1%	No
HYDROGEN SULFIDE	0.0081	11	0.10	0.10	0.9%	0.9%	No
M-CRESOL	0.00028	1.2	0.0010	0.0010	<0.1%	<0.1%	No
METHACRYLATE	0.0048	17	0.00057	0.00057	<0.1%	<0.1%	No
METHYL METHACRYLATE	0.083	340	0.15	0.15	<0.1%	<0.1%	No
NAPHTHALENE	0.084	440	0.0026	0.0027	<0.1%	<0.1%	No
N-BUTYL ALCOHOL	0.83	2516	1.8	1.8	<0.1%	<0.1%	No
NITROBENZENE	0.018	91	0.023	0.024	<0.1%	<0.1%	No
OSMIUM TETROXIDE	0.0019	20	0.000044	0.000045	<0.1%	<0.1%	No
PHENOL	0.040	154	0.37	0.40	0.2%	0.3%	No
PHOSPHINE	0.51	709	0.0014	0.0014	<0.1%	<0.1%	No
PROPYLENE DICHLORIDE	0.25	1155	0.00024	0.00025	<0.1%	<0.1%	No
PYRIDINE	0.17	550	2.7	2.8	0.5%	0.5%	No
STYRENE	0.32	1363	0.12	0.12	<0.1%	<0.1%	No
TOLUENEDIISOCYANATE (MIXED ISOMERS)	0.17	1211	0.000028	0.000029	<0.1%	<0.1%	No
TRIETHYLAMINE	0.48	1986	12	13	0.6%	0.7%	No
VINYL ACETATE	0.50	1760	0.046	0.047	<0.1%	<0.1%	No

9.0 ECOLOGICAL ASSESSMENT

An ecological risk assessment (ERA) was conducted for the Site. As discussed in the human health risk assessment, there are only volatile emissions from Site operations under both the current and proposed modified Part B permit. These volatile emissions are not expected to be significant source of exposure for ecological receptors in the vicinity of the Site. Instead, the study area evaluated within this ERA is the tidal slough adjacent to the east side of the facility. A number of chlorinated and non-chlorinated hydrocarbons, semi-volatile chemicals and metals have been detected in slough sediments and surface water samples at the Site.

This ERA considers information previously collected at the Site to characterize ecological resources and chemical distribution in the slough. It has been designed to estimate the potential for exposures both to aquatic receptors living in the slough as well as to terrestrial receptors that may use the slough for feeding purposes. This report presents a predictive assessment that builds on the approaches and findings of the Scoping Level ERA (HLA, 1991), the Ecological Assessment (EA) and the 1994 In Situ Growth Study Report (USA, 1993, 1994), and additional data collection activities in 1994. In addition, comments issued by DTSC in 1997 addressing the earlier reports were considered in preparing this ERA. This ERA includes problem formulation, exposure and effects assessment, and risk characterization as the major components of the overall risk analysis. This section presents a summary of the ERA. The full report is included in Appendix E.

9.1 Problem Formulation

The problem formulation phase of the ERA includes a review of site characterization information, selection of constituents of potential ecological concern (COPECs), exposure pathway analysis, refinement of the CSM and selection of assessment endpoints and measurement endpoints. The on-site areas of the Romic facility contain no viable ecological habitat. The majority of the Site area is paved or covered with buildings. The study area for this ERA is comprised of a north south trending slough immediately east of the facility (eastern slough) that is connected to a smaller east-west trending slough located to the north of the Site (northern slough) (collectively referred to as the tidal slough). The primary COPECs include chlorinated solvents (e.g., 1,1-dichloroethane and vinyl chloride), hydrocarbons (e.g., benzene), semi-volatile compounds (e.g., PCBs) and metals.

The receptor classes considered in this ERA include benthic invertebrates, terrestrial mammals (evaluated as the raccoon) and shore birds (evaluated as the California clapper rail, which is included on both the state and federal endangered species lists). The exposure pathways evaluated in the terrestrial assessment include food chain exposure to mammals through ingestion of contaminated prey and sediment as well as inhalation of volatile chemicals in slough sediments. A sediment equilibrium partitioning and vapor emission model was developed to evaluate inhalation exposures.

The exposure pathways evaluated in the aquatic assessment include direct contact with and ingestion of sediments by benthic invertebrates, and food chain exposure to benthic feeding birds through ingestion of contaminated prey and sediment, as well as inhalation of volatile chemicals in slough sediments. Feeding patterns and residence time in the slough for fish species are

insufficient to support rigorous exposure models, and fish exposure will not be quantitatively evaluated in this assessment. It is expected that protection of benthic invertebrates would be protective of fish species as benthic invertebrates have much greater exposure to the sediments in the slough than do fish.

The assessment endpoints (AE) selected for quantitative evaluation in this assessment are based on protection of the most sensitive and relevant environmental values that have been identified at the Site. Table 9.1 presents the receptor classes selected for protection and addressed by the assessment endpoints and associated measurement endpoints for the terrestrial and aquatic environments.

9.2 Exposure Assessment

Exposures were estimated using a conservative dose model to estimate a daily dose of site COPECs to the selected terrestrial receptors. COPEC concentrations in invertebrate tissue were estimated using conservative bioaccumulation factor (BAFs) derived from available literature. The resulting mg/kg/day dose estimates indicate that there is the potential for exposure of terrestrial wildlife to site related COPECs.

The assessment includes an evaluation of direct exposure and an evaluation of food chain exposure for aquatic receptors. Based on the results of sediment chemistry analyses and toxicity studies performed for the EA, there is evidence that benthic invertebrates may be exposed to site-related COPECs. Identified potential routes of exposure include direct exposure to and ingestion of sediments, as well as exposure to interstitial water and near-surface particulates. Exposure to higher trophic level receptors was identified using a conservative dose model. The resulting mg/kg/day dose estimates indicate that there is potential for exposure of benthic invertebrates as well as higher-level receptors to site-related COPECs.

9.3 Effects Assessment

The effects assessment for terrestrial receptors considers estimated site exposure levels, toxicological effects data (e.g., toxicity reference values or "TRVs") and site-specific bioassay results to determine the potential for adverse environmental impacts. The NOAEL and LOAEL based wildlife TRVs were compared to modeled daily doses to evaluate the potential risk to terrestrial animals (i.e., raccoon and California clapper rail). The resulting ratio is the HQ and is calculated for each chemical and exposure pathway. HQ values exceeding 1.0 may require additional evaluation to more accurately determine the risks they may pose. Chemicals lacking TRVs were not quantitatively evaluated but are discussed in the uncertainty section of Appendix E.

Calculated NOAEL HQs for the clapper rail for metals ranged from less than 0.007 (mercury) to 1.08 (zinc). The LOAEL HQ for zinc was 0.1. The NOAEL HQs for PCBs, pesticides, polyaromatic hydrocarbones (PAHs), and SVOCs/VOCs were all less than 1 and ranged from less than 0.0001 (1,2 dichloroethane) to 0.6 (DDE). All calculated NOAEL HQs for the raccoon for metals were below 1, ranging from 0.005 (mercury) to 0.3 (cadmium). All NOAEL HQs for PCBs, pesticides, PAHs, and SVOCs/VOCs were less than or equal to 1, and ranged from less than 0.000001 (2-butanone) to 1 (vinyl chloride). The LOAEL HQ for vinyl chloride was 0.1.

The results of the food chain model indicate that no deleterious effects to birds and mammals foraging in the slough are expected.
The potential for effects to occur to the aquatic organisms that utilize the tidal slough was evaluated in 1993 and 1994 using sediment and surface water laboratory bioassays, in situ bivalve bioassays, and a field benthic community survey. It has been determined that the information, interpretations and conclusions from 1993 and 1994 are relevant, applicable, and appropriate to support the objectives of this ERA.

These studies were designed to evaluate the exposure of organisms to the sediment in the bottom of the slough, as well as to the surface water column overlying the slough sediments. The studies were implemented at five stations selected to represent a "worst case" exposure scenario based on the observed VOC distribution in the eastern slough immediately adjacent to the Romic facility.

> Amphipod Bioassay Summary – the average number of survivors varied from 45% to 61% in the study area, while the average number of survivors in control and reference samples was 90% and 82% respectively. Based on ANOVA analysis, all five stations tested differed significantly from survival in both the reference and control sediments. These results indicate the potential for deleterious effects to occur to the benthic community utilizing the tidal slough. It should be noted that the cause of the observed toxicity couldn't currently be explained or defined by dose-response relationships.
>
> In Situ Growth Studies – the in situ growth and survival of caged bivalves was studied by exposing Macoma balthica to sediment in the eastern tidal slough over a six-month period in 1994. A high degree of variability for both percent recovery and survival was observed. The growth study indicated that the test clams grew and showed good survival over a six-month period and that no significant differences in the growth indices measured were observed.
>
> Benthic Invertebrate Community Analysis – the results of the benthic invertebrate community analysis indicate that no significant differences in community parameters (i.e., organism density, diversity, or species composition) were present in the study area. Furthermore, the data indicate that this slough segment supports a large and diverse benthic community with 26 taxa representing six phyla. These results indicate that deleterious effects are not expected to the benthic community in this section of the slough.
>
> Aquatic Organisms Exposed to Slough Bottom Sediments – the potential for deleterious effects to organisms exposed to COPECs in the surface water overlying the slough sediment was evaluated using a 96 hour mysid shrimp (Mysidopsis bahia) water column bioassay. No toxicity was observed in any of the bioassays and deleterious effects to water column organisms in this portion of the slough are not expected.

Based on the moderate levels of toxicity observed in the amphipod bioassay, the lack of any obvious indication of effects in the in situ clam studies, and the results of the benthic invertebrate community analysis which indicate a healthy, typical and un-impacted community, no effects to

the benthic community are expected in the area evaluated by the aquatic studies, or in the rest of the tidal slough. Although the amphipod bioassay indicates the potential for effects to occur to the benthic community, the direct measurements made of the benthic community clearly establish that the potential for effects indicated by the laboratory bioassay conducted with a surrogate species has not been realized. These conclusions can applied to the rest of the slough as: 1) the area evaluated contains the highest levels of VOCs and is considered to represent a worst case exposure estimate; and 2) the concentrations of metals (the other significant COPEC chemical class) appear to be generally consistent throughout the slough and are not expected to result in significantly greater exposures in the rest of the slough. Similarly, water column exposures to identified COPECs is not expected to be significantly greater either upstream or downstream of the area sampled considering the sediments as the primary sources. The application of these conclusions to significant precipitation events causing surface runoff cannot be evaluated at this time as significant non-point sources of contamination have not been identified in the scope of this assessment.

9.4 Risk Characterization

The results of the terrestrial assessment indicate that there minimal potential for risk to the wildlife community that may utilize the Site. The HQs for both the California Clapper Rail and the raccoon were below a level of concern. Although there are a number of uncertainties inherent in this assessment, conservative approaches were used throughout and the conclusions are considered to be conservative, protective and representative of the entire slough area.

The results of the aquatic assessment indicated that some toxicity was observed in the amphipod test, the results of the benthic community analysis do not indicate that sediment benthos have been impacted. The in situ bivalve growth study results are difficult to interpret, and neither indicates the potential for risk, or that risk is not expected. The benthic community assessment results are considered to carry more weight than the laboratory amphipod toxicity results in characterizing risk to the benthic community. The direct measure of the community provides greater confidence than a single laboratory bioassay, and is the best indicator of risk to the community. Based on the results of the benthic community analysis, a finding "no unacceptable risk" for the benthic community living in the study area is supported.

There are many sources of uncertainty documented in the report that are associated with the risk findings. The most significant areas of uncertainty include estimating exposure levels of the different receptors, selecting TRVs appropriate to each receptor, spatial and temporal representativeness of the data, and the food chain and inhalation dose models. To account for the uncertainty in the analysis, conservative assumptions were used throughout and have likely resulted in an overestimate of potential risk.

Overall, the results of this ecological risk assessment indicate that the chemicals detected in slough sediment do not pose unacceptable risk to local receptors.

9.5 References

Albertson, J. 1995. Ecology of the California Clapper Rail in South San Francisco Bay. Biology. San Francisco, CA, San Francisco State University: 1995

Baes, C.F., R.D. Sharp, A.L. Sjoreen, and R.W. Shor, 1984. A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture. Oak Ridge National Laboratory, Health and Safety Research Division. ORNL-5786. September.

Beyer, W.N., E.E. Connor, S. Gerould, U.S.F.a.W. Service and U.S.G. Survey. 1994. Estimates of soil ingestion by wildlife. Journal of Wildlife Management 58 (2): 375-382

Cal-EPA, 1996. Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities. Part A: Overview, California Environmental Protection Agency, Department of Toxic Substances Control, Human and Ecological Risk Division, July 4, 1996.

CalEPA, 1998. Ambient Concentrations of Toxic Chemicals in Sediment. Regional Water Quality Control Board, San Francisco Bay Region. April.

Ferraro, S.P., H. Lee II, R.J. Ozretich, and D.T. Specht, 1990. Predicting Bioaccumulation Potential: A Test of a Fugacity-Based Model. Archives of Environmental Contaminant Toxicology, pp. 386-394

Forstner, U. 1983. Metal pollution assessment for sediment analysis. In: Metal pollution in the aquatic environment. Eds: Forstner, U. and Wittman, G.T.W. Springer-Verlag Berlin-Heidelber, Germany.

H.T. Harvey and Associates, 1990. California Clapper Rail Breeting Survey – Laumeister Tract. May 31.

Jenkins Sanders and Associates (JSA), 1993. An Ecological Assessment of the Slough Adjacent to Romic Facility East Palo Alto, California. May

Jenkins, Sanders & Associates (JSA), 1994. Ecological Assessment of the Tidal Wetland 1990 Bay Road Site, East Palo Alto, California. Final Report. June 24.

Jenkins, Sanders & Associates (JSA), 1998. Ecological Risk Assessment of the Tidal Wetland, 1990 Bay Road Site, East Palo Alto, California.

Lasiewski, R.C. and Dawson, W.R., 1971. A preliminary allometric analysis of respiratory variables in resting birds. Respiratory Physiology. 11:152-166. In: U.S. Environmental Protection Agency (EPA), 1993. Wildlife Exposure Factors Handbook. Office of Research and Development, Washington, DC. EPA/500/R-93/187a. December.

Nagy, K.A. 1987. Field metabolic rate and food requirement scaling in mammals and birds. Ecological Monographs. 57:111-128.

McFarland, V.A., C.H. Lutz, and F.J. Reilly, Jr., 1994. Bioaccumulation Data and Analysis for Selected Contaminants in Sediments and Biota of the New York Bight Apex Mud Dump Reference Site Final Report to US Army Engineer District, New York.

Mulsow, S.G. and P.F. Landrum, 1995. Bioaccumulation of DDT in a marine polychaete, the conveyor-belt deposit feeder heteromastus filiformis (Claparede). Chemosphere, 4:3141-3152.

Oak Ridge National Laboratory for USDOE. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. ES/ER/TM-86/R3. June.

Oak Ridge National Laboratory (ORNL), 1998. Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Oak Ridge Reservation. BJC/OR-112.

Sample, B.E. and C.A. Arenal. 1999. Allometric models for interspecies extrapolation of wildlife toxicity data. Bulletin of Environmental Contamination and Toxicology. 62:653-663.

Stahl, W.R., 1967. Scaling of respiratory variables in mammals. Journal of Applied Physiology. 22:453-460. In U.S. Environmental Protection Agency (EPA), 1993. Wildlife Exposure Factors Handbook. Office of Research and Development, Washington, DC. EPA/600/R-93/187a. December.

Thomann, R.V., J.D. Mahony, and R. Mueller, 1995. Steady-state model of biota sediment accumulation factor for metals in two marine bivalves. Environmental Toxicology and Chemistry, 14(11):1989-1998.

Tetra Tech EM, Inc. and ENTRIX, 1999. NFD Point Molate Offshore Risk Assessment.

Tracey, G. and D. Hansen. 1996. Use of biota-sediment accumulation factors to assess similarity of nonionic organic chemical exposure to benthically-coupled organisms of differing trophic mode. Archives of Environmental Contamination and Toxicology 30:467-475

U.S. Army Corps of Engineers (ACE), 1999. The BSAF Database. The Aquatic Contaminants Team, Environmental Laboratory, Waterways Experiment Station.

U.S. Department of the Interior (DOI), 1980. Selected Vertebrate Endangered Species of the Seacoast of the United States – California Clapper Rail. Fish and Wildlife Service. FWS/OBS-80/01.56. March

U.S. Environmental Protection Agency (EPA), 1992. Guidelines for Exposure Assessment. Notice. Federal Register 57 (104):22888, 22938, May 29.

U.S. Environmental Protection Agency (EPA), 1993. Wildlife Exposure Factors Handbook. Office of Research and Development, Washington, DC. EPA/600/R-93/187a. December.

U.S. Environmental Protection Agency (EPA), 1995. Water Quality Guidance for the Great Lakes System; Final Rule. Federal Register 60(56):15365-15425. EPA, 1996;

U.S. Environmental Protection Agency (EPA), 1997. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessment. Interim Final, EPA-540/R-97/006.

Table 9.1
Measurement Endopoints Evaluated for
Ecologically Significant Receptors
Romic Facility, East Palo Alto, California

Environment	Selected Receptor Class	Measurement Endpoint
Tidal Slough	Benthic Invertebrates	Compare solid phase (SP) amphipod test and surface water (SW) mysid test to reference/control results to evaluate toxicity
	Benthic-feeding birds	Compare estimated site-specific doses based on modeled COPEC body burdens in benthic invertebrate tissue and on modeled COPEC ambient air concentrations for the California clapper rail to avian toxicity data associated with reproductive impairment
	Omnivorous mammals	Compare estimated site-specific doses based on modeled COPEC body burdens in benthic invertebrate tissue and on modeled COPEC ambient air concentrations for the raccoon to mammalian toxicity data associated with reproductive impairment

10.0 CONCLUSION

In support of their RCRA Part B permit renewal/modification, Romic has volunteered to perform a human health and ecological risk assessment and to prepare an Environmental Impact Report (EIR). The purpose of the risk assessment is to evaluate potential adverse effects to human and ecological receptors that are at or around the facility and that could be exposed to chemical emissions from the Site.

Based on the land use surrounding the Site, the risk assessment evaluated off-site workers, off-site residents, and off-site recreationists under both a current and future emissions scenario. In addition to the above populations, the risk assessment also evaluates potential sensitive receptors surrounding the Site. These receptors include schools, daycare centers, health care facilities, and senior homes in the vicinity of the Site.

A summary of the cumulative cancer risks calculated in this risk assessment show that the estimated lifetime incremental cancer risks are less than 1×10^{-5} for all populations evaluated. This estimated cancer risk is less than the 1×10^{-5} risk level used for Proposition 65 and well within the acceptable risk level used by the USEPA for hazardous waste sites (1×10^{-4} to 1×10^{-6}).

Individual chemical exposures that yield HIs of less than 1 are not expected to result in adverse noncancer health effects (USEPA 1989). The HIs calculated in this risk assessment are below one for all populations evaluated.

In order to evaluate the potential for acute health effects, the maximum one-hour concentration estimated at the Site boundary was compared with the acute RELs. No individual chemical exceeded their corresponding acute REL. In addition, the maximum total acute HI for different toxic endpoints was also less than one.

Area and personal sampling results were used to evaluate potential exposure to on-site workers. All sampling results were below the chemical-specific PELs.

Based on the results of the risk assessment, no significant chronic or acute health effects are expected for the off-site populations evaluated. In addition, based on previous on-site worker sampling results, no occupational standard exceedences are expected.

APPENDICES

APPENDIX A
Selection of Chemicals for Risk Assessment

TABLE OF CONTENTS

A.1 Identification of Facility Emissions A-1
A.2 Chemical Selection for Process Streams A-3
A.2.1 Development of Master List of Candidate Chemicals to be Considered for Process Streams A-3
A.2.2 Preliminary Screen of Process Stream Chemicals A-4
A.2.3 Refined Screen for Process Stream Chemicals A-4
A.3 Final Selection of Chemicals of Concern A-7
A.4 References A-7

SELECTION OF CHEMICALS FOR RISK ASSESSMENT

The purpose of this appendix is to summarize the results of the selection of chemicals for the Health Risk Assessment (HRA) for Romic's East Palo Alto, California Facility ("Site"). This summary is part of the interim deliverable "Chemical Selection for the RCRA Part B Permit Health Risk Assessment for Romic Environmental Technologies, Corp." submitted to DTSC on December 10, 1999. Revisions to this interim deliverable are discussed below.

The remainder of this appendix is organized into four sections as follows. Section A.1 describes the sources of potential emissions at the Site and identifies the analytical data used to evaluate each source. Section A.2 describes the preliminary and refined screen conducted in order to select process stream chemicals to be evaluated in the risk assessment. Section A.3 summarizes the final selection of chemicals of concern for the Site. References are provided in Section A.4.

A.1 Identification of Facility Emissions

The main operations at the Site consist of:

- recycling waste solvents primarily by distillation to produce reusable solvent
- blending operations to recycle waste solvents and fuels to produce fuel-grade mixtures
- biological wastewater treatment

Emissions from the Site primarily result from these recycling and treatment operations, with some additional emissions from ancillary operations (such as fuel dispensing, drum liquefaction and washing, and truck washing). Because no dust-generating process operations occur at the Site, only volatile emissions resulting from liquid waste handling and processing were evaluated in the risk assessment.

The chemicals for emissions sources at the Site were determined based on the type of volatile material handled. Organic vapor emissions from the different sources can be characterized as one of the following types:

- Vapors from the liquid organic waste stream
- Vapors from the organic wastewater stream
- Vapors from the lab pack waste stream
- Vapors from drum liquefaction processing (diesel)
- Combustion products from the combustion of natural gas
- Vapors from truck rinsate
- Vapors from vehicle fueling

For the risk assessment, chemical constituents of emissions from the liquid organic waste stream were identified and selected based on a database received from Romic that lists the composition of the incoming process streams. The database includes 322 entries. Because the database used to evaluate process stream chemicals is so large, it is further described and evaluated in Section A.2 of this report.

This information was developed to characterize the liquid organic waste stream. In the initial chemical selection process, chemical constituents from the organic wastewater stream were selected based on a wastewater stream grab sample. However, according to facility personnel, the aqueous organic waste stream is 5% material with the same composition as the liquid organic waste stream and 95% water. In order to be consistent, the chemical constituents of emissions from the organic wastewater were assumed to be equivalent to those in the liquid organic waste stream. This information was also used to represent the composition of the truck rinsate as the facility occasionally uses liquid organic waste material to rinse the trucks.

The lab pack processing area, which contributes less than 0.5 percent of the total volatile emissions, is used to consolidate small quantity waste materials from laboratories and other small quantity generators. Since the waste processed in this area is generated from different sources than the waste processed in other areas at the facility, its composition is unique from the main facility process stream. Therefore, a unique lab pack waste stream was identified. The same chemicals were selected for evaluation in the HRA from the lab pack stream as were selected from the process stream; but the percentage of each chemical in the total organic vapor emitted was based on a representative two-week lab pack throughput log provided by the facility.

Chemical constituents from emissions from drum liquefaction operations are based on the composition of diesel fuel used in the process. This composition, as identified by the State of California Air Resource Board (CARB), is listed in Attachment I (CARB 1991). All chemicals identified as potential components of diesel fuel were evaluated for the quantitative risk assessment to assess potential risks due to emissions from drum liquefaction and washing.

Chemical constituents from the combustion of natural gas were based on the USEPA's Compilation of Air Pollutant Emission Factors AP-42 (USEPA 1998). This guidance provides the speciation of organic compounds from natural gas combustion in Table 1.4-3. Emission factors in USEPA's AP-42 are rated from A to E to provide the user with an indication of how "good" the factor is, with "A" being excellent and "E" being poor (USEPA 1998). Chemicals with an emission factor rating of C or better were chosen for further analysis in the HRA. This included the following three chemicals: benzene, formaldehyde, and toluene.

The fueling station at the Site services both gasoline and diesel vehicles. The throughput at the fueling station is 12 percent gasoline and 88 percent diesel. Therefore, the chemical constituents emitted from the fueling station are assumed to be the same percentage. The chemical constituents of diesel were determined as discussed above for the drum liquefaction operations.

In the initial chemical selection process, chemicals detected in soil gas at the Site were included. These chemicals have since been removed as contaminated ground water (and associated soil gas emissions) are being addressed under another regulatory program and is not anticipated to be part of the Site's long term air emissions. Ground water remediation will be further addressed in the EIR.

A.2 Chemical Selection for Process Streams

As discussed previously, because of the large database listing the composition of the incoming process stream, further evaluation was conducted to select chemicals from this process for evaluation in the risk assessment of potential risks due to emissions from recycling wastes and blending operations. The selection of chemicals for process streams is based on selection criteria and methodology recommended by USEPA and DTSC specifically for TSD facilities. The selection process recommended by DTSC (1991, 1995) is a three-step process including: 1) developing a master list of candidate chemicals to be considered for quantitative risk assessment; 2) using DTSC's preliminary screening criteria to evaluate the chemicals on the master list to identify a subset of chemicals that may be addressed in the quantitative risk assessment; and, if necessary; 3) using DTSC's refined criteria to identify the final list of chemicals to be addressed. Each step of the chemical selection for the process streams is described in the following sections.

A.2.1 Development of Master List of Candidate Chemicals to be Considered for Process Streams

Guidance from DTSC (1996, 1997) recommends the use of relevant manifest data to characterize emissions. This is generally interpreted as at least one year of recent manifest data. In order to evaluate potential emissions from the process stream, Romic personnel conducted a review of manifests from October 1997 through September 1998. This manifest information, along with marketing and stack test data, was used to develop the master list of chemicals received at the Site. The master list, consisting of 322 entries, is presented in Table 1.

Prior to chemical selection, the master list was evaluated for duplicate listings and non-chemical specific entries. The following changes, as noted in the comment section of Table 1, were made to the master chemical list:

- 4 chemicals listed in the manifests were considered as unknown based on incomplete or insufficient manifest information. These chemicals are not further evaluated in the screening process. Thermometers were also removed from the screening process since these are not processed on site.

- 76 chemicals listed in the manifests were considered either duplicates (i.e., the same chemical spelled two different ways [trichloroethylene/trichloroethene] or two different names for the same chemical [Freon 113/1,1,2-trichloro-1,2,2-trifluoroethane]) or were non-specific chemicals [e.g., nitric acid residue was evaluated as nitric acid]). Table 1 identifies the duplicate and non-specific chemical names as well as the name of the chemical that was used to evaluate each removed chemical.

Also as noted in Table 1, six chemicals (benzo(a)pyrene, 2-chlorophenol, chromium III, chromium VI, kerosene and trans-1,2-dichloroethene) were added to the chemical list to evaluate several of the non-specific chemicals. Based on the above changes, the resulting number of chemicals in the master list was 248. Each of the 248 chemicals was evaluated in the preliminary screen, as discussed in Section A.2.2 below.

A.2.2 Preliminary Screen of Process Stream Chemicals

The preliminary screen was conducted using the 248 chemicals discussed above. Consistent with the recommendations provided by the DTSC (1991) in their draft guidelines for assessing risks from TSD facilities and in subsequent discussions regarding specific facilities, the preliminary screen included:

1) chemicals that have toxicity values derived by the USEPA or Cal/EPA;
2) chemicals that have a threshold limit value (TLV) based on human sensory irritation;
3) chemicals listed on the Proposition 65 list of carcinogens and reproductive toxins;
4) chemicals that have an odor threshold below 1 ppm; and
5) chemicals listed for regulation under the Air Toxics Hot Spots' Program (AB 2588).

Table 2 presents the candidate chemicals and the criteria used in the preliminary screen. The chemicals that met the criteria described above were retained for further evaluation. A total of 34 chemicals, which are listed in Table 3, were eliminated based on the selection criteria in the preliminary screen. One chemical, diphenyloxide, was selected only on the basis of the odor criteria. However, this chemical has since been removed from the assessment as it is no longer received at the Site. A total of 214 chemicals did not pass the preliminary screen. Due to the large number of chemicals remaining, a refined screen was conducted. This refined screen is discussed in Section A.2.3 below.

A.2.3 Refined Screen for Process Stream Chemicals

Since the preliminary screen resulted in a list of chemicals that is too long to manage efficiently, the chemical list was subjected to a refined screen. This refined screen considers toxicity, concentration, and volatility. The refined screen considers all of the 214 chemicals remaining after the completion of the preliminary screening process.

A concentration-toxicity screen similar to that described in the USEPA's RAGS (USEPA 1989) is recommended by the DTSC (1991) and was used for this Site to eliminate chemicals present in the process stream at low concentrations. According to the USEPA, "the objective of the concentration-toxicity screen is to identify the chemicals in a particular medium that - based on concentration and toxicity - are most likely to contribute significantly to risks calculated for exposure scenarios involving that medium, so that the risk assessment focuses on the "most significant" chemicals" (USEPA 1989). Volatility is included in this screen as only volatile chemicals are of concern at the Site.

Table 1 lists the amount in pounds per year for each chemical received at the Site. As shown in Table 1, the amounts were reported as low, midpoint, and high. These amounts correspond to the range of amounts listed on the manifests. The refined screening process was conducted using the midpoint amount.

Two steps were used in the evaluation of volatility. In the first step, chemical-specific vapor pressures were used as recommended by DTSC guidance (DTSC 1991). Based on DTSC guidance (1991), all chemicals with a moderate to high vapor pressure (i.e., greater than 10^{-3}

millimeters (mm) mercury [Hg]) were included in the refined screen. Sources for vapor pressures included the following:

- Genium's Handbook of Safety, Health, and Environmental Data for Common Hazardous Substances (McGraw-Hill 1999)
- Superfund Chemical Data Matrix (SCDM) (electronic program)
- Handbook of Environmental Fate and Exposure Data for Organic Chemicals (Lewis Publishers 1989)
- Perry's Chemical Engineers' Handbook (McGraw-Hill 1997)
- RBCA Chemical Database (Groundwater Services, Inc. 1995-1997)
- Risk Management Program Guidance for Offsite Consequence Analysis (USEPA Office of Solid Waste and Emergency Response, April 1999)
- Hazardous Waste Treatment Storage and Disposal Facility – Air Emissions Models (USEPA 1987)
- Material Safety Data Sheets (MSDS)

The vapor pressures for most chemicals were set at normal temperature of 25 degrees centigrade. However, for some chemicals that are gaseous at room temperature, the vapor pressures were set differently. For chemicals that were in aqueous solution, and whose maximum vapor pressure was less than 760 mm Hg or 1 atmosphere (atm), the vapor pressure was set at that corresponding to the maximum solubility of that chemical in water. When the vapor pressure of the maximum solubility in water exceeded 760 mm Hg, the vapor pressure was set at 760 mm Hg. Chemicals affected by this include ammonia, hydrochloric acid, hydrogen sulfide, and formaldehyde.

Chemical-specific vapor pressures were not available for 18 chemicals. In the second step, chemicals without vapor pressures values were further evaluated using their Henry's Law Constant and molecular weight as recommended by USEPA guidance (USEPA 1989). According to USEPA, chemicals that may easily volatilize are those chemicals with a Henry's Law Constant of greater than 1×10^{-5} atm-m^3/mole and a molecular weight of less than 200 g/mole. All chemicals evaluated using these criteria are labeled in Table 4.

Of the chemicals evaluated in the refined screen, nine chemicals had no vapor pressure or Henry's Law Constant. These chemicals, which are listed in Table 4, will not be quantitatively evaluated in the risk assessment. Sixty-five chemicals with vapor pressures less than 10^{-3} mm Hg were also eliminated from further evaluation. These chemicals are also listed in Table 4.

To evaluate toxicity, chemical-specific inhalation cancer slope factors (CSFs) and reference concentrations (RfCs) were used. Sources for these toxicity values included the following:

- Cal/EPA's California Cancer Potency Factors: Update. November 1, 1994.

- USEPA's Integrated Risk Information System (IRIS). 1999.

- USEPA's Health Effects Assessment Summary Tables (HEAST). 1997.

- USEPA's National Center for Environmental Assessment Risk Assessment Issues Papers (various dates).

- California Air Pollution Control Officer's Association's (CAPCOA) Air Toxics "Hot Spots" Program. Revised 1992 Risk Assessment Guidelines. October 1993.

For general chemicals (e.g., dichlorobenzene), the most conservative form was used as a surrogate (e.g., 1,4-dichlorobenzene). Surrogates were used for nine chemicals as listed on Table 5. Inhalation CSFs or RfCs were not available for 27 of the chemicals with a vapor pressure greater than 10^{-3} mm Hg. These chemicals, which are listed in Table 4, will not be quantitatively evaluated in the risk assessment. For chemicals with more than one toxicity value available, the most conservative toxicity value from the above listed sources was used in the refined screen.

A total of 104 chemicals were carried through the refined concentration-toxicity-volatility screen. The concentration-toxicity-volatility screen was conducted in two steps. In the first step, the amount, toxicity, and volatility for each chemical were multiplied together to obtain a risk factor. In this step, separate risk factors were developed for carcinogenic and noncarcinogenic chemicals. For carcinogens, the toxicity factor used is the CSF. For noncarcinogens, the toxicity factor used is 1/RfC. In the second step, chemical-specific risk factors were then summed to obtain the total risk factor for all chemicals of potential concern. Again, separate total risk factors were calculated for carcinogenic and noncarcinogenic effects. The ratio of the risk factor for each chemical to the total risk factor approximates the relative risk for each chemical. Based on DTSC guidance (1991), chemicals that contribute less than 0.001 or 0.1% of the aggregate risk factor were not considered further in the risk assessment.

The results of the refined screen for carcinogenic chemicals in the process stream are shown in Table 6. As shown in Table 6, 17 chemicals contributed more than 0.1% of the aggregate risk factor and were selected for further evaluation of potential carcinogenic risks due to emissions from recycling wastes and blending operations.

The results of the refined screen for noncarcinogenic chemicals in the process stream are shown in Table 7. As shown in Table 7, 28 chemicals contributed more than 0.1% of the aggregate risk factor and were selected for further evaluation of potential noncarcinogenic effects due to emissions from recycling wastes and blending operations. In addition, six chemicals listed in Proposition 65 as reproductive toxins were also selected for further evaluation.

Four chemicals were later eliminated from the initial chemical selection for noncarcinogenic materials. Although 1,2-dibromo-3-chloropropane was listed on the manifests, the listed concentration is zero and this chemical was removed from the assessment. Two other chemicals, ethylene glycol methyl ether and trichorofluoromethane, are no longer received at the Site. Mercury was also eliminated as it is received only in thermometers that are not processed or recycled at the Site.

A.3 Final Selection of Chemicals of Concern

Table 8 summarizes all of the chemicals to be further evaluated in the risk assessment for the Site. Columns 1 through 4 of this table present the chemicals to be evaluated for the process and waste water streams, drum liquefaction, lab pack processing, and natural gas combustion. Many of the constituents from drum liquefaction, based on diesel fuel composition, did not have chronic or acute toxicity values or exceed the odor threshold as described below. The only chemicals quantitatively evaluated for this process were cyclohexane and n-hexane.

Columns 5 and 6 list the chemicals that will be evaluated for odor impacts and acute health effects. All chemicals identified in Table 2 as having an odor threshold below 1 ppm will be included in the odor impact evaluation. For acute health effects, all chemicals with an acute reference exposure value will be evaluated. Hydrogen cyanide, which was originally listed, has been removed as it is no longer received at the Site.

In addition to the sources listed above, worker air monitoring data will also be considered for the evaluation of onsite worker exposure. All chemicals detected during worker air monitoring conducted in 1997 and 1998 will be quantitatively evaluated in the risk assessment. As shown in column 7 of Table 8, 25 chemicals were detected during worker air monitoring. In the initial table, 22 chemicals were listed for workers. However three chemicals were inadvertently left off the list. These chemicals are n-butyl acetate, d-limonene, and methyl n-amyl ketone.

A.4 References

California Air Resources Board (CARB). 1991. Identification of Volatile Organic Compound Species Profiles. ARB Speciation Manual. Second Edition. August.

Department of Toxic Substances Control (DTSC). 1991. Permitting of Treatment, Storage and Disposal Facilities (TSDF) Items to be Considered for Inclusion in a Health Risk Assessment. Memorandum from Chuck Salocks to All TSCP Staff Toxicologists. February 14.

Department of Toxic Substances Control (DTSC). 1992. Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities. July.

Department of Toxic Substances Control (DTSC).1995. Guidelines for Planning, Conducting, and Reviewing Human and Ecological Risk Assessments. Memorandum from Judith Parker to the Toxicologists of the Office of Scientific Affairs (OSA). February 21.

Department of Toxic Substances Control (DTSC). 1996. Review of Exposure Information for the Romic Facility. Memorandum from Ann Eli, Associate Air Pollution Specialist of the Northern California Permitting Office, to Henry Chui. October 31.

Department of Toxic Substances Control (DTSC). 1997. Romic Environmental Technologies Corp., East Palo Alto, CA. Memorandum from Cheng L. Liao, Staff Toxicologist of the

Human and Ecological Risk Division, to Henry Chui of the Hazardous Waste Management Branch. June 13.

ENVIRON. 1999. Work Plan for Human Health Risk Assessment and Ecological Risk Assessment, Part B Permit for Romic's East Palo Alto Facility. January 6.

Schmidt, C.E. 1992. Technical Memorandum: Results of the Field Assessment of Surface Emissions of Volatile Organic Compounds at the Romic Facility. July 28.

U.S. Environmental Protection Agency (USEPA). 1989a. Risk Assessment Guidance for Superfund. Vol. 1, Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1-89/002. Office of Emergency and Remedial Response. Washington, D.C. December.

U.S. Environmental Protection Agency (USEPA). 1989b. Human Health Evaluation Manual, Part B: "Development of Risk-based Preliminary Remediation Goals". OSWER Directive 9285.7-01B.

TABLE 1

Master Chemical List

CHEMICAL COMPONENT	Number of Manifests	Amount Received (pounds)			Comments
		Low	Midpoint	High	
1,1,1-TRICHLOROETHANE	4616	102870.98	222613.29	342355.6	
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	186	430.72	8446.24	16461.75	same as 1,1,2-trichlorotrifluoroethane
1,1,2-TRICHLOROETHANE	5	40.76	69.23	97.69	
1,1,2-TRICHLOROETHYLENE	2	536.4	771.07	1005.74	same as trichloroethene
1,1,2-TRICHLOROTRIFLUOROETHANE	247	879.06	955.16	1031.25	
1,1-DICHLOROETHANE	8	0	320.28	640.56	
1,1-DICHLOROETHENE	2	0	318.75	637.5	
1,1-DICHLOROETHYLENE	36	0.38	8384.24	16768.09	same as 1,1 dichloroethene
1,2,4-TRICHLOROBENZENE	53	27191.8	53235.26	79278.71	
1,2,4-TRIMETHYLBENZENE	3	3.34	13.52	23.69	
1,2-BENZENEDICARBOXYLIC ACID	3	1010.35	1285.9	1561.45	
1,2-BUTYLENE OXIDE	7	0	31.18	62.36	
1,2-DIBROMO-3-CHLOROPROPANE	1	0	0	0	
1,2-DICHLOROBENZENE	4	0	0.27	0.54	
1,2-DICHLOROETHANE	53	0.38	8980.17	17959.96	
1,2-DICHLOROETHYLENE	6	0	10.56	21.11	evaluate as trans-1,2-dichloroethylene
1,2-ETHANEDIOL	14	0	124.16	248.32	same as ethylene glycol
1,3,5-TRIMETHYLBENZENE	2	0	1.45	2.89	
1,3-DICHLOROBENZENE	1	0	0.5	1	
1,3-DICHLOROPROPENE	1	0	0	0	
1,4-DICHLOROBENZENE	36	0.93	9152.49	18304.05	
1,4-DIOXANE	62	378.94	1360.79	2342.63	
1-BUTANOL	9	99.5	242.37	385.24	same as n-butyl alcohol
1-METHYL-2-PYRROLIDINONE	19	99415.59	128065.92	156716.25	same as n-methyl-2-pyrrolidone
2,4-DIMETHYLPHENOL	4	0	0.21	0.41	
2,4-DINITROTOLUENE	33	0.44	9336.41	18672.38	
2-BUTANONE	47	0.25	481.06	961.86	
2-ETHOXYETHANOL	337	29729.96	79621.3	129512.63	
2-METHOXYETHANOL	31	1213.5	1825.42	2437.34	same as ethylene glycol methylether
2-METHYL-1-PROPANOL	2	22.96	57.4	91.84	
2-NITROPROPANE	21	0.12	6454.54	12908.95	
2-PROPANOL	48	5213.11	6756.8	8300.48	evaluate as propanol

TABLE 1

Master Chemical List

CHEMICAL COMPONENT	Number of Manifests	Amount Received (pounds)			Comments
		Low	Midpoint	High	
3,3-DICHLORO-1,1,1,2,2	3	48	73.25	98.5	chemical name not found
4,4-(1-METHYLETHYLIDENE)PHENOL	3	33.5	184.25	335	evaluate as phenol
4,4-DIPHENYLMETHANE DIISOCYANATE	12	658.25	729.1	799.95	same as methylene bisphenylisocyanate
4-METHYL-2-PENTANONE	135	1.41	96569.4	193137.38	
ACETALDEHYDE	4	6.01	7.23	8.45	
ACETONE	1088	28441.2	49322.66	88814.29	
ACETONITRILE	1158	111206.2	221017.2	330828.2	
ACRYLAMIDE	99	1969.13	7802.91	13636.69	
ACRYLAMIDE POLYMERS	4	385.54	498.4	611.25	evaluate as acrylamide
ACRYLIC ACID	4	0	9.8	19.6	
ACRYLONITRILE	5	52.8	302.28	551.76	
ALDRIN	1	0	0.01	0.02	
ALLYL ALCOHOL	1	0	9.76	19.52	
ALUMINUM FINES	2	0	21.48	42.96	
ALUMINUM OXIDE	173	63817.91	106294.11	148770.3	
AMMONIA	52	420.97	7799.17	15177.37	
AMMONIUM HYDROXIDE	172	3474.58	15129.4	26784.21	
AMMONIUM NITRATE SOLUTION	1	25.05	37.58	50.1	
AMMONIUM SULFATE	2	0	1.73	3.46	
ANTIMONY	147	0.12	110.88	221.64	
ANTIMONY TRICHLORIDE	4	0	18.64	37.28	
ANTIMONY TRIOXIDE	17	748.9	4766.43	8783.95	
AROMATICS	221	22355.5	155574.04	293371.55	evaluate as kerosene
ARSENIC	722	371.34	8534.43	16697.52	
ASBESTOS	6	0	0	0	
ASBESTOS (FRIABLE)	1	0	0	0	evaluate as asbestos
BARIUM	5006	178.12	12682.99	25187.86	
BARIUM CARBONATE	4	3.03	4.56	6.09	
BARIUM COMPOUNDS	2	0	680.58	1361.16	evaluate as barium
BARIUM PEROXIDE	5	0	6.18	12.35	
BARIUM SULFATE	13	45.97	61.98	77.99	
BENZENE	2024	140.43	100125.37	200110.31	

TABLE 1

Master Chemical List

CHEMICAL COMPONENT	Number of Manifests	Amount Received (pounds)			Comments
		Low	Midpoint	High	
BENZOYL PEROXIDE	7	88	132	176	
BENZYL ALCOHOL	26	2296.94	11277.5	20258.06	
BERYLLIUM	77	3.23	10.73	18.22	
BERYLLIUM CHLORIDE	4	3.9	5.85	7.8	
BORON TRICHLORIDE	1	0	6	12	
BROMINE	5	0	5.29	10.57	
BUTOXYETHANOL	44	109.92	849.66	1589.4	
BUTYLENE OXIDE	3	0.02	2.82	5.62	
BUTYOXYETHANOL	4	55.4	170.38	285.36	same as butoxyethanol
CADMIUM	1538	1351.14	2611.49	3871.84	
CADMIUM OXIDE	56	648.22	1309.64	1971.05	
CADMIUM SULFIDE	34	0	0	0	
CARBON	216	43813.74	47426.59	51039.44	
CARBON DISULFIDE	25	0.12	6953.99	13907.85	
CARBON TETRACHLORIDE	111	379.35	11561.53	22743.71	
CATECHOL	216	6434.63	28559.98	50685.32	
CHLORENDIC ANHYDRIDE	1	258	258	258	
CHLORINE	23	0	644.7	1289.4	
CHLOROBENZENE	125	560.77	11549.74	22538.7	
CHLORODIFLUOROETHANE	1	229.53	688.6	1147.66	
CHLORODIFLUOROMETHANE	117	0.04	9508.75	19017.45	
CHLOROFORM	378	4503.47	40675.46	76847.44	
CHLOROPHENOLS	6	0	122.55	245.1	evaluate as chlorophenol isomers
CHROMIC ACID	145	4511.17	10611.51	16711.85	
CHROMIC SULFATE	2	909.3	919.41	929.52	
CHROMIUM	2788	3205.29	25765.95	48326.6	evaluate as chromium III and chromium VI
CHROMIUM OXIDE	2	0	68.93	137.85	
CHROMIUM TRIOXIDE	18	39.2	204.91	370.61	
COBALT	113	5.37	22.45	39.52	
COBALT HYDROXIDE	45	278.43	419.15	559.87	
COBALT SULFATE	2	7.3	40.15	73	
COPPER	861	4809.24	80247.8	155686.36	

TABLE 1

Master Chemical List

CHEMICAL COMPONENT	Number of Manifests	Amount Received (pounds)			Comments
		Low	Midpoint	High	
COPPER 8 HYDROXYQUINOLATE	1	8.35	25.05	41.75	evaluate as copper
COPPER COMPOUNDS	3	0.06	849.02	1697.98	evaluate as copper
COPPER HYDROXIDE	8	389.75	599.64	809.53	
COPPER OXIDE	19	3021.8	7009.75	10997.7	
COPPER SULFATE	44	12570.86	14679.59	16788.32	
CREOSOTE	1	0	1	2	
CRESOL (MIXED ISOMERS)	1	47.76	71.64	95.52	evaluate as cresol isomers
CRESOL(S)	104	21.1	10660	21256.7	evaluate as cresol isomers
CUMENE	5	0	182.7	365.4	
CUMENE HYDROPEROXIDE	4	0	0	0	
CUPRIC ACETATE	2	0	1.63	3.25	
CUPRIC CHLORIDE	2	5072.63	10145.26	15217.88	
CUPRIC NITRATE	7	0	275.04	550.08	
CUTTING OIL	35	24663.33	26363.16	28062.99	
CYANIDE	50	1.69	288.2	574.71	
CYANIDE SALTS	2	0	0	0	evaluate as cyanide
CYANIDES	23	0	1728.42	3456.84	evaluate as cyanide
CYCLOHEXANE	129	2549.28	4725.47	6901.65	
CYCLOHEXANOL	6	0	101.95	203.89	
DENATURED ALCOHOL	16	665.86	2087.02	3508.17	
DEVELOPER	9	396.14	698.05	999.96	evaluate as n-butyl alcohol
DI(2-ETHYLHEXYL)PHTHALATE	10	0	38.75	77.5	
DIACETONE ALCOHOL	27	44.26	16313.82	32583.38	
DIATOMACEOUS EARTH	29	11231.25	13820.05	16408.85	
DIBORANE	1	0	0.5	1	
DIBUTYL PHENYL PHOSPHATE	7	174.6	491.9	809.2	
DIBUTYL PHTHALATE	11	45.92	259.19	472.46	
DIBUTYLAMINOETHANOL	4	0	195.13	390.25	
DICHLOROACETIC ACID	51	0	1566.1	3132.19	
DICHLOROBENZENE	6	548.23	826.31	1104.38	evaluate as dichlorobenzene isomers
DICHLORODIFLUOROETHANE	3	6371.03	12104.99	17838.94	
DICHLORODIFLUOROMETHANE	59	154	656.39	1158.77	

TABLE 1

Master Chemical List

CHEMICAL COMPONENT	Number of Manifests	Amount Received (pounds)			Comments
		Low	Midpoint	High	
DICHLOROETHANE	27	3278.54	6890.92	10503.3	evaluate as 1,2-dichloroethane
DICHLOROETHYLENE	3	49.26	2492.17	4935.07	evaluate as 1,1-dichloroethene
DICHLOROFLUOROETHANE	21	13490.73	15041.29	16591.84	
DICHLOROMETHANE	254	102281.36	116786.9	131292.44	same as methylene chloride
DICHLOROPENTAFLUOROPROPANE	1	108.28	108.84	109.39	
DIETHANOLAMINE	122	256227.26	367374.14	478521.02	
DIETHYL ETHER	18	1328.24	1522.86	1717.47	
DIETHYL KETONE	32	236.57	341.04	445.5	
DIETHYLAMINE	6	0	0.1	0.2	
DIETHYLAMINOETHANOL	2	11.14	19.36	27.57	
DIETHYLBENZENE	8	177.71	399.87	622.03	
DIETHYLENE GLYCOL	219	51203.91	153400.62	255597.33	
DIETHYLENE GLYCOL DIBENZOATE	9	0	1149.96	2299.91	
DIETHYLHYDROXYLAMINE	6	20.45	30.68	40.9	
DIFLUOROETHANE	1	0	0	0	
DIGLYCIDYL ETHER	3	0	0	0	
DIISOBUTYL KETONE	4	500.13	555.53	610.92	
DIISOPROPYLAMINE	43	0	106.73	213.46	
DIMETHOXYETHANE	8	4.05	41.53	79	
DIMETHYL ETHER	5	1697.66	2048.84	2400.01	
DIMETHYL FORMAMIDE	102	40054.5	55441.62	70828.73	
DIMETHYL PHTHALATE	3	1025.49	1171.99	1318.49	
DIMETHYL SULFOXIDE	187	3357.04	28282.9	53208.75	
DIMETHYLACETAMIDE	7	1581.88	2280.11	2978.34	
DIMETHYLAMINOETHANOL	19	343.29	3567.3	6791.31	
DIMETHYLFORMAMIDE	248	192605.88	322646.2	452686.52	evaluate as dimethylformamide
DIMETHYLSILYDIETHYLAMINE	1	4	8	12	chemical name not found
DIOCTYL PHTHALATE	3	313.75	1736	3158.24	
DIOXANE	109	58.4	23790.94	47523.47	same as 1,4 dioxane
DIPHENYLGUANIDINE	4	0	127.5	255	
DIPHENYLOXIDE	10	3024.21	5273.51	7522.8	
DIPROPYLENE GLYCOL	13	45.92	1448.57	2851.22	

TABLE 1

Master Chemical List

CHEMICAL COMPONENT	Number of Manifests	Amount Received (pounds) Low	Midpoint	High	Comments
DIPROPYLENE GLYCOL DIBENZOATE	9	0	1181.19	2362.38	
DIPROPYLENE GLYCOL METHYL ETHER	58	587.03	11811.26	23035.49	
DISODIUM PHOSPHATE	1	0	6.26	12.52	
DITHIOTHREITOL	3	0	32.03	64.06	
DIURON	2	0	3.08	6.16	
DIVINYL BENZENE	10	20.32	104.69	189.06	
DODECYLBENZENESULFONIC ACID	141	24459.7	57771.96	91084.22	
DOWANOL	3	0	6.86	13.72	
ELECTROLESS NICKEL	3	0	3.25	6.5	evaluate as nickel
EPICHLOROHYDRIN	16	108.38	235.19	361.99	
ETHYL ACRYLATE	6	0	43.73	87.45	
ETHYL BENZENE	4070	62983.34	146793.74	381467.88	
ETHYL CELLOSOLVE	16	67.17	732.66	1398.14	same as 2-ethoxyethanol
ETHYL CHLORIDE	1	0	1.29	2.58	
ETHYLENE DICHLORIDE	34	206.54	1026.24	1845.94	same as 1,2 dichloroethane
ETHYLENE GLYCOL	7990	5189878.88	7089483.74	8989088.59	
ETHYLENE GLYCOL METHYL ETHER	1	0	0	0	
ETHYLENE GLYCOL MONOETHYL ETHER	48	44591.7	68840.07	93088.44	same as 2-ethoxyethanol
ETHYLENE OXIDE	2	0	4.67	9.33	
ETHYLENEDIAMINE	5	0	22.49	44.98	
FERRIC NITRATE	1	106.6	213.2	319.8	
FORMALDEHYDE	115	779.41	3461.5	6143.59	
FORMALIN	63	15.44	1685.97	3356.5	same as formaldehyde
FORMIC ACID	106	105.28	436.69	768.09	
FREON	84	56911.75	85027.13	113142.51	
FREON 11	2	31.79	79.88	127.96	same as trichlorofluoromethane
FREON 113	8	1521.4	1703.71	1886.01	same as 1,1,2-trichloro-1,2,2-trifluoroethane
GASOLINE	1729	620556.16	851077.51	1081598.85	
GLYCOL	35	9649.57	10149.24	10648.91	same as ethylene glycol
HDI	3	0	27.55	55.09	same as hexamethylene diisocyanate
HEXACHLOROBENZENE	33	0.64	12179.53	24358.41	
HEXACHLOROBUTADIENE	33	0.59	11685.06	23369.53	

TABLE 1

Master Chemical List

CHEMICAL COMPONENT	Number of Manifests	Amount Received (pounds) Low	Midpoint	High	Comments
HEXACHLOROETHANE	33	0.54	11097.9	22195.25	
HEXAMETHYLENE DIISOCYANATE	3	0	4.37	8.74	
HEXAMETHYLENE DIISOCYANATE MONOMER	6	0	28.65	57.29	evaluate as hexamethylene diisocyanate
HEXANE	682	459301.35	748447.82	1037594.28	
HEXANES	9	22.96	77.86	132.76	evaluate as hexane
HYDRAZINE	9	2044.32	3208.87	4373.41	
HYDROCHLORIC ACID	640	17922.38	54888.83	91855.27	
HYDROFLUORIC ACID	675	4961.3	29304.82	53648.34	
HYDROGEN CHLORIDE	14	134.16	421.12	708.08	same as hydrochloric acid
HYDROGEN CYANIDE	3	0	0	0	
HYDROGEN SULFIDE	19	0	33.77	67.54	
HYDROQUINONE	14	1.07	173.65	346.22	
ISOPROPYL ALCOHOL	2088	269417.35	561101.45	852785.55	
LEAD	6374	13281.34	34565.33	55849.31	
LEAD ACID BATTERIES	3	683.7	686.35	689	evaluate as inorganic lead
LEAD SOLDER	92	0	22.75	45.49	evaluate as inorganic lead
MANGANESE	18	0	1426.34	2852.68	
MANGANESE DIOXIDE	237	11020.55	22569.47	34118.38	
MANGANOUS OXIDE	7	0	2651.05	5302.09	
M-CRESOL	21	0.12	6528.42	13056.72	
MERCURY	655	29.94	219.38	408.81	
MERCURY (METALLIC)	7	2.05	68.12	134.19	evaluate as inorganic mercury
MERCURY CONTAMINATED ARTICLES	3	11	16.05	21.1	evaluate as inorganic mercury
MERCURY VAPOR LAMPS	41	2957.31	9209.81	15462.31	evaluate as inorganic mercury
MERCURY/FLUORESCENT LIGHT BULBS	11	2630.9	2694.95	2759	evaluate as inorganic mercury
METHACRYLATE	17	26.62	50.22	73.82	
METHANOL	3732	446806.23	1179846.01	1912885.79	
METHYL CHLOROFORM	18	553.85	841.07	1128.28	same as 1,1,1-trichloroethane
METHYL ETHYL KETONE	4	682.45	1032.47	1382.48	same as 2-butanone
METHYL ISOBUTENYL KETONE	4	0	4.61	9.21	
METHYL ISOBUTYL KETONE	4664	136749.12	475126.71	813504.29	same as 4-methyl-2-pentanone
METHYL METHACRYLATE	18	2.35	1031.66	2060.96	

TABLE 1

Master Chemical List

CHEMICAL COMPONENT	Number of Manifests	Amount Received (pounds)			Comments
		Low	Midpoint	High	
METHYL PYROLIDONE	6	23.65	47.3	70.95	
METHYLENE BISPHENYL ISOCYANATE	6	3825	5100	6375	
METHYLENE CHLORIDE	5859	250001.35	431233.05	612464.74	
METHYLENE DIANILINE	1	0	0	0	
METHYLENE DICHLORIDE	8	1774.54	2524.04	3273.53	same as methylene chloride
METHYLMETHACRYLATE	1	0	4.18	8.35	same as methylmethacrylate
METHYLMETHOXYPROPIONATE	22	12744.39	19116.64	25488.88	chemical name not found
METHYL-TERT-BUTYL ETHER	127	26237.67	40174.61	54111.55	
MICHLER'S KETONE	2	0	3.25	6.5	
MURIATIC ACID	16	334.07	481.43	628.79	same as hydrochloric acid
N,N-DIMETHYL FORMAMIDE	29	244.49	722.76	1201.03	same as dimethylformamide
N,N-DIMETHYLFORMAMIDE	72	7665.55	8747.07	9828.59	same as dimethylformamide
NAPHTHALENE	121	2336.87	8019.68	13702.48	
N-BUTYL ALCOHOL	512	10451.06	70026.78	129602.5	
NICKEL	1005	8219.22	15304.68	22390.13	
NICKEL ACETATE	5	52.12	78.19	104.25	
NICKEL BROMIDE	5	9	13.5	18	
NICKEL OXIDE	60	248.77	1024.59	1800.4	
NICKEL PEROXIDE	56	1190.51	1785.77	2381.02	
NITRAPYRIN	2	0	581	1162	
NITRIC ACID	623	37074.2	66463.87	95853.54	
NITRIC ACID RESIDUE	1	4.17	12.52	20.87	evaluate as nitric acid
NITRILOTRIACETIC ACID	2	13	39	65	
NITROBENZENE	73	1.95	25458.29	50914.62	
NITROGEN	24	154	231.5	309	
N-METHYL-2-PYRROLIDONE	1377	2352202.6	2890486.93	3428771.25	
NMP	4	0	3.17	6.33	same as n-methyl-2-pyrrolidone
O-CRESOL	27	507.39	7226.98	13946.57	
O-DICHLOROBENZENE	120	233068.59	359054.67	485040.75	same as 1,2-dichlorobenzene
ORTHO-DICHLOROBENZENE	2	12.24	14.29	16.33	same as 1,2-dichlorobenzene
OSMIUM TETROXIDE	1	0	1.05	2.1	
OXALIC ACID	5	245	256.29	267.58	

TABLE 1

Master Chemical List

CHEMICAL COMPONENT	Number of Manifests	Amount Received (pounds)			Comments
		Low	Midpoint	High	
P-CRESOL	21	0.12	6528.42	13056.72	
PERACETIC ACID	3	0	6.26	12.52	
PERCHLOROETHANE	5	344.43	466.65	588.86	same as hexachloroethane
PHENOL	375	763.42	102325.26	203887.09	
PHOPHORIC ACID	2	5.5	140.52	275.54	same as phosphoric acid
PHOSPHINE	1	0	0.5	1	
PHOSPHORIC ACID	368	28399.69	51104.98	73810.27	
PHOSPHORUS	7	0	4.05	8.1	
PICRIC ACID	2	0	16.25	32.5	
POLYMERIC METHYL DIISOCYANATE	1	0	0	0	evaluate as methyldiisocyanate
POLYMETHYLENE POLYPHENYLISOCYANATE	3	0	2.92	5.84	
POLYNUCLEAR AROMATIC HYDROCARBONS	4	0	6.63	13.25	evaluate as benzo(a)pyrene and naphthalene
POTASSIUM CYANIDE	1	150	150	150	
PROPANOL	148	14892.99	31268.93	79061.78	
PROPELLENT	8	55	70.19	85.37	evaluate as cutting oil
PROPYLENE DICHLORIDE	1	0	1.29	2.58	
PROPYLENE OXIDE	30	5.25	7772.82	15540.38	
PYRIDINE	561	1734.07	25791.78	49849.48	
PYROCATECHOL	5	0	36.77	73.53	same as catechol
SAFROLE	1	2.75	8.26	13.77	
SEC-BUTYL ALCOHOL	8	218.29	1197.93	2177.56	
SELENIUM	1035	46.94	290.51	534.07	
SILVER	1397	414.49	1008.24	1601.99	
SILVER NITRATE	21	6.69	361.72	716.74	
SILVER OXIDE	2	200	250	300	
SILVER SULFATE	6	0	2.2	4.4	
SODIUM AZIDE	16	0	13.41	26.82	
SODIUM NITRATE	11	775.08	1871.76	2968.44	
SODIUM NITRITE	47	15358.4	45686.05	76013.69	
SODIUM SALT	30	654.58	1046.48	1438.38	
SOLDER	2	34.5	46	57.5	not chemical specific
SOLVENTS (AROMATIC)	15	0	25.47	50.93	evaluate as kerosene

TABLE 1

Master Chemical List

CHEMICAL COMPONENT	Number of Manifests	Amount Received (pounds)			Comments
		Low	Midpoint	High	
STYRENE	76	2567.9	5202.37	7836.84	
SULFAMIC ACID	2	26	39.31	52.62	
SULFURIC ACID	755	217019.83	311080.82	405141.8	
TETRACHLOROETHANE	6	0	10.19	20.37	
TETRACHLOROETHENE	1	0	20.25	40.5	
TETRACHLOROETHYLENE	889	27068.47	117161.92	207255.36	same as tetrachloroethene
THALLIUM	262	4.98	18.38	31.77	
THERMOMETERS	4	37.8	40.15	42.5	not processed on-site
THIAZOLYL BLUE	10	0	2.18	4.35	
THIOACETAMIDE	3	15.36	23.04	30.72	
THIOUREA	15	32.14	384.36	736.57	
TOLUENE	7285	494934.56	2164506.21	3834077.86	
TOLUENE DIISOCYANATE	14	426.38	698.44	970.5	evaluate as toluene diisocyanate (mixed isomers)
TOLUENEDIISOCYANATE (MIXED ISOMERS)	2	39.24	215.85	392.45	
TRANSMISSION FLUID	147	2229.8	3570.44	4911.07	evaluate as cutting oil
TRIBROMOMETHANE	1	0	0	0	
TRICHLOROETHENE	6	35	80.03	125.06	
TRICHLOROETHYLENE	421	81667.41	121742.28	161817.15	same as trichloroethene
TRICHLOROFLUOROMETHANE	79	467.34	8821.23	17175.12	
TRICHLOROMETHANE	1	1	1.5	2	same as chloroform
TRICHLOROTRIFLUOROETHANE	183	7737.49	32083.86	56430.23	same as 1,1,2-trichlorotrifluoroethane
TRIETHYLAMINE	213	1736.82	17864.83	33992.84	
TRIMETHYLBENZENE	32	340.32	886.04	1431.75	
TRIS BASE	23	0	0	0	
URANINE	1	0	1.25	2.5	
URETHANE	13	5530.06	10867.58	16205.1	
VANADIUM	40	0	0.18	0.36	
VINYL ACETATE	26	13.45	141.29	269.12	
VINYL BENZYL CHLORIDE	6	0	43.73	87.45	
VINYL CHLORIDE	14	0	145.61	291.21	
XYLENE	7005	395961.68	1539539.05	2683116.42	evaluate as xylene (mixed isomers)
XYLENE (MIXED ISOMERS)	2	0	0	0	

TABLE 1

Master Chemical List

CHEMICAL COMPONENT	Number of Manifests	Amount Received (pounds)			Comments
		Low	Midpoint	High	
XYLENES	31	770.3	1541.05	2311.8	evaluate as xylene (mixed isomers)
ZINC	998	7967.69	17737.23	27506.77	

TABLE 2
Preliminary Selection of Chemicals

CAS #	Compound	Vapor Pressure	Prop 65 Listed	AB2588 Listed	TLV	Toxicity Values			Low Odor Threshold	Included in refined screen
						Cal/EPA	IRIS	HEAST		
71-55-6	1,1,1-TRICHLOROETHANE	1		1	NS					yes
79-00-5	1,1,2-TRICHLOROETHANE	1		1	NS	1	1	1		yes
76-13-1	1,1,2-TRICHLOROTRIFLUOROETHANE	1		1	NS		1	1		yes
75-34-3	1,1-DICHLOROETHANE	1	1	1	1	1		1		yes
75-35-4	1,1-DICHLOROETHENE	1		1	NS		1	1		yes
120-82-1	1,2,4-TRICHLOROBENZENE	1		1	1		1			yes
95-63-6	1,2,4-TRIMETHYLBENZENE	1		1	1					yes
88-99-3	1,2-BENZENEDICARBOXYLIC ACID									no
106-88-7	1,2-BUTYLENE OXIDE	1					1			yes
96-12-8	1,2-DIBROMO-3-CHLOROPROPANE	1	1	1		1	1	1		yes
95-50-1	1,2-DICHLOROBENZENE	1		1	1		1		1	yes
107-06-2	1,2-DICHLOROETHANE	1	1	1	NS	1	1			yes
108-67-8	1,3,5-TRIMETHYLBENZENE	1			1					yes
541-73-1	1,3-DICHLOROBENZENE	1		1	1					yes
542-75-6	1,3-DICHLOROPROPENE	1	1	1	1	1	1	1		yes
106-46-7	1,4-DICHLOROBENZENE	1	1	1	1	1	1	1	1	yes
123-91-1	1,4-DIOXANE	1	1	1	NS	1	1			yes
105-67-9	2,4-DIMETHYLPHENOL	1		1			1			yes
121-14-2	2,4-DINITROTOLUENE	1	1	1	NS		1			yes
78-93-3	2-BUTANONE	1		1	1		1			yes
95-57-8	2-CHLOROPHENOL	1		1			1			yes
110-80-5	2-ETHOXYETHANOL	1	1	1	NS		1	1		yes
78-83-1	2-METHYL-1-PROPANOL	1					1			yes
79-46-9	2-NITROPROPANE	1	1	1	1		1	1		yes
108-10-1	4-METHYL-2-PENTANONE	1						1	1	yes
75-07-0	ACETALDEHYDE	1	1	1	1	1	1		1	yes
67-64-1	ACETONE	1		1	1		1			yes
75-05-8	ACETONITRILE	1		1	NS		1			yes
79-06-1	ACRYLAMIDE	1	1	1	NS	1	1	1		yes
79-10-7	ACRYLIC ACID	1		1	1		1		1	yes
107-13-1	ACRYLONITRILE	1	1	1	NS	1	1	1		yes
309-00-2	ALDRIN	1	1	1	NS	1	1	1		yes
107-18-6	ALLYL ALCOHOL	1		1	1		1			yes
7429-90-5	ALUMINUM FINES			1	1					yes
1344-28-1	ALUMINUM OXIDE			1	1					yes
7664-41-7	AMMONIA	1		1	1		1			yes
1336-21-6	AMMONIUM HYDROXIDE									no
6484-52-2	AMMONIUM NITRATE SOLUTION			1						yes
7783-20-2	AMMONIUM SULFATE			1						yes
7440-36-0	ANTIMONY			1	1		1			yes
10025-91-9	ANTIMONY TRICHLORIDE			1						yes
1309-64-4	ANTIMONY TRIOXIDE		1	1	NS		1	1		yes

TABLE 2
Preliminary Selection of Chemicals

CAS #	Compound	Vapor Pressure	Prop 65 Listed	AB2588 Listed	TLV	Toxicity Values			Low Odor Threshold	Included in refined screen
						Cal/EPA	IRIS	HEAST		
7440-38-2	ARSENIC		1	1	NS	1	1			yes
1332-21-4	ASBESTOS (tox val. = f/ml)		1	1	NS	1	1			yes
7440-39-3	BARIUM			1	1		1			yes
513-77-9	BARIUM CARBONATE			1	1					yes
1304-29-6	BARIUM PEROXIDE			1	1					yes
7727-43-7	BARIUM SULFATE			1	NS					yes
71-43-2	BENZENE	1	1	1	NS	1	1	1		yes
50-32-8	BENZO(A)PYRENE	1	1	1		1	1			yes
94-36-0	BENZOYL PEROXIDE			1	1					yes
100-51-6	BENZYL ALCOHOL	1						1		yes
7440-41-7	BERYLLIUM		1	1	NS	1	1	1		yes
13814-50-1	BERYLLIUM CHLORIDE		1	1	NS					yes
10294-34-5	BORON TRICHLORIDE	1								no
7726-95-6	BROMINE	1		1	1				1	yes
109-99-9	BUTYLENE OXIDE	1								no
111-76-2	BUTYOXYETHANOL	1			NS			1		yes
7440-43-9	CADMIUM		1	1	NS	1	1			yes
1306-19-0	CADMIUM OXIDE		1	1	NS					yes
1306-23-6	CADMIUM SULFIDE		1	1	NS					yes
7440-44-0	CARBON									no
75-15-0	CARBON DISULFIDE	1	1	1	NS		1		1	yes
56-23-5	CARBON TETRACHLORIDE	1	1	1	NS	1	1	1		yes
120-80-9	CATECHOL			1	1					yes
115-27-5	CHLORENDIC ANHYDRIDE									no
7782-50-5	CHLORINE	1		1	1		1		1	yes
108-90-7	CHLOROBENZENE	1		1	NS		1		1	yes
25497-29-4	CHLORODIFLUOROETHANE			1						yes
75-45-6	CHLORODIFLUOROMETHANE	1		1	NS		1			yes
67-66-3	CHLOROFORM	1	1	1	NS	1	1	1		yes
7738-94-5	CHROMIC ACID			1						yes
10101-53-8	CHROMIC SULFATE			1						yes
7440-47-3	CHROMIUM (III)			1	1		1			yes
18540-29-9	CHROMIUM (VI)		1			1	1	1		yes
11118-57-3	CHROMIUM OXIDE			1						yes
1333-82-0	CHROMIUM TRIOXIDE	1	1	1						yes
7440-48-4	COBALT		1	1	NS					yes
21041-93-0	COBALT HYDROXIDE			1	NS					yes
10124-43-3	COBALT SULFATE			1	NS					yes
7440-50-8	COPPER			1	1					yes
20427-59-2	COPPER HYDROXIDE			1	1					yes
1317-38-0	COPPER OXIDE			1	1					yes
7758-98-7	COPPER SULFATE			1	1					yes

TABLE 2
Preliminary Selection of Chemicals

CAS #	Compound	Vapor Pressure	Prop 65 Listed	AB2588 Listed	TLV	Toxicity Values			Low Odor Threshold	Included in refined screen
						Cal/EPA	IRIS	HEAST		
8001-58-9	CREOSOTE		1	1						yes
98-82-8	CUMENE	1		1	NS		1	1	1	yes
80-15-9	CUMENE HYDROPEROXIDE	1		1						yes
142-71-2	CUPRIC ACETATE			1						yes
7447-39-4	CUPRIC CHLORIDE			1						yes
3251-23-8	CUPRIC NITRATE			1						yes
64771-79-5	CUTTING OIL			1						yes
57-12-5	CYANIDE	1		1			1			yes
110-82-7	CYCLOHEXANE	1		1	1					yes
108-93-0	CYCLOHEXANOL	1			1				1	yes
64-17-5	DENATURED ALCOHOL	1								no
117-81-7	DI(2-ETHYLHEXYL)PHTHALATE	1	1	1	1		1			yes
123-42-2	DIACETONE ALCOHOL	1			1				1	yes
61790-53-2	DIATOMACEOUS EARTH				1					yes
19287-45-7	DIBORANE				NS					no
2528-36-1	DIBUTYL PHENYL PHOSPHATE	1			1					yes
84-74-2	DIBUTYL PHTHALATE	1		1	1		1			yes
102-81-8	DIBUTYLAMINOETHANOL	1			1					yes
79-43-6	DICHLOROACETIC ACID	1	1							yes
25915-78-0	DICHLORODIFLUOROETHANE			1						yes
75-71-8	DICHLORODIFLUOROMETHANE	1		1	NS		1			yes
1717-00-6	DICHLOROFLUOROETHANE	1		1						yes
127564-92-5	DICHLOROPENTAFLUOROPROPANE			1						yes
111-42-2	DIETHANOLAMINE	1		1	NS					yes
60-29-7	DIETHYL ETHER	1			1		1			yes
96-22-0	DIETHYL KETONE	1			1					yes
109-89-7	DIETHYLAMINE	1			1				1	yes
100-37-8	DIETHYLAMINOETHANOL	1			1				1	yes
25340-17-4	DIETHYLBENZENE									no
111-46-6	DIETHYLENE GLYCOL	1		1						yes
120-55-8	DIETHYLENE GLYCOL DIBENZOATE			1						yes
3710-84-7	DIETHYLHYDROXYLAMINE									no
75-37-6	DIFLUOROETHANE	1					1			yes
2238-07-5	DIGLYCIDYL ETHER	1			1					yes
108-83-8	DIISOBUTYL KETONE	1			1				1	yes
108-18-9	DIISOPROPYLAMINE	1			1					yes
110-71-4	DIMETHOXYETHANE	1								no
115-10-6	DIMETHYL ETHER	1								no
68-12-2	DIMETHYL FORMAMIDE	1		1	NS		1	1		yes
131-11-3	DIMETHYL PHTHALATE	1		1	1					yes
67-68-5	DIMETHYL SULFOXIDE	1								no
127-19-5	DIMETHYLACETAMIDE									no

TABLE 2
Preliminary Selection of Chemicals

CAS #	Compound	Vapor Pressure	Prop 65 Listed	AB2588 Listed	TLV	Toxicity Values			Low Odor Threshold	Included in refined screen
						Cal/EPA	IRIS	HEAST		
108-01-0	DIMETHYLAMINOETHANOL									no
117-84-0	DIOCTYL PHTHALATE			1						yes
30282-54-3	DIPHENYL GUANIDINE									no
101-84-8	DIPHENYL OXIDE								1	no
25265-71-8	DIPROPYLENE GLYCOL	1		1						yes
94-51-9	DIPROPYLENE GLYCOL DIBENZOATE			1						yes
34590-94-8	DIPROPYLENE GLYCOL METHYL ETHER	1		1	1					yes
7558-79-4	DISODIUM PHOSPHATE			1						yes
27565-41-9	DITHIOTHREITOL									no
330-54-1	DIURON	1			1		1			yes
1321-74-0	DIVINYL BENZENE	1			1					yes
27176-87-0	DODECYLBENZENESULFONIC ACID									no
111-90-0	DOWANOL	1						1		yes
106-89-8	EPICHLOROHYDRIN	1	1	1	1	1	1	1	1	yes
140-88-5	ETHYL ACRYLATE	1	1	1	1			1	1	yes
100-41-4	ETHYL BENZENE	1		1	1		1			yes
75-00-3	ETHYL CHLORIDE	1		1	NS		1			yes
107-21-1	ETHYLENE GLYCOL	1		1	1		1			yes
109-86-4	ETHYLENE GLYCOL METHYL ETHER	1	1	1	NS		1			yes
75-21-8	ETHYLENE OXIDE	1	1	1	NS	1		1		yes
107-15-3	ETHYLENEDIAMINE	1						1		yes
10421-48-4	FERRIC NITRATE									no
50-00-0	FORMALDEHYDE	1	1	1	1	1	1	1	1	yes
64-18-6	FORMIC ACID	1			1			1		yes
11126-05-9	FREON			1						yes
8006-61-9	GASOLINE	1		1	1					yes
118-74-1	HEXACHLOROBENZENE	1	1	1	NS	1	1	1		yes
87-68-3	HEXACHLOROBUTADIENE	1		1	1		1	1		yes
67-72-1	HEXACHLOROETHANE	1	1	1	1	1	1	1	1	yes
822-06-0	HEXAMETHYLENE DIISOCYANATE	1		1	1		1			yes
110-54-3	HEXANE	1		1	1		1	1		yes
302-01-2	HYDRAZINE	1	1	1	1	1	1	1		yes
7647-01-0	HYDROCHLORIC ACID	1		1	1		1			yes
7664-39-3	HYDROFLUORIC ACID	1			1					yes
74-90-8	HYDROGEN CYANIDE	1		1	1		1		1	yes
7783-06-4	HYDROGEN SULFIDE	1		1	1		1		1	yes
123-31-9	HYDROQUINONE	1		1	NS			1		yes
67-63-0	ISOPROPYL ALCOHOL	1			1					yes
8008-20-6	KEROSENE	1								no
7439-92-1	LEAD		1	1	NS					yes
7439-96-5	MANGANESE			1			1			yes
1313-13-9	MANGANESE DIOXIDE			1						yes

TABLE 2
Preliminary Selection of Chemicals

CAS #	Compound	Vapor Pressure	Prop 65 Listed	AB2588 Listed	TLV	Toxicity Values			Low Odor Threshold	Included in refined screen
						Cal/EPA	IRIS	HEAST		
1344-43-0	MANGANOUS OXIDE			1						yes
108-39-4	M-CRESOL	1		1	1		1		1	yes
7439-97-6	MERCURY	1	1	1	NS		1	1		yes
96-33-3	METHACRYLATE				1				1	yes
67-56-1	METHANOL	1		1			1			yes
141-79-7	METHYL ISOBUTENYL KETONE									no
80-62-6	METHYL METHACRYLATE	1		1	1		1	1	1	yes
51013-18-4	METHYL PYROLIDONE									no
101-68-8	METHYLENE BISPHENYL ISOCYANATE			1	1		1			yes
75-09-2	METHYLENE CHLORIDE	1	1	1	NS	1	1			yes
101-77-9	METHYLENE DIANILINE		1	1	NS	1				yes
1634-04-4	METHYL-TERT-BUTYL ETHER	1		1	1		1			yes
90-94-8	MICHLERS KETONE		1	1		1				yes
91-20-3	NAPHTHALENE	1		1	1		1		1	yes
71-36-3	N-BUTYL ALCOHOL	1		1	1		1		1	yes
7440-02-0	NICKEL		1	1	NS	1	1			yes
373-02-4	NICKEL ACETATE		1	1	1					yes
13462-88-9	NICKEL BROMIDE		1	1	1					yes
1313-99-1	NICKEL OXIDE		1	1	1					yes
1314-06-3	NICKEL PEROXIDE		1	1	1					yes
1929-82-4	NITRAPYRIN				NS					no
7697-37-2	NITRIC ACID	1		1	1					yes
139-13-9	NITRILOTRIACETIC ACID	1	1	1		1				yes
98-95-3	NITROBENZENE	1	1	1	1		1		1	yes
7727-37-9	NITROGEN				NS					no
872-50-4	N-METHYL-2-PYRROLIDONE	1								no
95-48-7	O-CRESOL	1		1	1		1			yes
20816-12-0	OSMIUM TETROXIDE	1		1	1				1	yes
144-62-7	OXALIC ACID	1			1					yes
106-44-5	P-CRESOL	1		1	1			1		yes
79-21-0	PERACETIC ACID	1		1						yes
108-95-2	PHENOL	1		1	1		1		1	yes
7803-51-2	PHOSPHINE	1			1		1		1	yes
7664-38-2	PHOSPHORIC ACID	1		1	1		1			yes
7723-14-0	PHOSPHORUS	1		1	1		1			yes
88-89-1	PICRIC ACID	1		1	1					yes
	POLYMERIC METHYL DIISOCYANATE									no
9016-87-9	POLYMETHYLENE POLYPHENYLISOCYANATE	1		1			1			yes
151-50-8	POTASSIUM CYANIDE			1			1			yes
71-23-8	PROPANOL	1			1					yes
78-87-5	PROPYLENE DICHLORIDE	1		1	1	1	1	1	1	yes
75-56-9	PROPYLENE OXIDE	1	1		1		1	1		yes

TABLE 2
Preliminary Selection of Chemicals

CAS #	Compound	Vapor Pressure	Prop 65 Listed	AB2588 Listed	TLV	Toxicity Values			Low Odor Threshold	Included in refined screen
						Cal/EPA	IRIS	HEAST		
110-86-1	PYRIDINE	1		1	1		1		1	yes
94-59-7	SAFROLE	1	1	1		1				yes
78-92-2	SEC-BUTYL ALCOHOL	1		1	1					yes
7782-49-2	SELENIUM			1	1		1			yes
7440-22-4	SILVER			1	NS		1			yes
7761-88-8	SILVER NITRATE			1	NS					yes
1301-96-8	SILVER OXIDE			1	NS					yes
10294-26-5	SILVER SULFATE			1	NS					yes
26628-22-8	SODIUM AZIDE				1		1			yes
7631-99-4	SODIUM NITRATE			1			nitric acid			yes
7632-00-0	SODIUM NITRITE									no
7440-23-5	SODIUM SALT									no
100-42-5	STYRENE	1		1	1		1		1	yes
5329-14-6	SULFAMIC ACID									no
7664-93-9	SULFURIC ACID	1		1	1					yes
79-34-5	TETRACHLOROETHANE	1	1	1	NS	1	1	1		yes
127-18-4	TETRACHLOROETHENE	1	1	1	1	1	1			yes
7440-28-0	THALLIUM			1	1					yes
298-93-1	THIAZOLYL BLUE									no
62-55-5	THIOACETAMIDE		1	1		1				yes
62-56-6	THIOUREA	1	1	1		1				yes
108-88-3	TOLUENE	1	1	1	NS		1			yes
26471-62-5	TOLUENE DIISOCYANATE (MIXED ISOMERS)	1	1	1	1	1	1		1	yes
156-60-5	TRANS-1,2-DICHLOROETHYLENE	1					1			yes
75-25-2	TRIBROMOMETHANE	1					1	1		yes
79-01-6	TRICHLOROETHENE	1	1	1	NS	1				yes
75-69-4	TRICHLOROFLUOROMETHANE	1		1	NS		1			yes
121-44-8	TRIETHYLAMINE	1		1	1		1		1	yes
25551-13-7	TRIMETHYLBENZENE	1		1	1					yes
77-86-1	TRIS BASE									no
518-47-8	URANINE									no
51-79-6	URETHANE	1	1	1		1				yes
7440-62-2	VANADIUM			1				1		yes
108-05-4	VINYL ACETATE	1		1	1		1	1	1	yes
26446-61-7	VINYL BENZYL CHLORIDE									no
75-01-4	VINYL CHLORIDE	1	1	1	NS	1		1		yes
1330-20-7	XYLENE (MIXED ISOMERS)	1		1	1		1			yes
7440-66-6	ZINC			1			1			yes

Notes:
"1" = chemical is listed or has a value
AB2588 Listed = chemicals listed for regulation under the Air Toxics "Hot Spots" Program

TABLE 2
Preliminary Selection of Chemicals

CAS #	Compound	Vapor Pressure	Prop 65 Listed	AB2588 Listed	TLV	Toxicity Values			Low Odor Threshold	Included in refined screen
						Cal/EPA	IRIS	HEAST		

NS = non-sensitizing
NV = not volatile
Low odor threshold = chemicals with an odor threshold below 1 ppm
Prop. 65 Listed = Proposition 65 carcinogens and reproductive toxicants
TLV = threshold limit value (based on human sensory irritation)

TABLE 3
Eliminated after Preliminary Screen
Romic, East Palo Alto, California

CAS #	Compound
88-99-3	1,2-BENZENEDICARBOXYLIC ACID
1336-21-6	AMMONIUM HYDROXIDE
10294-34-5	BORON TRICHLORIDE
109-99-9	BUTYLENE OXIDE
7440-44-0	CARBON
115-27-5	CHLORENDIC ANHYDRIDE
64-17-5	DENATURED ALCOHOL
19287-45-7	DIBORANE
25340-17-4	DIETHYLBENZENE
3710-84-7	DIETHYLHYDROXYLAMINE
110-71-4	DIMETHOXYETHANE
115-10-6	DIMETHYL ETHER
67-68-5	DIMETHYL SULFOXIDE
127-19-5	DIMETHYLACETAMIDE
108-01-0	DIMETHYLAMINOETHANOL
30282-54-3	DIPHENYL GUANIDINE
101-84-8	DIPHENYL OXIDE
003483-12-3	DITHIOTHREITOL
27176-87-0	DODECYLBENZENESULFONIC ACID
10421-48-4	FERRIC NITRATE
8008-20-6	KEROSENE
141-79-7	METHYL ISOBUTENYL KETONE
51013-18-4	METHYL PYROLIDONE
1929-82-4	NITRAPYRIN
7727-37-9	NITROGEN
872-50-4	N-METHYL-2-PYRROLIDONE
	POLYMERIC METHYL DIISOCYANATE
7632-00-0	SODIUM NITRITE
7440-23-5	SODIUM SALT
5329-14-6	SULFAMIC ACID
298-93-1	THIAZOLYL BLUE
77-86-1	TRIS BASE
518-47-8	URANINE
26446-61-7	VINYL BENZYL CHLORIDE

TABLE 4
Chemicals Eliminated Based on Vapor Pressure and Toxicity Values
Romic, East Palo Alto, California

CAS #	Compound	No Vapor Pressure	Vapor Pressure $<10^{-3}$ mm Hg	No Toxicity Value
541-73-1	1,3-DICHLOROBENZENE			X
121-14-2	2,4-DINITROTOLUENE		X	
309-00-2	ALDRIN		X	
7429-90-5	ALUMINUM FINES		X	
1344-28-1	ALUMINUM OXIDE		X	
6484-52-2	AMMONIUM NITRATE SOLUTION		X	
7783-20-2	AMMONIUM SULFATE		X	
7440-36-0	ANTIMONY		X	
10025-91-9	ANTIMONY TRICHLORIDE		X	
1309-64-4	ANTIMONY TRIOXIDE		X	
7440-38-2	ARSENIC		X	
1332-21-4	ASBESTOS		X	
7440-39-3	BARIUM		X	
513-77-9	BARIUM CARBONATE		X	
1304-29-6	BARIUM PEROXIDE		X	
7727-43-7	BARIUM SULFATE		X	
94-36-0	BENZOYL PEROXIDE		X	
7440-41-7	BERYLLIUM		X	
13814-50-1	BERYLLIUM CHLORIDE		X	
7440-43-9	CADMIUM		X	
1306-19-0	CADMIUM OXIDE		X	
1306-23-6	CADMIUM SULFIDE		X	
120-80-9	CATECHOL		X	
25497-29-4	CHLORODIFLUOROETHANE	X		
7738-94-5	CHROMIC ACID		X	
10101-53-8	CHROMIC SULFATE		X[a]	
7440-47-3	CHROMIUM (III)		X	
18540-29-9	CHROMIUM (VI)		X	
11118-57-3	CHROMIUM OXIDE		X	
1333-82-0	CHROMIUM TRIOXIDE		X	
7440-48-4	COBALT		X	
21041-93-0	COBALT HYDROXIDE	X		X
10124-43-3	COBALT SULFATE	X		X
7440-50-8	COPPER		X	
20427-59-2	COPPER HYDROXIDE	X		X
1317-38-0	COPPER OXIDE		X	
7758-98-7	COPPER SULFATE		X	
8001-58-9	CREOSOTE	X		
80-15-9	CUMENE HYDROPEROXIDE			X
142-71-2	CUPRIC ACETATE		X	
7447-39-4	CUPRIC CHLORIDE		X	
3251-23-8	CUPRIC NITRATE		X	
64771-79-5	CUTTING OIL	X		X
110-82-7	CYCLOHEXANE			X
108-93-0	CYCLOHEXANOL			X
117-81-7	DI(2-ETHYLHEXYL)PHTHALATE		X	
123-42-2	DIACETONE ALCOHOL			X
61790-53-2	DIATOMACEOUS EARTH		X	
2528-36-1	DIBUTYL PHENYL PHOSPHATE			X
84-74-2	DIBUTYL PHTHALATE		X	

TABLE 4
Chemicals Eliminated Based on Vapor Pressure and Toxicity Values
Romic, East Palo Alto, California

CAS #	Compound	No Vapor Pressure	Vapor Pressure $<10^{-3}$ mm Hg	No Toxicity Value
102-81-8	DIBUTYLAMINOETHANOL			X
79-43-6	DICHLOROACETIC ACID			X
25915-78-0	DICHLORODIFLUOROETHANE		X [a]	
127564-92-5	DICHLOROPENTAFLUOROPROPANE		X [a]	
111-42-2	DIETHANOLAMINE		X	
96-22-0	DIETHYL KETONE			X
109-89-7	DIETHYLAMINE			X
100-37-8	DIETHYLAMINOETHANOL			X
111-46-6	DIETHYLENE GLYCOL			X
120-55-8	DIETHYLENE GLYCOL DIBENZOATE		X	
2238-07-5	DIGLYCIDYL ETHER			X
108-83-8	DIISOBUTYL KETONE			X
108-18-9	DIISOPROPYLAMINE			X
131-11-3	DIMETHYL PHTHALATE			X
117-84-0	DIOCTYL PHTHALATE		X [a]	
25265-71-8	DIPROPYLENE GLYCOL			X
94-51-9	DIPROPYLENE GLYCOL DIBENZOATE		X [a]	
34590-94-8	DIPROPYLENE GLYCOL METHYL ETHER			X
7558-79-4	DISODIUM PHOSPHATE		X	
330-54-1	DIURON		X	
1321-74-0	DIVINYL BENZENE			X
11126-05-9	FREON	X		X [b]
118-74-1	HEXACHLOROBENZENE		X	
7664-39-3	HYDROFLUORIC ACID			X
67-63-0	ISOPROPYL ALCOHOL			X
7439-92-1	LEAD		X	
7439-96-5	MANGANESE		X	
1313-13-9	MANGANESE DIOXIDE		X	
1344-43-0	MANGANOUS OXIDE		X	
96-33-3	METHACRYLATE	X		
101-68-8	METHYLENE BISPHENYL ISOCYANATE		X [a]	
101-77-9	METHYLENE DIANILINE		X [a]	
90-94-8	MICHLER'S KETONE		X	
7440-02-0	NICKEL		X	
373-02-4	NICKEL ACETATE		X	
13462-88-9	NICKEL BROMIDE		X [a]	
1313-99-1	NICKEL OXIDE		X	
1314-06-3	NICKEL PEROXIDE	X		X
7697-37-2	NITRIC ACID			X
139-13-9	NITRILOTRIACETIC ACID		X	
20816-12-0	OSMIUM TETROXIDE			X
144-62-7	OXALIC ACID			X
79-21-0	PERACETIC ACID			X
88-89-1	PICRIC ACID			X
9016-87-9	POLYMETHYLENE POLYPHENYLISOCYANATE		X	
151-50-8	POTASSIUM CYANIDE		X	
71-23-8	PROPANOL			X
7782-49-2	SELENIUM		X	
7440-22-4	SILVER		X	
7761-88-8	SILVER NITRATE		X	

TABLE 4
Chemicals Eliminated Based on Vapor Pressure and Toxicity Values
Romic, East Palo Alto, California

CAS #	Compound	No Vapor Pressure	Vapor Pressure $<10^{-3}$ mm Hg	No Toxicity Value
1301-96-8	SILVER OXIDE		X	
10294-26-5	SILVER SULFATE		X	
26628-22-8	SODIUM AZIDE		X	
7631-99-4	SODIUM NITRATE		X	
7664-93-9	SULFURIC ACID		X	
7440-28-0	THALLIUM		X	
62-55-5	THIOACETAMIDE		X [a]	
62-56-6	THIOUREA		X	
7440-62-2	VANADIUM		X	
7440-66-6	ZINC		X	

[a] Chemical has a molecular weight greater than 200 g/mole and/or a Henry's Law Constant less than 1×10^{-5} atm-m^3/mole.

[b] See specific chlorofluorocarbons in Tables 6 and 7.

TABLE 5
Surrogate Chemicals for Toxicity Values
Romic, East Palo Alto, California

Compound	Surrogate
1,2-DICHLOROETHYLENE	evaluate as trans-1,2-dichloroethene
CHLOROPHENOL	evaluate as 2-chlorophenol
CRESOL	evaluate as p-cresol
DICHLOROBENZENE	evaluate as 1,4-dichlorobenzene
DICHLOROETHANE	evaluate as 1,2-dichloroethane
DICHLOROETHYLENE	evaluate as 1,1-dichloroethylene
POLYNUCLEAR AROMATIC HYDROCARBONS	evaluate as benzo(a)pyrene for carcinogenic effects; naphthalene for noncarcinogenic effects
SEC-BUTYL ALCOHOL	evaluate as 1-butanol
TRIMETHYLBENZENE	evaluate as 1,3,5-trimethylbenzene

Table 6
Refined Screen - Carcinogens
Romic, East Palo Alto, California

Compound	Cancer Weight of Evidence	Cancer Slope Factors (CSFs) (mg/kg-day)$^{-1}$					Selected CSF	Total pounds[c]	VP (mm Hg)	Risk factors[d]	Percent of total risk
		CAL/EPA	IRIS	HEAST	NCEA	AB2588					
1,1-DICHLOROETHENE	C		1.75E-01	1.20E+00			1.20E+00	8702.99	600	6.27E+06	50.004%
2-NITROPROPANE	B2			9.40E+00			9.40E+00	6454.54	18	1.09E+06	8.715%
BENZENE	A	1.00E-01	2.90E-02	2.90E-02			1.00E-01	100125.37	95	9.51E+05	7.590%
VINYL CHLORIDE	A	2.70E-01		1.90E+00			1.90E+00	145.61	3000	8.30E+05	6.623%
METHYLENE CHLORIDE	B2	3.50E-03	1.65E-03				3.50E-03	550543.99	430	8.29E+05	6.612%
HYDRAZINE	B2	1.70E+01	1.71E+01	1.70E+01			1.71E+01	3208.87	14	7.68E+05	6.130%
CHLOROFORM	B2	1.90E-02	8.05E-02	8.10E-02			8.10E-02	40676.96	200	6.59E+05	5.259%
GASOLINE	NA					5.60E-03	5.60E-03	851077.51	55.4	2.64E+05	2.107%
CARBON TETRACHLORIDE	B2	1.50E-01	5.24E-02	5.30E-02			1.50E-01	11561.53	120	2.08E+05	1.661%
FORMALDEHYDE	B1	2.10E-02	4.54E-02	4.50E-02			4.54E-02	5147.47	760	1.78E+05	1.417%
1,2-DICHLOROETHANE	B2	7.00E-02	9.10E-02				9.10E-02	16897.33	79	1.21E+05	0.969%
URETHANE	NA	1.00E+00					1.00E+00	10867.58	10	1.09E+05	0.867%
TRICHLOROETHENE	B2	1.00E-02			6.00E-03		1.00E-02	122593.38	73	8.95E+04	0.714%
PROPYLENE OXIDE	B2		1.29E-02	1.30E-02			1.30E-02	7772.82	532.1	5.38E+04	0.429%
TETRACHLOROETHENE	NA	2.10E-02			2.00E-03		2.10E-02	117182.17	19	4.68E+04	0.373%
ACRYLONITRILE	B1	1.00E+00	2.38E-01	2.40E-01			1.00E+00	302.28	110	3.33E+04	0.265%
1,4-DIOXANE	B2	2.70E-02	1.10E-02				2.70E-02	25151.73	38	2.58E+04	0.206%
ETHYLENE OXIDE	B1	3.10E-01		1.02E+00			1.02E+00	4.67	1094	5.21E+03	0.042%
1,1-DICHLOROETHANE	NA	5.70E-03					5.70E-03	320.28	230	4.20E+02	0.003%
1,4-DICHLOROBENZENE	C	4.00E-02		2.40E-02			4.00E-02	9978.8	1	3.99E+02	0.003%
EPICHLOROHYDRIN	B2	8.00E-02	4.20E-03	4.20E-03			8.00E-02	235.19	16.44	3.09E+02	0.002%
ACRYLAMIDE	B2	4.5	4.55E+00	4.50E+00			4.55E+00	7802.91	0.007	2.49E+02	0.002%
HEXACHLOROBUTADIENE	C		7.70E-02	7.78E-02			7.78E-02	11685.06	0.22	2.00E+02	0.002%
1,1,2-TRICHLOROETHANE	C	7.20E-02	5.59E-02	5.70E-02			7.20E-02	69.23	23	1.15E+02	0.001%
HEXACHLOROETHANE	C	3.90E-02	1.40E-02	1.40E-02			3.90E-02	11097.9	0.21	9.09E+01	0.001%
ACETALDEHYDE	B2	1.00E-02	7.69E-03				1.00E-02	7.23	900	6.51E+01	0.001%
STYRENE	C					2.00E-03	2.00E-03	5202.37	6.12	6.37E+01	0.001%
ETHYL ACRYLATE	B2			4.80E-02			4.80E-02	43.73	29.3	6.15E+01	0.000%
BENZO (A)PYRENE	B2	3.90E+00	7.30E+00				7.30E+00	6.63	1	4.84E+01	0.000%
TETRACHLOROETHANE	C	2.70E-01	2.00E-01	2.00E-01			2.70E-01	10.19	12	3.30E+01	0.000%
PROPYLENE DICHLORIDE	B2	6.30E-02		6.80E-02			6.80E-02	1.29	49.67	4.36E+00	0.000%
TOLUENE DIISOCYANATE (MIXED ISOMERS)	NA	3.90E-02					3.90E-02	914.29	0.008	2.85E-01	0.000%
SAFROLE	NA	2.20E-01					2.20E-01	8.26	0.071	1.29E-01	0.000%
1,2-DIBROMO-3-CHLOROPROPANE	B2	7		1.40E+00			7.00E+00	0	0.58	0.00E+00	0.000%
1,3-DICHLOROPROPENE	B2	5.50E-02		1.80E-01			1.80E-01	0	34	0.00E+00	0.000%
TRIBROMOMETHANE	B2		3.84E-03	3.90E-03			3.90E-03	0	5.5	0.00E+00	0.000%
36								Total Risk		1.25E+07	100.00%

Notes:
NA = not available
[a] Chemical throughput at the facility in 1998.
[b] Synonyms for the same chemical and generic groups included (see footnotes in this column).
[c] Sum of Facility Use and Additional Chemicals.
[d] Risk Factor = Selected CSF x Total pounds x VP

Table 7

Refined Screen - Noncarcinogens

Romic, East Palo Alto, California

Compound	Reproductive toxicant?	Reference dose (RfD) (mg/kg-day)				Selected RfD	1/RfD	Total pounds[c]	VP (mm Hg)	Risk factors[d]	Percent of total risk
		IRIS	HEAST	NCEA	AB2588						
HYDROCHLORIC ACID		5.71E-03				5.71E-03	1.75E+02	55791.38	760	7.43E+09	32.020%
METHYLENE CHLORIDE		6.00E-02				6.00E-02	1.67E+01	550543.99	430	3.95E+09	17.013%
CARBON TETRACHLORIDE		7.00E-04				7.00E-04	1.43E+03	11561.53	120	1.98E+09	8.546%
HEXANE		5.71E-02	6.00E-02			5.71E-02	1.75E+01	748525.68	150	1.97E+09	8.479%
ACETONITRILE		1.71E-02				1.71E-02	5.85E+01	221017.2	91	1.18E+09	5.072%
CHLOROFORM		1.00E-02				1.00E-02	1.00E+02	40676.96	200	8.14E+08	3.508%
1,1-DICHLOROETHENE		9.00E-03				9.00E-03	1.11E+02	11195.16	600	7.46E+08	3.218%
HYDRAZINE					6.86E-05	6.86E-05	1.46E+04	3208.87	14	6.55E+08	2.824%
PYRIDINE		1.00E-03				1.00E-03	1.00E+03	25791.78	21	5.42E+08	2.335%
TOLUENE	yes	1.14E-01				1.14E-01	8.77E+00	2164506.21	28	5.32E+08	2.292%
TRIETHYLAMINE		2.00E-03				2.00E-03	5.00E+02	17864.83	57.1	5.10E+08	2.199%
PROPYLENE OXIDE		8.57E-03				8.57E-03	1.17E+02	7772.82	532.1	4.83E+08	2.081%
BENZENE	yes				2.03E-02	2.03E-02	4.93E+01	100125.37	95	4.69E+08	2.020%
METHANOL		5.00E-01				5.00E-01	2.00E+00	1179846.01	130	3.07E+08	1.323%
TETRACHLOROETHENE		1.00E-02				1.00E-02	1.00E+02	117182.17	19	2.23E+08	0.960%
AMMONIA		2.86E-02				2.86E-02	3.50E+01	7799.17	760	2.07E+08	0.894%
DIMETHYLFORMAMIDE		8.57E-03	1.10E-02			8.57E-03	1.17E+02	387557.65	3.85	1.74E+08	0.751%
PHOSPHINE		8.57E-05				8.57E-05	1.17E+04	0.5	29000	1.69E+08	0.730%
ACETONE		1.00E-01				1.00E-01	1.00E+01	49322.66	230	1.13E+08	0.489%
4-METHYL-2-PENTANONE			8.00E-02			8.00E-02	1.25E+01	571696.11	14.5	1.04E+08	0.447%
1,1,1-TRICHLOROETHANE				2.86E-01		2.86E-01	3.50E+00	223454.36	120	9.38E+07	0.404%
HYDROGEN SULFIDE		2.86E-04				2.86E-04	3.50E+03	33.77	760	8.97E+07	0.387%
GASOLINE					6.00E-01	6.00E-01	1.67E+00	851077.51	55.4	7.86E+07	0.339%
VINYL CHLORIDE					7.43E-03	7.43E-03	1.35E+02	145.61	3000	5.88E+07	0.254%
ACRYLONITRILE		5.71E-04	1.00E-03			5.71E-04	1.75E+03	302.28	110	5.82E+07	0.251%
DICHLOROFLUOROETHANE					2.00E-01	2.00E-01	5.00E+00	15041.29	412	3.10E+07	0.134%
CHLORINE		1.00E-01				1.00E-01	1.00E+01	644.7	3800	2.45E+07	0.106%
TRICHLOROFLUOROMETHANE		3.00E-01				3.00E-01	3.33E+00	8901.11	800	2.37E+07	0.102%
2-NITROPROPANE		5.71E-03				5.71E-03	1.75E+02	6454.54	18	2.03E+07	0.088%
FORMALDEHYDE		2.00E-01				2.00E-01	5.00E+00	5147.47	760	1.96E+07	0.084%
DICHLORODIFLUOROMETHANE		2.00E-01			2.00E-01	2.00E-01	5.00E+00	656.39	4800	1.58E+07	0.068%
EPICHLOROHYDRIN	yes	2.86E-04	2.00E-03			2.86E-04	3.50E+03	235.19	16.44	1.35E+07	0.058%
HEXACHLOROBUTADIENE			2.00E-04			2.00E-04	5.00E+03	11685.06	0.22	1.29E+07	0.055%
CARBON DISULFIDE	yes	2.00E-01				2.00E-01	5.00E+00	6953.99	360	1.25E+07	0.054%
NITROBENZENE		5.00E-04				5.00E-04	2.00E+03	25458.29	0.24	1.22E+07	0.053%
METHYL-TERT-BUTYL ETHER		8.60E-01				8.60E-01	1.16E+00	40174.61	249	1.16E+07	0.050%
2-ETHOXYETHANOL		5.70E-02	4.00E-01			5.70E-02	1.75E+01	149194.03	3.8	9.95E+06	0.043%

Table 7

Refined Screen - Noncarcinogens

Romic, East Palo Alto, California

Compound	Reproductive toxicant?	Reference dose (RfD) (mg/kg-day) IRIS	HEAST	NCEA	AB2588	Selected RfD	1/RfD	Total pounds[c]	VP (mm Hg)	Risk factors[d]	Percent of total risk
CYANIDE		2.00E-02				2.00E-02	5.00E+01	2016.62	97	9.78E+06	0.042%
CHLOROBENZENE		2.00E-02				2.00E-02	5.00E+01	11549.74	12	6.93E+06	0.030%
XYLENE (MIXED ISOMERS)		2.00E+00				2.00E+00	5.00E-01	1541080.1	8.9	6.86E+06	0.030%
1,2-DICHLOROBENZENE		9.00E-02				9.00E-02	1.11E+01	359069.23	1.4	5.59E+06	0.024%
ETHYL BENZENE		2.86E-01				2.86E-01	3.50E+00	146793.74	9.6	4.93E+06	0.021%
N-BUTYL ALCOHOL		1.00E-01				1.00E-01	1.00E+01	72165.13	6.5	4.69E+06	0.020%
CHLORODIFLUOROMETHANE		1.43E+01				1.43E+01	6.99E-02	9508.75	4279	2.85E+06	0.012%
ACETALDEHYDE		2.57E-03				2.57E-03	3.89E+02	7.23	900	2.53E+06	0.011%
HEXACHLOROETHANE		1.00E-03				1.00E-03	1.00E+03	11564.55	0.21	2.43E+06	0.010%
BROMINE					4.86E-04	4.86E-04	2.06E+03	5.29	212	2.31E+06	0.010%
1,2,4-TRICHLOROBENZENE		1.00E-02				1.00E-02	1.00E+02	53235.26	0.43	2.29E+06	0.010%
1,1,2-TRICHLOROTRIFLUOROETHANE		3.00E+01	8.57E+00			8.57E+00	1.17E-01	43188.97	330	1.66E+06	0.007%
1,3,5-TRIMETHYLBENZENE				1.71E-03		1.71E-03	5.85E+02	887.49	2.8461538	1.48E+06	0.006%
HEXAMETHYLENE DIISOCYANATE		2.86E-06				2.86E-06	3.50E+05	60.57	0.05	1.06E+06	0.005%
1,2-BUTYLENE OXIDE		5.71E-03				5.71E-03	1.75E+02	31.18	160	8.74E+05	0.004%
NAPHTHALENE		8.57E-04		4.00E-02		8.57E-04	1.17E+03	8026.31	0.085	7.96E+05	0.003%
1,1-DICHLOROETHANE			1.00E-01			1.00E-01	1.00E+01	320.28	230	7.37E+05	0.003%
PHOSPHORIC ACID		2.86E-03				2.86E-03	3.50E+02	51245.5	0.03	5.38E+05	0.002%
METHYL METHACRYLATE		2.00E-01	8.00E-02			8.00E-02	1.25E+01	1035.84	38	4.92E+05	0.002%
2-BUTANONE		2.86E-01				2.86E-01	3.50E+00	1513.53	77.5	4.10E+05	0.002%
1,1,2-TRICHLOROETHANE		4.00E-03				4.00E-03	2.50E+02	69.23	23	3.98E+05	0.002%
TOLUENE DIISOCYANATE (MIXED ISOMERS)		2.00E-05				2.00E-05	5.00E+04	914.29	0.008	3.66E+05	0.002%
ETHYLENE GLYCOL		2.00E+00				2.00E+00	5.00E-01	7099757.14	0.092	3.27E+05	0.001%
CUMENE		1.14E-01	2.57E-03			2.57E-03	3.89E+02	182.7	4.5	3.20E+05	0.001%
ACRYLAMIDE		2.00E-04				2.00E-04	5.00E+03	8301.31	0.007	2.91E+05	0.001%
ETHYLENE GLYCOL METHYL ETHER	yes	5.71E-03				5.71E-03	1.75E+02	1825.42	0.76	2.43E+05	0.001%
VINYL ACETATE		5.71E-02	1.00E+00			5.71E-02	1.75E+01	141.29	85	2.10E+05	0.001%
P-CRESOL			5.00E-03		5.14E-02	5.00E-03	2.00E+02	23788.48	0.04	1.90E+05	0.001%
O-CRESOL		5.00E-02			5.14E-02	5.00E-02	2.00E+01	7226.98	1	1.45E+05	0.001%
ACRYLIC ACID		2.86E-04				2.86E-04	3.50E+03	9.8	4	1.37E+05	0.001%
STYRENE		2.86E-01				2.86E-01	3.50E+00	5202.37	6.12	1.11E+05	0.000%
TRANS-1,2-DICHLOROETHYLENE		2.00E-02				2.00E-02	5.00E+01	10.56	200	1.06E+05	0.000%
ETHYL ACRYLATE					1.37E-02	1.37E-02	7.30E+01	43.73	29.3	9.35E+04	0.000%
PROPYLENE DICHLORIDE		1.14E-03				1.14E-03	8.77E+02	1.29	49.67	5.62E+04	0.000%
2-CHLOROPHENOL		5.00E-03				5.00E-03	2.00E+02	122.55	2.2	5.39E+04	0.000%
PHOSPHORUS		2.00E-05				2.00E-05	5.00E+04	4.05	0.26	5.27E+04	0.000%
ALLYL ALCOHOL		5.00E-03				5.00E-03	2.00E+02	9.76	26	5.08E+04	0.000%

Table 7

Refined Screen - Noncarcinogens

Romic, East Palo Alto, California

Compound	Reproductive toxicant?	Reference dose (RfD) (mg/kg-day)				Selected RfD	1/RfD	Total pounds[c]	VP (mm Hg)	Risk factors[d]	Percent of total risk
		IRIS	HEAST	NCEA	AB2588						
PHENOL		6.00E-01				6.00E-01	1.67E+00	102509.51	0.28	4.78E+04	0.000%
1,4-DICHLOROBENZENE		2.28E-01				2.28E-01	4.39E+00	9978.8	1	4.38E+04	0.000%
ETHYLENE OXIDE	yes				1.71E-01	1.71E-01	5.85E+00	4.67	1094	2.99E+04	0.000%
BUTOXYETHANOL			5.71E-03			5.71E-03	1.75E+02	170.38	0.88	2.63E+04	0.000%
1,2,4-TRIMETHYLBENZENE				1.71E-03		1.71E-03	5.85E+02	13.52	2.1	1.66E+04	0.000%
ETHYLENEDIAMINE			2.00E-02			2.00E-02	5.00E+01	22.49	12.2	1.37E+04	0.000%
FORMIC ACID			2.00E+00			2.00E+00	5.00E-01	436.69	43	9.39E+03	0.000%
M-CRESOL		5.00E-02				5.00E-02	2.00E+01	6528.42	0.04	5.22E+03	0.000%
MERCURY	yes	8.57E-05	8.57E-05			8.57E-05	1.17E+04	219.38	0.002	5.12E+03	0.000%
BENZYL ALCOHOL			3.00E-01			3.00E-01	3.33E+00	11277.5	0.063	2.37E+03	0.000%
2-METHYL-1-PROPANOL		3.00E-01				3.00E-01	3.33E+00	57.4	10.41	1.99E+03	0.000%
ETHYL CHLORIDE		2.86E+00				2.86E+00	3.50E-01	1.29	1000	4.51E+02	0.000%
DIETHYL ETHER		2.00E-01				2.00E-01	5.00E+00	1522.86	0.00128	9.75E+00	0.000%
HYDROQUINONE			4.00E-02			4.00E-02	2.50E+01	173.65	0.001	4.34E+00	0.000%
2,4-DIMETHYLPHENOL		2.00E-02				2.00E-02	5.00E+01	0.21	0.098	1.03E+00	0.000%
DOWANOL			2.00E+00			2.00E+00	5.00E-01	6.86	0.126	4.32E-01	0.000%
1,2-DIBROMO-3-CHLOROPROPANE	yes	5.71E-05				5.71E-05	1.75E+04	0	0.58	0.00E+00	0.000%
1,3-DICHLOROPROPENE		5.71E-03				5.71E-03	1.75E+02	0	34	0.00E+00	0.000%
DIFLUOROETHANE		1.14E+01				1.14E+01	8.77E-02	0	4437.1	0.00E+00	0.000%
HYDROGEN CYANIDE		8.57E-04				8.57E-04	1.17E+03	0	740	0.00E+00	0.000%
TRIBROMOMETHANE		2.00E-02				2.00E-02	5.00E+01	0	5.5	0.00E+00	0.000%
95										2.32E+10	100.00%

Notes:

[a] Chemical throughput at the facility in 1998.

[b] Synonyms for the same chemical and generic groups.

[c] Sum of Facility Use and Additional Chemicals.

[d] Risk Factor = 1/RfD x Total pounds x VP

TABLE 8
Chemicals Selected for Quantitative Risk Evaluation
Romic Facility, East Palo Alto, California

Chemicals	Process and Waste Streams	Drum Liquifaction	Labpack Processing	Natural Gas Combustion	Cancer Health Effects	Noncancer Health Effects	Acute Health Effects	Odors Impacts	Worker
1,1,1-TRICHLOROETHANE	X					X	X		X
1,1-DICHLOROETHENE	X				X	X			
1,2,4-TRIMETHYLBENZENE									X
1,2-DICHLOROBENZENE								X	
1,2-DICHLOROETHANE	X				X				
1,3,5-TRIMETHYLBENZENE									X
1,4-DICHLOROBENZENE								X	
1,4-DIOXANE	X				X		X		
2-BUTANONE			X			X	X		X
2-ETHOXYETHANOL							X		
2-NITROPROPANE	X				X				
4-METHYL-2-PENTANONE	X					X		X	
ACETALDEHYDE								X	
ACETONE	X		X			X			X
ACETONITRILE	X		X		X	X			
ACRYLIC ACID							X	X	
ACRYLONITRILE	X					X			
AMMONIA	X		X			X	X		
ARSENIC									X
BENZENE	X		X	X	X	X	X		X
BROMINE								X	
CARBON DISULFIDE	X					X	X	X	
CARBON TETRACHLORIDE	X				X	X	X		
CHLORINE	X					X	X	X	
CHLOROBENZENE								X	
CHLOROFORM	X				X	X	X		X
CUMENE								X	
CYCLOHEXANE		X				X			X
CYCLOHEXANOL								X	
DIACETONE ALCOHOL								X	
DICHLOROFLUOROETHANE	X					X			

TABLE 8
Chemicals Selected for Quantitative Risk Evaluation
Romic Facility, East Palo Alto, California

Chemicals	Process and Waste Streams	Drum Liquifaction	Labpack Processing	Natural Gas Combustion	Cancer Health Effects	Noncancer Health Effects	Acute Health Effects	Odors Impacts	Worker
DIETHYLAMINE								X	
DIETHYLAMINOETHANOL								X	
DIISOBUTYL KETONE								X	
D-LIMONENE									X
DIMETHYL FORMAMIDE	X		X			X			
EPICHLOROHYDRIN	X					X	X	X	
ETHYL ACRYLATE								X	
ETHYL BENZENE									X
ETHYLENE OXIDE	X					X			
FORMALDEHYDE	X		X	X	X		X	X	
GASOLINE	X		X		X	X			
HEXACHLOROETHANE								X	
HEXANE	X		X			X			X
HYDRAZINE	X				X	X			
HYDROCHLORIC ACID	X		X			X	X		
HYDROFLUORIC ACID							X		
HYDROGEN SULFIDE	X					X	X	X	
ISOPROPYL ALCOHOL							X		
M-CRESOL								X	
METHACRYLATE								X	
METHANOL	X					X	X		
METHYL ISOBUTYL KETONE									X
METHYL METHACRYLATE								X	
METHYLENE CHLORIDE	X		X		X	X	X		X
METHYL N-AMYL KETONE									X
METHYL-TERT-BUTYL ETHER									X
NAPHTHALENE								X	
N-BUTYL ACETATE									X
N-BUTYL ALCOHOL								X	
N-HEPTANE		X							X

TABLE 8
Chemicals Selected for Quantitative Risk Evaluation
Romic Facility, East Palo Alto, California

Chemicals	Process and Waste Streams	Drum Liquifaction	Labpack Processing	Natural Gas Combustion	Cancer Health Effects	Noncancer Health Effects	Acute Health Effects	Odors Impacts	Worker
N-HEXANE		X				X			
NITRIC ACID							X		
NITROBENZENE								X	
OSMIUM TETROXIDE								X	
PHENOL							X	X	
PHOSPHINE	X					X		X	
PROPYLENE DICHLORIDE								X	
PROPYLENE OXIDE	X				X	X	X		
PYRIDINE	X		X			X		X	
STYRENE							X	X	X
SULFURIC ACID							X		
TETRACHLOROETHENE	X				X	X	X		X
TETRAHYDROFURAN									X
TOLUENE	X		X	X		X	X		X
TOLUENE DIISOCYANATE								X	
TRICHLOROETHENE	X				X				X
TRIETHYLAMINE	X					X	X	X	
URETHANE	X				X				
VINYL ACETATE								X	
VINYL CHLORIDE	X				X	X	X		X
XYLENE							X		X

ATTACHMENT I

Composition of Diesel (Distillate Fuel)

State of California
Air Resources Board

Identification of Volatile Organic Compound Species Profiles

ARB Speciation Manual
Second Edition
Volume 1 of 2

August 1991

TABLE II
VOC SPECIES PROFILE

760 EVAPORATIVE EMISSIONS-DISTILLATE FUEL

PROFILE NUMBER	SPECIES	WEIGHT FRACTION
760	CYCLOHEXANE	.0100
	ETHANE	.0100
	ISOBUTANE	.0250
	ISOMERS OF HEPTANE	.0200
	ISOMERS OF HEXANE	.0300
	ISOMERS OF NONANE	.0050
	ISOMERS OF OCTANE	.0300
	ISOMERS OF PENTANE	.0500
	METHANE	.0420
	N-BUTANE	.1270
	N-DECANE	.1480
	N-HEPTANE	.0860
	N-HEXANE	.0900
	N-NONANE	.0650
	N-OCTANE	.0990
	N-PENTANE	.1100
	PROPANE	.0530
*TOTAL 760		1.0000

APPENDIX B
Toxicity Profiles

CONTENTS APPENDIX B

Benzene B-1
Carbon Tetrachloride B-3
Chloroform B-5
Gasoline B-7
Hydrazine B-8
Methylene Chloride B-9
2-Nitropropane B-11
References B-12

BENZENE

Use:

Benzene is widely used in industry as a solvent and chemical intermediate. It is also a component of gasoline.

Health Effects:

Benzene is a volatile and fat-soluble chemical, which can be absorbed by the body via oral, inhalation and dermal exposure. As demonstrated from both experimental animal and human epidemiology studies, the bone marrow appears to be the primary target organ of benzene toxicity. The lymphoid system seems also affected by benzene exposure. It has been shown that benzene metabolites can cause hematotoxic effects and lymphoid suppression (ATSDR 1997). Benzene has been shown to cause cancer (leukemogen) in humans and is considered a known human carcinogen by the United States Environmental Protection Agency (USEPA) and the International Agency for Research on Cancer (IARC). Benzene is a Category A carcinogen (USEPA 2001).

Acute exposure to high levels of benzene may result in irritation of the eyes, nose, throat and respiratory tract, and central nervous system depression with symptoms of drowsiness, dizziness, headache, giddiness, nausea, vertigo, which may lead to loss of consciousness (ATSDR 1997).

Toxicity Values:

The California Office of Environmental Health Hazard Assessment's (OEHHA) inhalation cancer slope factor (CSF) is 0.1 $(mg/kg\text{-}day)^{-1}$ (Cal/EPA 1994). This value is based on toxicity information from both animal and human studies (Cal/EPA 1999a). The animal data used in deriving the CSF included information on Zymbal gland carcinomas in Sprague-Dawley rats exposed via inhalation and gavage (Maltoni et. al. 1983) as well as Zymbal gland carcinomas, preputial gland carcinomas, and lymphoma or leukemia in male $B6C3F_1$ mice or mammary carcinomas in female $B6C3F_1$ mice exposed via gavage (NTP 1984). The human data included several occupational studies demonstrating leukemia and lymphomas resulting from benzene exposures (Infante et. al. 1977, Rinsky et. al. 1981, Aksoy et. al. 1974 and 1976, Aksoy 1977, and Ott et. al. 1978). In total, the CSF established by OEHHA is higher than the inhalation risk range of 0.008 and 0.03 $(mg/kg\text{-}day)^{-1}$ presented by the USEPA for benzene (USEPA 2001).

The inhalation reference dose (RfD) used for benzene in this evaluation was 0.02 mg/kg-day, as was published for the California Air Toxics "Hot Spots" Program (CAPCOA 1993). The critical endpoint for this RfD was central nervous system effects. The OEHHA RfD published in February of 2000 was also 0.02 mg/kg-day based on effects to the hematopoietic, developmental, and nervous systems in humans (Cal/EPA 2000). The inhalation RfD listed by the USEPA Region 9 Preliminary Remediation Goals table is about an order of magnitude lower at 0.0017 mg/kg-day (USEPA 2000).

The acute toxicity Reference Exposure Level (REL) for benzene was reported by OEHHA to be 1,300 $\mu g/m^3$ based on reproductive and developmental effects in rats (Cal/EPA 2000).

CARBON TETRACHLORIDE

Use:

Carbon tetrachloride is volatile clear liquid that is used in industry in refrigerants and propellants for aerosol cans. Historically, carbon tetrachloride was also used as an industrial and household degreasing agent and cleaning fluid. Carbon tetrachloride is also an intermediate in industrial processes, a component in fire extinguishers, and used as an agricultural fumigant (Geniums 1999).

Health Effects:

The primary effects of acute poisoning by carbon tetrachloride are central nervous system (CNS) depression and gastrointestinal (GI) tract irritation. Often the immediate symptoms are headache, dizziness, sleepiness, nausea, and vomiting. Additional effects can include visual disturbances, circulatory disturbances, bleeding in the gastrointestinal tract and under the skin, as well as liver and kidney lesions. Repeated doses of carbon tetrachloride may cause similar effects to the CNS and GI systems, although the main effects are on the liver and kidney. Following exposures to carbon tetrachloride, the liver may become swollen and tender with a fatty buildup inside the organ. In severe cases, cells inside the liver may be damaged or destroyed. High doses may also result in kidney damage including a decrease of urine formation and a buildup of water in the body and waste products in the blood. Kidney failure is often the main cause of death as the result of very high exposure to carbon tetrachloride. For less extreme cases, regeneration of damaged organs has been documented (ATSDR 1994).

Carbon tetrachloride has been identified as a possible human carcinogen by the International Agency for Research on Cancer (IARC) and as a probable human carcinogen by the United States Environmental Protection Agency (USEPA). Carbon tetrachloride is listed by the USEPA as a Class B2 carcinogen based on observed carcinogenicity in rats, mice, and hamsters (USEPA 2001).

Limited human studies suggest that ingestion of carbon tetrachloride exposure in drinking water may also have reproductive or developmental effects (e.g., birth defects, low birth weight, and small size at birth). Animal data does not, however, support these findings. In animals, carbon tetrachloride may result in a decreased survival rate of newborn animals (ATSDR 1994).

Toxicity Values:

The California Office of Environmental Health Hazard Assessment's (OEHHA) inhalation cancer slope factor (CSF) is 0.15 $(mg/kg\text{-}day)^{-1}$ (Cal/EPA 1994, Cal/EPA 2000). This value is based on toxicity information from a series of three animal studies. In one study, Edwards et. al. (1942) found an increased incidence of hepatomas in 56 male and 19 female mice treated orally with a carbon tetrachloride solution for 2 or 3 times per week for a period of 4 months. In the second study conducted by the National Cancer Institute (NCI), hepatocellular carcinomas were observed in male and female $B6C3F_1$ mice that were dosed by gavage for 5 days per week for a period of 92 weeks (NCI 1977). Liver tumor incidence was also recorded in male and female

Syrian golden hamsters that were exposed weekly to carbon tetrachloride by gavage for a total of 25 weeks (Della Porta et. al. 1961). Using this data, OEHHA conducted a route-to-route extrapolation to derive an inhalation CSF. The resulting CSF is approximately two-times higher than the CSF of 0.052 $(mg/kg\text{-}day)^{-1}$ established by the USEPA (USEPA 2001). The USEPA's CSF was also extrapolated from the oral CSF derived from Edwards et. al. (1942), Della Porta et. al. (1961), and NTP (1977) but also included data from a previous NTP study.

The USEPA oral reference dose (RfD) for carbon tetrachloride of 0.0007 mg/kg-day was used in this evaluation for the inhalation pathway based on an assumption of equal absorption between the oral and inhalation routes. This oral RfD was derived based on data on liver lesions in male Sprague-Dawley rats that were dosed with carbon tetrachloride by gavage, 5 days/week for 12 weeks (USEPA 2001). The USEPA notes that subsequent mice studies have indicated good validation of the oral RfD. It should be noted that this RfD is substantially lower than the RfD published by OEHHA of 0.011 mg/kg-day based on effects to the ailmentary, developmental, and nervous systems (Cal/EPA 2000).

The acute toxicity Reference Exposure Level (REL) for carbon tetrachloride was reported by OEHHA to be 1,900 $\mu g/m^3$ based on reproductive and developmental effects in rats (Cal/EPA 2000).

CHLOROFORM

Uses:

Chloroform, also known as trichloromethane, is used in the chemical industry in the preparation of refrigerants, aerosol propellants, and resins, as a solvent for pesticides, adhesives, fats, oils, rubbers, alkaloids, and waxes, and as a component of pharmaceuticals. Chloroform is also a byproduct of the chlorination process of municipal sewage and water (Geniums 1999).

Health Effects:

Chloroform is a central nervous system depressant and is known to adversely effect the liver and kidneys. Once a widely used anesthetic, inhalation of high levels of chloroform vapor (>10,000 parts per million) can depress cardiovascular and respiratory function and result in respiratory and cardiac arrest. Chloroform anesthesia can also result in delayed death a day or two after exposure due to liver necrosis. Animal studies have indicated that chloroform is embryotoxic (ACGIH 1991).

Chloroform is classified by the United States Environmental Protection Agency (USEPA) as a Group B2 probable human carcinogen based on its ability to induce liver and kidney tumors in rats and mice. Numerous human studies have found evidence of increased cancer rates in persons drinking chlorinated drinking water, but a direct correlation between chloroform and tumor generation has not been established (USEPA 2001).

Toxicity Values:

The inhalation cancer slope factor (CSF) for chloroform used in this report is 8.1×10^{-2} $(mg/kg/day)^{-1}$ as reported by the USEPA (2001). The basis for this CSF is a study of $B6C3F_1$ female mice by the National Cancer Institute (NCI 1976) in which liver tumors were developed by the animals that were administered chloroform by gavage. An inhalation CSF was calculated from this data by taking the geometric mean of male and female slope factors and assuming 100% absorption for low doses of chloroform in air. The USEPA comments that an adequate number of animals were included in this study and additional data seems to support the CSF (USEPA 2001).

The USEPA inhalation CSF is higher than that of the California Environmental Protection Agency (Cal/EPA) which lists the inhalation CSF as 1.9×10^{-2} $(mg/kg/day)^{-1}$(Cal/EPA 1999a). While Cal/EPA's CSF does use data from the NCI study cited by the USEPA, it also considers additional data regarding renal tumors in male Osborne-Mendel rats from Jorgenson et. al. (1985) and male ICI mice in Roe et. al. (1979) as well as liver tumors in female rats from Tumasonis et. al. (1985) (Cal/EPA 1999a).

The inhalation Reference Dose (RfD) was extrapolated from the oral RfD of 0.01 mg/kg-day established by the USEPA for chloroform. This RfD was derived from a study of beagle dogs administered chloroform in a toothpaste base in gelatin capsules where the critical effect was fatty cyst formation in the liver. An uncertainty factor of 1,000 was applied to account for

interspecies variability, to protect a sensitive human sub-population, and because of the extrapolation from a Lowest Observable Adverse Effect Level (LOAEL) to a No Observable Adverse Effect Level (NOAEL) in the principal study. Confidence in the RfD is medium due to the large number of dogs used and the measurement of multiple endpoints (USEPA 2001). This RfD is more conservative than the corresponding RfD published by Cal/EPA of 0.086 mg/kg-day. The Cal/EPA RfD was based on adverse effects to the alimentary system and kidney development (Cal/EPA 2000). The provisional inhalation RfD reported in the USEPA Region 9 Preliminary Remediation Goal tables is, however, lower than the value used in this assessment at 0.000086 mg/kg-day (USEPA 2000).

The acute Reference Exposure Level (REL) for chloroform of 150 $\mu g/m^3$ was derived based on reproductive and developmental effects in rats. An uncertainty factor of 1,000 was used in the calculation of this value (Cal/EPA 2000).

GASOLINE

Uses:

Gasoline is a mixture of petroleum hydrocarbons generally in the range of C_5 to $C_{10.}$ Gasoline is widely used as a fuel but can also be used in industry as a solvent for rubber adhesives, detergent for precision instruments, and a finishing agent for artificial leathers (Geniums 1999).

Health Effects:

Gasoline is absorbed by the lungs, skin, and gastrointestinal tract. Acute exposures to gasoline can result in irritation to the eyes, skin, and respiratory tract as well as central nervous system (CNS) depression. Chronic exposures can result in CNS disturbances and animal studies have indicated that inhalation of gasoline can result in inflammation and ulcers of the male reproductive system.

Toxicity Values:

The inhalation cancer slope factor (CSF) published by the California Air Pollution Control Officers Association (CAPCOA) for gasoline is 0.0056 $(mg/kg\text{-}day)^{-1}$ (CAPCOA 1993). The United States Environmental Protection Agency (USEPA) have not developed a CSF for gasoline.

The inhalation reference dose (RfD) used in this evaluation was 0.6 mg/kg-day as reported by CAPCOA. This value was derived from a Threshold Limit Value (TLV) published by the American Conference of Governmental Industrial Hygienists (ACGIH) using a factor of 420 to account for differences between a work week and a standard week (40 hours vs. 168 hours) as well as applying an additional safety factor of 100 to protect the general population and sensitive subpopulations (CAPCOA 1993). No other agency has published an inhalation RfD for gasoline.

HYDRAZINE

Uses:

Hydrazine is a colorless white solid with an ammonia-like odor. In industry, hydrazine is used as rocket and jet fuel, a cleaning agent, an agricultural chemical, and for chemical synthesis (Geniums 1999).

Health Effects:

Hydrazine is rapidly absorbed by the skin, gastrointestinal tract, and lungs although the absorption of vapors through the skin is not a significant pathway. Exposure to hydrazine vapor can, however, cause irritation of the eyes and respiratory tract, and contact with the liquid can cause chemical burns. Acute exposures to hydrazine can also result in weight loss, weakness, vomiting, excitability, convulsions, hypoglycemia, anemia, and liver damage (ACGIH 1991).

Hydrazine has been listed by the United States Environmental Protection Agency (USEPA) as a probable human (i.e., Class B2) carcinogen based on tumors found in mice, rats, and hamsters as the result of oral, inhalation, or intraperitoneal administration of hydrazine and hydrazine sulfate. Hydrazine is also mutagenic in numerous assays (USEPA 2001).

Toxicity Values:

The inhalation cancer slope factor (CSF) for hydrazine is 17 $(mg/kg/day)^{-1}$ according to the California Office of Environmental Health Hazard Assessment (OEHHA) (Cal/EPA 1994, Cal/EPA 2000). This value was derived from data indicating an increased incidence of nasal cavity adenoma and adenocarcinoma in male F344 rats as the result of the inhalation of hydrazine vapor 6 hours/day, 5 days/week for 1 year (MacEwan *et a*l. 1981). While other species were also evaluated in this study, the inhalation CSF was based on the male F344 rats because they were the most sensitive species and sex to the carcinogenic effects of inhaled hydrazine. This study was selected over other studies because it demonstrated a dose response via inhalation and used hydrazine vapor instead of hydrazine sulfate (Cal/EPA 1999a). The USEPA inhalation CSF is also based on this study and is also 17 $(mg/kg/day)^{-1}$ (USEPA 2001).

The inhalation reference dose (RfD) used in this evaluation was 0.00007 mg/kg-day based on information cited by the California Air Pollution Control Officers Association (CAPCOA) for respiratory and dermal effects (CAPCOA 1993). This RfD is roughly equivalent to that established by OEHHA (0.00006 mg/kg-day) based on alimentary and endocrine system effects (Cal/EPA 1999b). The USEPA does not currently have a RfD established for hydrazine.

METHYLENE CHLORIDE

Uses:

Methylene chloride, also known as dichloromethane, is a volatile organic solvent widely used in industry. It is commonly used as a paint stripper, process solvent, aerosol propellant, metal cleaning agent, and coffee decaffeinating agent, however, most uses have been declining in recent years due to concerns about health effects and increasing regulation (ATSDR 1993).

Health Effects:

The central nervous system is a major target of methylene chloride toxicity in humans. Acute exposure to very high concentrations have produced fatigue, narcosis, analgesia, and impairment of sensory and psychomotor function, while exposure to lower concentrations have resulted in lethargy, reduced eye-hand coordination, and deficits in sensory detection thresholds. Similar effects, such as behavioral changes and central nervous system damage have also been observed in rats following exposure to methylene chloride. A large study conducted by the National Coffee Association (1982) also showed chronic liver damage in rats (ATSDR 1993).

The United States Environmental Protection Agency (USEPA) has classified methylene chloride as a probable human carcinogen (Group B2), which means there is sufficient evidence of carcinogenicity in animals and insufficient evidence in humans. The International Agency for Research on Cancer (IARC) has also identified methylene chloride as an animal carcinogen.

Developmental toxicity is not a major area of concern for methylene chloride. Studies in mice and rats have shown only minor skeletal variants and decreases in fetal body weights following maternal exposure to high doses of methylene chloride. Increased maternal liver weights were also observed, but viability and growth were not affected and teratogenic effects were not observed (ATSDR 1993).

Toxicity Values:

In this evaluation we used the California Environmental Protection Agency's (Cal/EPA's) cancer slope factor (CSF) for the inhalation route of methylene chloride of 3.5×10^{-3} $(mg/kg/day)^{-1}$ (Cal/EPA 1994, Cal/EPA 2000). This value was derived from the results a 102-week study of a total of fifty male and female F344 rats and B6C3F1 mice reported by the National Toxicity Program (NTP 1986) and Mennear et. al. (1988). This study found an increased incidence of mammary tumors in female rats, equivocal evidence of increased leukemia in the exposed female rats (an increased incidence was also seen in the controls), and increased incidence of lung and liver tumors in both sexes of mice (Cal/EPA 2000). The Cal/EPA CSF falls within the range of toxicity factors reported by the California Department of Health Services (DHS) of 1.1×10^{-3} and 1.1×10^{-2} $(mg/kg/day)^{-1}$ (Cal/EPA 2000) and is slightly higher than the USEPA inhalation CSF of 1.6×10^{-3} $(mg/kg/day)^{-1}$ (USEPA 2001).

For chronic toxicity, we conducted a route-to-route extrapolation based on the USEPA oral reference dose (RfD) of 0.06 mg/kg/day, which was derived from observed liver toxicity in a

two-year rat study conducted by the National Coffee Association (1982). This RfD includes a 100-fold uncertainty to account for interspecies extrapolation and for sensitive human subpopulations. The USEPA considers the quality of the study from which the RfD was derived to be high, however, since few supporting studies exist, the confidence in the overall database and the RfD itself is medium (USEPA 2001). It should be noted, however, that this RfD is lower than the USEPA inhalation reference concentration (RfC) of 3 mg/m^3 (i.e., a RfD of 0.86 mg/kd-day) based liver toxicity in rats and the Cal/EPA RfC of 0.4 mg/m^3 (i.e., a RfD of 0.11 mg/kd-day) based on cardiovascular and nervous system effects in humans (USEPA 1997, Cal/EPA 2000).

The acute Reference Exposure Level (REL) for methylene chloride of 14,000 $\mu g/m^3$ was derived based on mild effects observed in the human central nervous system (Cal/EPA 2000).

2-NITROPROPANE

Uses:

2-Nitropropane is a clear colorless liquid with a mild fruity odor. In industry, 2-nitropropane is used as a solvent, rocket propellant, gasoline additive, and for chemical synthesis (Geniums 1999).

Health Effects:

In animal studies, acute and chronic exposures to 2-nitropropane have resulted in damage to the liver, heart, and kidneys. The primary target appears to be the liver with reports of hepatocellular hypertrophy, hyperplasia, and necrosis in animals that inhaled various concentrations of 2-nitropropane. Studies of humans have also suggested that 2-nitropropane is toxic to the liver, although these studies were inconclusive in their findings (ACGIH 1991).

2-Nitropropane has been listed by the United States Environmental Protection Agency (USEPA) as a probable human carcinogen (i.e., Class B2) and by the International Agency for Research on Cancer (IARC) as a possible human carcinogen based on liver tumors found in rats as the result of inhalation exposures (USEPA 1997, ACGIH 1991). 2-Nitropropane has also been shown to be genotoxic in some non-mammalian systems although no significant mutagenic response has been demonstrated in *in-vivo* mammalian systems (ACGIH 1991).

Toxicity Values:

The inhalation cancer slope factor (CSF) for 2-nitropropane is 9.4 $(mg/kg\text{-}day)^{-1}$ according to the USEPA. This value was derived from data indicating an increased incidence of liver tumors in rats as the result of intermittent inhalation of 2-nitropropane over a period of 22-months (USEPA 1997). While the California Office of Health Hazard Assessment (OEHHA) has not established a CSF for 2-nitropropane, they have issued a No Significant Risk Level (NSRL) of 30 µg/day under Proposition 65. This corresponds to a CSF of 0.02 $(mg/kg\text{-}day)^{-1}$, a value that is lower than that used by the USEPA (Cal/EPA 2000).

The inhalation reference dose (RfD) used in this evaluation was 0.006 mg/kg-day established by the USEPA based on observed liver damage in chronic inhalation studies of Sprague-Dawley rats. The USEPA states that there is low confidence in the RfD because the principal studies used only a single exposure concentration and a Lowest Observable Adverse Effect Level (LOAEL) was used to extrapolate to a No Observable Adverse Effect Level (NOAEL). While other subchronic studies do support the critical effect seen in the principal studies, there is low confidence in the overall database for 2-nitropropane due to a lack of reproductive or developmental studies (USEPA 2001). OEHHA has not established a RfD for 2-nitropropane.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. *Toxicological Profile for Methylene Chloride.* April. U.S. Public Health Service.

Agency for Toxic Substances and Disease Registry (ATSDR). 1994. *Carbon Tetrachloride (Update).* Prepared by Life Systems Inc. May.

Agency for Toxic Substances and Disease Registry (ATSDR). 1997. *Toxicological Profile for Benzene.* Prepared by Research Triangle Institute. September.

Aksoy, M. 1977. *Testimony of "Informal Hearing on the Proposed OSHA Benzene Standards".* Washington, DC.

Aksoy, M., Erdem, S. and Dincol, G. 1974. *Leukemia in Shoe-workers chronically exposed to benzene.* Blood 44:837-41.

Aksoy, M., Erdem, S. and Dincol, G. 1976. *Types of leukemia in chronic benzene poisoning. A study in thirty-four parts.* Acta Haematol 55:65-72.

American Conference of Governmental Industrial Hygienists, Inc. (ACGIH). 1991. *Documentation of the Threshold Limit Values and Biological Exposure Indices.* Cincinnati, OH: ACGIH.

California Air Pollution Control Officers Association (CAPCOA). 1993. *Air Toxics "Hot Spots" Program. Revised 1992 Risk Assessment Guidelines*. October.

California Environmental Protection Agency (Cal/EPA). 1994. *California Cancer Potency Factors: Update.* Memorandum from the Standards and Criteria Work Group of the Office of Environmental Health Hazard Assessment (OEHHA) to the Cal/EPA Departments, Boards, and Office. San Francisco, CA. November 1.

California Environmental Protection Agency (Cal/EPA). 1999a. *Air Toxics Hot Spots Program Risk Assessment Guidelines, Part II: Technical Support Document for Describing Available Cancer Potency Factors.* April.

California Environmental Protection Agency (Cal/EPA). 1999b. *Proposed OEHHA Chronic Inhalation REL Summary - Second Set of 4.* September 27.

California Environmental Protection Agency (Cal/EPA). 2000. *Toxicity Criteria Database.* Online database maintained by the Cal/EPA.

Della Porta, G. Terracini, B. and P. Shubik. 1961. *Induction with carbon tetrachloride of liver cell carcinomas in hamsters.* J. Natl. Cancer Inst. 26:855-863.

Edwards, J., Heston, W., and A. Dalton. 1942. *Induction of the Carbon Tetrachloride Hepatoma in Strain L Mice.* J Natl. Cancer Inst. 3:297-301.

Geniums. 1999. *Handbook of Safety, Health, and the Environmental Data for Common Hazardous Substances.* Volume I. New York: McGraw-Hill.

Infante, P.F., Rinsky, R.A., Wagoner, J.K., and Young, R.J.. 1977. *Leukemia in benzene workers.* Lancet 2:76-78

Jorgenson, T.A., Meierhenry, EF, Rushbrook, CJ, Bull, RJ, and M Robinson. 1985. *Carcinogenicity of Chloroform in Drinking Water to Male Osborne-Mendel Rats and Female B6C3F1 Mice*. Fundam. Appl. Toxicol. 2:873-887.

MacEwan, J.D., Vernot, E.H., Haun, C.C., Kinkead, E.R. and A. Hall III. 1981. *Chronic Inhalation Toxicity of Hydrazine: Oncogenic Effects.* Air Force Aerospace Medical Research Laboratory. Wright-Patterson Air Force Base, Ohio. NTIS, Springfield, VA.

Maltoni, C., Conti, B., and Cotti, G.. 1983. *Benzene: a multipotential carcinogen. Results of long-term bioassays performed at the Bologna Institute of Oncology.* Am J Ind Med 4:589-630.

Mennear, JH, McConnell, EE, Huff, HE, Renne, RA, and E. Giddens. 1988. *Dichloromethane.* In Some Halogenated Hydrocarbons and Pesticide Exposures. Vol. 41 Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. IARC. Lyon, France.

National Cancer Institute (NCI). 1976. *Report on Ccarcinogenesis Bioassay of Chloroform.* Report No. (NIH) 76-1279. PB-264 018. Bethesda, Maryland.

National Cancer Institute (NCI). 1977. *Carcinogenesis Technical Report Series No 3, Bioassay of 1,1,1-Trichloroethane for Possible Carcinogenicity*. U.S. Department of Health, Education, Welfare, Public Health Service. National Institutes of Health. Washington D.C.

National Coffee Association. 1982. 24-Month chronic toxicity and oncogenicity study of methylene chloride in rats. Final Report. Prepared by Hazleton Laboratories America, Inc., Vienna, VA. (Unpublished)

National Toxicology Program (NTP). 1984. *NTP technical report on toxicology carcinogenicity studies of benzene* (CAS No. 71-43-2) *in F344/N rats and B6C3F$_1$ mice* (gavage studies). NIH publication No. 84-2545. US Department of Health and Human Services, Research Triangle Park, NC.

National Toxicology Program (NTP). 1986. *Toxicology and Carcinogenesis Studies of Dichloromethane (Methylene Chloride) (CAS No. 75-09-2) in F344/N rats and B6C3F$_1$ mice (Inhalation Studies).* TR No. 306, Publication No 86-2565.

Ott, M.G., Townsend, J.C., Fishbeck, W.A., and Langner, R.A. 1978. *Mortality among individuals occupationally exposed to benzene.* Arch Environ Health 33:3-9.

Rinsky, R.A., Young, R.J., and Smith, A.B. 1981. *Leukemia in benzene workers.* Am J Ind Med 2:217-245.

Roe, F.J.C., Palmer, A.K., Worden, A.N., and N.J. Van Abbe. 1979. *Safety Evaluation of Toothpaste Containing Chloroform.* I. Long-Term Studies in Mice. J. Environ Pathol Toxicol. 2:799-819.

Tumasonis, C.F., McMartin, D.N., and B. Bush. 1985. *Lifetime Toxicity of Chloroform and Bromodichloromethane When Administered Over a Lifetime in Rats.* Ecotoxicol Environ Safety. 9:233-240.

United States Environmental Protection Agency (USEPA). 1997. *Health Effects Assessment Summary Tables (HEAST). FY 1997 Update.* EPA 540-R-97-036. Office of Solid Waste and Emergency Response. Washington, D.C. July.

United States Environmental Protection Agency (USEPA). 2000. *Region 9 Preliminary Remediation Goals (PRGs).* San Francisco, CA. November 1.

United States Environmental Protection Agency (USEPA). 2001. *Integrated Risk Information System (IRIS).* Online database maintained by the USEPA. Cincinnati, OH.

APPENDIX C
Air Emissions Support Documents

Appendix C
Air Emissions Support Documents

C.1 Sources of Emissions
C.2 Emission Rate by Chemical Source
C.3 Chemical Composition for Modeled Organics Stream
C.4 Chemical Composition for Modeled Lab Pack Stream
C.5 Chemical Composition for Diesel Stream
C.6 Chemical Composition of the Products of Natural Gas Combustion
C.7 Emission Information by Source
C.8 Tank Information
C.9 Chemical Composition of Liquid Organics Waste Stream in TANKS
C.10 Tank Stream Composition
C.11 Tank Emissions by Chemical
C.12 Equipment Leak Emission Factors
C.13 Component Leak Monitoring Data
C.14 Drum Storage
C.15 Drum Sampling Emissions Estimate Methodology
C.16 Truck Sampling Emissions Estimate Methodology
C.17 Emissions Estimation from Labpack Bulk Processing
C.18 Emissions Estimation from Drum Liquefaction System
C.19 Tanks and Units Controlled by Triple Scrubber/Boiler Emissions Abatement System
C.20 1993 DaRos Associates' Boiler Exhaust Source Test
C.21 Natural Gas Combustion Emission Factors
C.22 Emissions Estimation for Sieves
C.23 Emissions Estimation for Waste Water Treatment Operations
C.24 T13 and B2 Vent Emissions Estimation
C.25 Emission Factors for Truck Cleaning

Table C.1
Sources of Emissions
Romic Facility, East Palo Alto, California

Source Description	Model ID	Process	Current or Proposed Source	Control
Lab A, Fume Hood 1	LABA1	Fugitive evaporative emissions from testing samples of all streams (i.e., drums and trucks) entering the facility	Currently operating source	No
Lab B, Fume Hood 2	LABB2		Currently operating source	No
Lab C, Fume Hood 3	LABC3		Currently operating source	No
Lab C, Fume Hood 4	LABC4		Currently operating source	No
Lab E, Fume Hood 6	LABE6		Currently operating source	No
Inductively Coupled Plasma Spectroscopy Vent	ICPVENT		Currently operating source	No
Vent for Drum Liquefaction Control System	FUELBLND	Controlled emissions from the drum cleaning (Tidy Bowl) and waste shredding area. Sludge in drums is cleaned out with diesel to make blended fuel, and solid waste is shredded and blended with fuel mixture.	Currently operating source	Yes
Vent for Scrubber at Lab pack Warehouse	LABPACK	Controlled emissions from lab pack area, where small volumes of incoming waste is consolidated	Currently operating source	Yes
Vent for Boiler Control System - VOC emissions	BOILER	Emissions from the triple scrubber/boiler emissions abatement system, which burns natural gas to control emissions from fuel-blending tanks and processing units	Currently operating source	Yes
Vent for Boiler Control System - HCL emissions	BOILER - HCL	Hydrochloric acid emissions from the triple scrubber/boiler abatement system, which burns natural gas to control emissions from fuel-blending tanks and processing units	Currently operating source	Yes
Vent for Boiler Control System - NG emissions	BOILER -NG	Natural gas emissions from the triple scrubber/boiler abatement system, which burns natural gas to control emissions from fuel-blending tanks and processing units	Currently operating source	Yes
Control System for Zone E tanks	ZONEE	Controlled emissions from proposed future fuel-blending tanks	Proposed source	Yes
Control System for Zone F tanks	ZONEF	Controlled emissions from proposed future wastewater treatment units	Proposed source	Yes
T13, B2 Vent	T13B2	Controlled emissions from wastewater processing tanks	Currently operating source	Yes
Drum Sampling Fugitives	SAMPLING	Fugitive emissions from drum sampling	Currently operating source	No
Consolidation Fugitives	CONSOLID	Fugitive emissions from solid waste consolidation	Currently operating source	No
Drum Liquefaction Fugitives	FUGFB	Fugitive emissions from cleaning of drums with diesel to make blended fuel	Currently operating source	No
Fueling Station Fugitives	FUELST	Fugitive emissions from fueling station that fuels trucks with gasoline or diesel fuel	Currently operating source	No
Tanks A-J Fugitives	PVFAJ	Fugitive emissions from storage tanks	Currently operating source	No
Tanks K-M Fugitives	PVFKM	Fugitive emissions from fuel-blending tanks	Currently operating source	No
Tanks R91-R95 Fugitives	PVFR915	Fugitive Emissions from fuel-blending tanks	Currently operating source	No
Processing Columns Fugitives	PVFC	Fugitive emissions from organic processing columns	Currently operating source	No
Tanks 96-98, N, & O Fugitives	PVFZE	Fugitive Emissions from proposed future fuel-blending tanks	Proposed source	No
Tanks A-1 to A-5 Fugitives	PVFZF	Fugitive emissions from proposed future wastewater treatment units	Proposed source	No
Drum Storage Fugitives	DSSAMP	Fugitive emissions from drums storing organic liquid	Currently operating source	No
Drum Storage North Fugitives	DSCONS	Fugitive emissions from drums storing organic liquid	Currently operating source	No
Drum Storage South Fugitives	DSSOUTH	Fugitive emissions from drums storing organic liquid	Currently operating source	No
Drum Storage West 1 Fugitives	DSWEST1	Fugitive emissions from drums storing organic liquid	Currently operating source	No
Drum Storage West 2 Fugitives	DSWEST2	Fugitive emissions from drums storing organic liquid	Currently operating source	No
Truck Sampling - North	TRKSAMPN	Fugitive emissions from truck sampling	Currently operating source	No
Truck Sampling - South	TRKSAMPS	Fugitive emissions from truck sampling	Currently operating source	No
Zone 4 Tank Area	ZONE4	Fugitive emissions from organic liquid and wastewater storage tanks and 35" column and 36" column troughs.	Current and proposed tanks	No
Zone 5 Tank Area	ZONE5	Fugitive emissions from organic liquid and wastewater storage tanks	Currently operating source	No
Zone 6 Tank Area	ZONE6	Fugitive emissions from organic liquid and wastewater storage tanks and truck loading and unloading liquid transfer area.	Currently operating source	No
Zone 7a Tank Area	ZONE7A	Fugitive emissions from organic liquid storage tanks and sieves.	Current and proposed tanks	No
Zone 7b Tank Area	ZONE7B	Fugitive emissions from organic liquid and wastewater storage tanks	Current and proposed tanks	No
Zone 8 Tank Area	ZONE8	Fugitive emissions from organic liquid and wastewater storage tanks	Current and proposed tanks	No
Zone 9a Tank Area	ZONE9A	Fugitive emissions from organic liquid storage tanks	Currently operating source	No
Zone 10 Tank Area	ZONE10	Fugitive emissions from diesel storage tanks	Current and proposed tanks	No
Zone 11 Tank Area	ZONE11	Fugitive emissions from wastewater treatment tanks	Currently operating source	No
Truck Washing	TRCKWASH	Fugitive emissions from truck washing area	Currently operating source	No

Table C.2a
Estimated Emission Rates of Chemicals of Concern from Facility Sources - Current
Romic Facility, East Palo Alto, California

ID	Units	1,1,1-Trichloroethane	1,1-Dichloroethene	1,2-Dibromo-3-chloropropane	1,2-Dichlorobenzene	1,2-Dichloroethane	1,4-Dichlorobenzene	1,4-Dioxane	2-Butanone	2-Nitropropane	4-Methyl-2-pentanone	Acetone	Acetonitrile	Acrylonitrile
LBA1	g/s	2.70E-05	6.77E-06	0.00E+00	5.07E-07	1.35E-06	1.01E-08	9.63E-07	1.18E-07	1.17E-07	8.35E-06	1.14E-05	2.03E-05	3.35E-08
LBB2	g/s	2.70E-05	6.77E-06	0.00E+00	5.07E-07	1.35E-06	1.01E-08	9.63E-07	1.18E-07	1.17E-07	8.35E-06	1.14E-05	2.03E-05	3.35E-08
LBC3	g/s	2.70E-05	6.77E-06	0.00E+00	5.07E-07	1.35E-06	1.01E-08	9.63E-07	1.18E-07	1.17E-07	8.35E-06	1.14E-05	2.03E-05	3.35E-08
LBC4	g/s	2.70E-05	6.77E-06	0.00E+00	5.07E-07	1.35E-06	1.01E-08	9.63E-07	1.18E-07	1.17E-07	8.35E-06	1.14E-05	2.03E-05	3.35E-08
LBE6	g/s	2.70E-05	6.77E-06	0.00E+00	5.07E-07	1.35E-06	1.01E-08	9.63E-07	1.18E-07	1.17E-07	8.35E-06	1.14E-05	2.03E-05	3.35E-08
IVNT	g/s	2.70E-05	6.77E-06	0.00E+00	5.07E-07	1.35E-06	1.01E-08	9.63E-07	1.18E-07	1.17E-07	8.35E-06	1.14E-05	2.03E-05	3.35E-08
FLBL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LABP	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E-06	0.00E+00	0.00E+00	1.47E-03	1.80E-04	0.00E+00
BOIL	g/s	8.54E-05	2.14E-05	0.00E+00	1.60E-06	4.25E-06	3.18E-08	3.05E-06	3.74E-07	3.70E-07	2.64E-05	3.61E-05	6.41E-05	1.06E-07
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZONE	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-
ZONF	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-
T13B	g/s	4.86E-06	1.22E-06	0.00E+00	9.12E-08	2.42E-07	1.81E-09	1.73E-07	2.13E-08	2.11E-08	1.50E-06	2.06E-06	3.65E-06	6.03E-09
SAMP	g/s	5.97E-04	1.49E-04	0.00E+00	1.12E-05	2.97E-05	2.22E-07	2.13E-05	2.61E-06	2.58E-06	1.84E-04	2.52E-04	4.47E-04	7.40E-07
CONS	g/s	3.89E-04	9.74E-05	0.00E+00	7.29E-06	1.93E-05	1.45E-07	1.39E-05	1.70E-06	1.68E-06	1.20E-04	1.64E-04	2.91E-04	4.82E-07
FGFB	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FUEL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PVAJ	g/s	5.02E-05	1.26E-05	0.00E+00	9.41E-07	2.50E-06	1.87E-08	1.79E-06	2.20E-07	2.17E-07	1.55E-05	2.12E-05	3.76E-05	6.22E-08
PVKM	g/s	5.02E-05	1.26E-05	0.00E+00	9.41E-07	2.50E-06	1.87E-08	1.79E-06	2.20E-07	2.17E-07	1.55E-05	2.12E-05	3.76E-05	6.22E-08
P915	g/s	5.02E-05	1.26E-05	0.00E+00	9.41E-07	2.50E-06	1.87E-08	1.79E-06	2.20E-07	2.17E-07	1.55E-05	2.12E-05	3.76E-05	6.22E-08
PVFC	g/s	5.02E-05	1.26E-05	0.00E+00	9.41E-07	2.50E-06	1.87E-08	1.79E-06	2.20E-07	2.17E-07	1.55E-05	2.12E-05	3.76E-05	6.22E-08
PVZE	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-
PVZF	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-
DSSA	g/s	3.12E-04	7.81E-05	0.00E+00	5.84E-06	1.55E-05	1.16E-07	1.11E-05	1.36E-06	1.35E-06	9.63E-05	1.32E-04	2.34E-04	3.86E-07
DSCO	g/s	3.45E-04	8.65E-05	0.00E+00	6.48E-06	1.72E-05	1.29E-07	1.23E-05	1.51E-06	1.50E-06	1.07E-04	1.46E-04	2.59E-04	4.28E-07
DSSO	g/s	9.92E-04	2.48E-04	0.00E+00	1.86E-05	4.94E-05	3.69E-07	3.53E-05	4.34E-06	4.30E-06	3.07E-04	4.20E-04	7.44E-04	1.23E-06
DSW1	g/s	1.15E-04	2.88E-05	0.00E+00	2.16E-06	5.73E-06	4.29E-08	4.10E-06	5.04E-07	4.99E-07	3.56E-05	4.87E-05	8.64E-05	1.43E-07
DSW2	g/s	4.74E-04	1.19E-04	0.00E+00	8.88E-06	2.36E-05	1.76E-07	1.69E-05	2.07E-06	2.05E-06	1.46E-04	2.00E-04	3.55E-04	5.87E-07
TRSN	g/s	5.77E-05	1.44E-05	0.00E+00	1.08E-06	2.87E-06	2.15E-08	2.06E-06	2.52E-07	2.50E-07	1.78E-05	2.44E-05	4.32E-05	7.15E-08
TRSS	g/s	5.77E-05	1.44E-05	0.00E+00	1.08E-06	2.87E-06	2.15E-08	2.06E-06	2.52E-07	2.50E-07	1.78E-05	2.44E-05	4.32E-05	7.15E-08
ZON4	$g/s\text{-}m^2$	5.33E-06	1.62E-06	0.00E+00	9.84E-08	2.64E-07	1.19E-08	1.72E-07	1.73E-08	1.71E-08	2.51E-06	2.28E-06	3.91E-06	4.90E-09
ZON5	$g/s\text{-}m^2$	1.06E-05	5.23E-06	0.00E+00	2.03E-07	5.12E-07	8.69E-08	2.40E-07	0.00E+00	0.00E+00	1.07E-05	4.67E-06	7.30E-06	0.00E+00
ZON6	$g/s\text{-}m^2$	1.42E-05	4.70E-06	0.00E+00	2.68E-07	6.98E-07	4.21E-08	4.44E-07	4.16E-08	4.12E-08	7.69E-06	6.07E-06	1.03E-05	1.18E-08
ZO7A	$g/s\text{-}m^2$	7.01E-06	3.57E-06	0.00E+00	1.39E-07	3.37E-07	5.93E-08	1.58E-07	0.00E+00	0.00E+00	7.31E-06	3.08E-06	4.81E-06	0.00E+00
ZO7B	$g/s\text{-}m^2$	1.02E-06	5.20E-07	0.00E+00	2.02E-08	4.91E-08	8.64E-09	2.30E-08	0.00E+00	0.00E+00	1.07E-06	4.50E-07	7.01E-07	0.00E+00
ZON8	$g/s\text{-}m^2$	3.51E-06	1.81E-06	0.00E+00	7.03E-08	1.69E-07	3.01E-08	7.88E-08	0.00E+00	0.00E+00	3.71E-06	1.54E-06	2.41E-06	0.00E+00
ZO9A	$g/s\text{-}m^2$	6.55E-06	3.15E-06	0.00E+00	1.22E-07	3.16E-07	5.24E-08	1.48E-07	0.00E+00	0.00E+00	6.46E-06	2.87E-06	4.50E-06	0.00E+00
ZO10	$g/s\text{-}m^2$	8.77E-06	4.20E-06	0.00E+00	1.63E-07	4.23E-07	6.99E-08	1.99E-07	0.00E+00	0.00E+00	8.61E-06	3.85E-06	6.03E-06	0.00E+00
ZO11	$g/s\text{-}m^2$	2.27E-07	5.69E-08	0.00E+00	4.26E-09	1.13E-08	8.45E-11	8.09E-09	9.93E-10	9.84E-10	7.02E-08	9.60E-08	1.70E-07	2.82E-10
PAVE	$g/s\text{-}m^2$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
UNP1	$g/s\text{-}m^2$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRCK	$g/s\text{-}m^2$	1.38E-06	3.46E-07	0.00E+00	2.59E-08	6.88E-08	5.14E-10	4.93E-08	6.05E-09	5.99E-09	4.27E-07	5.85E-07	1.04E-06	1.71E-09
UNP2	$g/s\text{-}m^2$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table C.2a
Estimated Emission Rates of Chemicals of Concern from Facility Sources - Current
Romic Facility, East Palo Alto, California

ID	Units	Ammonia	Benzene	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Cyclohexane	Dichlorofluoroethane	Dimethyl Formamide	Epichlorohydrin	Ethane	Ethylene Oxide	Formaldehyde	Gasoline	Hexane	Hydrazine	Hydrochloric Acid
LBA1	g/s	3.37E-07	9.58E-06	2.52E-06	1.40E-06	8.20E-06	0.00E+00	6.24E-06	1.50E-06	3.90E-09	0.00E+00	3.58E-09	3.94E-06	8.15E-05	1.13E-04	4.53E-08	1.41E-06
LBB2	g/s	3.37E-07	9.58E-06	2.52E-06	1.40E-06	8.20E-06	0.00E+00	6.24E-06	1.50E-06	3.90E-09	0.00E+00	3.58E-09	3.94E-06	8.15E-05	1.13E-04	4.53E-08	1.41E-06
LBC3	g/s	3.37E-07	9.58E-06	2.52E-06	1.40E-06	8.20E-06	0.00E+00	6.24E-06	1.50E-06	3.90E-09	0.00E+00	3.58E-09	3.94E-06	8.15E-05	1.13E-04	4.53E-08	1.41E-06
LBC4	g/s	3.37E-07	9.58E-06	2.52E-06	1.40E-06	8.20E-06	0.00E+00	6.24E-06	1.50E-06	3.90E-09	0.00E+00	3.58E-09	3.94E-06	8.15E-05	1.13E-04	4.53E-08	1.41E-06
LBE6	g/s	3.37E-07	9.58E-06	2.52E-06	1.40E-06	8.20E-06	0.00E+00	6.24E-06	1.50E-06	3.90E-09	0.00E+00	3.58E-09	3.94E-06	8.15E-05	1.13E-04	4.53E-08	1.41E-06
IVNT	g/s	3.37E-07	9.58E-06	2.52E-06	1.40E-06	8.20E-06	0.00E+00	6.24E-06	1.50E-06	3.90E-09	0.00E+00	3.58E-09	3.94E-06	8.15E-05	1.13E-04	4.53E-08	1.41E-06
FLBL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.44E-06	0.00E+00	0.00E+00	0.00E+00	6.44E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LABP	g/s	2.45E-05	1.94E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-07	0.00E+00	0.00E+00	0.00E+00	3.06E-04	2.95E-06	6.27E-05	0.00E+00	8.65E-05
BOIL	g/s	1.07E-06	3.03E-05	7.98E-06	4.42E-06	2.59E-05	0.00E+00	1.97E-05	4.75E-06	1.23E-08	0.00E+00	1.13E-08	1.25E-05	2.58E-04	3.58E-04	1.43E-07	4.44E-06
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.25E-02
BOIL	g/s	0.00E+00	8.82E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.15E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZONE	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZONF	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13B	g/s	6.08E-08	1.73E-06	4.54E-07	2.52E-07	1.48E-06	0.00E+00	1.12E-06	2.71E-07	7.01E-10	0.00E+00	6.44E-10	7.10E-07	1.47E-05	2.04E-05	8.15E-09	2.53E-07
SAMP	g/s	7.45E-06	2.12E-04	5.57E-05	3.09E-05	1.81E-04	0.00E+00	1.38E-04	3.32E-05	8.60E-08	0.00E+00	7.90E-08	8.70E-05	1.80E-03	2.50E-03	9.99E-07	3.10E-05
CONS	g/s	4.85E-06	1.38E-04	3.63E-05	2.01E-05	1.18E-04	0.00E+00	8.98E-05	2.16E-05	5.60E-08	0.00E+00	5.14E-08	5.67E-05	1.17E-03	1.63E-03	6.51E-07	2.02E-05
FGFB	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.34E-04	0.00E+00	0.00E+00	0.00E+00	4.34E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FUEL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.73E-04	0.00E+00	0.00E+00	0.00E+00	4.73E-04	0.00E+00	0.00E+00	6.45E-03	0.00E+00	0.00E+00	0.00E+00
PVAJ	g/s	6.27E-07	1.78E-05	4.68E-06	2.60E-06	1.52E-05	0.00E+00	1.16E-05	2.79E-06	7.24E-09	0.00E+00	6.64E-09	7.32E-06	1.51E-04	2.10E-04	8.41E-08	2.61E-06
PVKM	g/s	6.27E-07	1.78E-05	4.68E-06	2.60E-06	1.52E-05	0.00E+00	1.16E-05	2.79E-06	7.24E-09	0.00E+00	6.64E-09	7.32E-06	1.51E-04	2.10E-04	8.41E-08	2.61E-06
P915	g/s	6.27E-07	1.78E-05	4.68E-06	2.60E-06	1.52E-05	0.00E+00	1.16E-05	2.79E-06	7.24E-09	0.00E+00	6.64E-09	7.32E-06	1.51E-04	2.10E-04	8.41E-08	2.61E-06
PVFC	g/s	6.27E-07	1.78E-05	4.68E-06	2.60E-06	1.52E-05	0.00E+00	1.16E-05	2.79E-06	7.24E-09	0.00E+00	6.64E-09	7.32E-06	1.51E-04	2.10E-04	8.41E-08	2.61E-06
PVZE	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PVZF	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DSSA	g/s	3.89E-06	1.11E-04	2.91E-05	1.61E-05	9.45E-05	0.00E+00	7.20E-05	1.73E-05	4.49E-08	0.00E+00	4.12E-08	4.55E-05	9.40E-04	1.30E-03	5.22E-07	1.62E-05
DSCO	g/s	4.31E-06	1.23E-04	3.23E-05	1.79E-05	1.05E-04	0.00E+00	7.98E-05	1.92E-05	4.98E-08	0.00E+00	4.57E-08	5.04E-05	1.04E-03	1.45E-03	5.79E-07	1.80E-05
DSSO	g/s	1.24E-05	3.52E-04	9.26E-05	5.13E-05	3.01E-04	0.00E+00	2.29E-04	5.52E-05	1.43E-07	0.00E+00	1.31E-07	1.45E-04	2.99E-03	4.15E-03	1.66E-06	5.16E-05
DSW1	g/s	1.44E-06	4.08E-05	1.08E-05	5.96E-06	3.49E-05	0.00E+00	2.66E-05	6.41E-06	1.66E-08	0.00E+00	1.52E-08	1.68E-05	3.47E-04	4.82E-04	1.93E-07	5.99E-06
DSW2	g/s	5.91E-06	1.68E-04	4.42E-05	2.45E-05	1.44E-04	0.00E+00	1.09E-04	2.64E-05	6.83E-08	0.00E+00	6.27E-08	6.91E-05	1.43E-03	1.98E-03	7.93E-07	2.46E-05
TRSN	g/s	7.20E-07	2.05E-05	5.38E-06	2.98E-06	1.75E-05	0.00E+00	1.33E-05	3.21E-06	8.31E-09	0.00E+00	7.63E-09	8.41E-06	1.74E-04	2.41E-04	9.66E-08	3.00E-06
TRSS	g/s	7.20E-07	2.05E-05	5.38E-06	2.98E-06	1.75E-05	0.00E+00	1.33E-05	3.21E-06	8.31E-09	0.00E+00	7.63E-09	8.41E-06	1.74E-04	2.41E-04	9.66E-08	3.00E-06
ZON4	g/s-m^2	4.93E-08	1.89E-06	3.69E-07	3.05E-07	1.54E-06	0.00E+00	9.33E-07	2.86E-07	5.70E-10	0.00E+00	5.23E-10	5.76E-07	2.32E-05	1.65E-05	6.62E-09	2.05E-07
ZON5	g/s-m^2	0.00E+00	3.77E-06	0.00E+00	7.73E-07	2.60E-06	0.00E+00	1.58E-07	4.94E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.92E-05	0.00E+00	0.00E+00	0.00E+00
ZON6	g/s-m^2	1.19E-07	5.03E-06	8.88E-07	8.30E-07	4.02E-06	4.99E-09	2.27E-06	7.44E-07	1.37E-09	4.99E-09	1.26E-09	1.39E-06	6.79E-05	3.98E-05	1.59E-08	4.95E-07
ZO7A	g/s-m^2	0.00E+00	2.49E-06	0.00E+00	5.10E-07	1.72E-06	0.00E+00	1.05E-07	3.21E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.94E-05	0.00E+00	0.00E+00	0.00E+00
ZO7B	g/s-m^2	0.00E+00	3.62E-07	0.00E+00	7.43E-08	2.50E-07	0.00E+00	1.53E-08	4.67E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.65E-06	0.00E+00	0.00E+00	0.00E+00
ZON8	g/s-m^2	0.00E+00	1.24E-06	0.00E+00	2.55E-07	8.59E-07	1.68E-09	5.25E-08	1.59E-07	0.00E+00	1.68E-09	0.00E+00	0.00E+00	2.98E-05	0.00E+00	0.00E+00	0.00E+00
ZO9A	g/s-m^2	0.00E+00	2.33E-06	0.00E+00	4.76E-07	1.60E-06	0.00E+00	9.73E-08	3.07E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.46E-05	0.00E+00	0.00E+00	0.00E+00
ZO10	g/s-m^2	0.00E+00	3.11E-06	0.00E+00	6.37E-07	2.15E-06	0.00E+00	1.30E-07	4.12E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.31E-05	0.00E+00	0.00E+00	0.00E+00
ZO11	g/s-m^2	2.84E-09	8.05E-08	2.12E-08	1.17E-08	6.89E-08	0.00E+00	5.25E-08	1.26E-08	3.27E-11	0.00E+00	3.00E-11	3.31E-08	6.85E-07	9.51E-07	3.80E-10	1.18E-08
PAVE	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
UNP1	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRCK	g/s-m^2	1.73E-08	4.90E-07	1.29E-07	7.15E-08	4.19E-07	0.00E+00	3.19E-07	7.69E-08	1.99E-10	0.00E+00	1.83E-10	2.02E-07	4.17E-06	5.79E-06	2.32E-09	7.19E-08
UNP2	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table C.2a
Estimated Emission Rates of Chemicals of Concern from Facility Sources - Current
Romic Facility, East Palo Alto, California

ID	Units	Hydrogen Sulfide	Isobutane	Methane	Methanol	Methylene Chloride	n-Butane	n-Decane	n-Heptane	n-Hexane	n-Nonane	n-Octane	n-Pentane	Propane	Propylene Oxide	Pyridine	Tetrachloroethene	Toluene	Trichloroethene
LBA1	g/s	2.59E-08	0.00E+00	0.00E+00	1.55E-04	2.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-06	5.46E-07	2.24E-06	6.11E-05	9.02E-06
LBB2	g/s	2.59E-08	0.00E+00	0.00E+00	1.55E-04	2.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-06	5.46E-07	2.24E-06	6.11E-05	9.02E-06
LBC3	g/s	2.59E-08	0.00E+00	0.00E+00	1.55E-04	2.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-06	5.46E-07	2.24E-06	6.11E-05	9.02E-06
LBC4	g/s	2.59E-08	0.00E+00	0.00E+00	1.55E-04	2.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-06	5.46E-07	2.24E-06	6.11E-05	9.02E-06
LBE6	g/s	2.59E-08	0.00E+00	0.00E+00	1.55E-04	2.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-06	5.46E-07	2.24E-06	6.11E-05	9.02E-06
IVNT	g/s	2.59E-08	0.00E+00	0.00E+00	1.55E-04	2.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-06	5.46E-07	2.24E-06	6.11E-05	9.02E-06
FLBL	g/s	0.00E+00	1.61E-05	2.70E-05	0.00E+00	0.00E+00	8.18E-05	9.53E-05	6.83E-05	7.73E-05	4.51E-05	8.31E-05	1.03E-04	3.41E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LABP	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-06	0.00E+00	2.07E-05	0.00E+00
BOIL	g/s	8.18E-08	0.00E+00	0.00E+00	4.89E-04	7.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.32E-05	1.73E-06	7.09E-06	1.93E-04	2.85E-05
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-05	0.00E+00
ZONE	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZONF	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13B	g/s	4.66E-09	0.00E+00	0.00E+00	2.78E-05	4.29E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.50E-07	9.83E-08	4.04E-07	1.10E-05	1.62E-06
SAMP	g/s	5.71E-07	0.00E+00	0.00E+00	3.41E-03	5.27E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.20E-05	1.20E-05	4.95E-05	1.35E-03	1.99E-04
CONS	g/s	3.72E-07	0.00E+00	0.00E+00	2.22E-03	3.43E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.99E-05	7.85E-06	3.23E-05	8.78E-04	1.30E-04
FGFB	g/s	0.00E+00	1.08E-03	1.82E-03	0.00E+00	0.00E+00	5.51E-03	6.42E-03	4.60E-03	5.21E-03	3.04E-03	5.60E-03	6.94E-03	2.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FUEL	g/s	0.00E+00	1.18E-03	1.99E-03	0.00E+00	0.00E+00	6.00E-03	7.00E-03	5.01E-03	5.67E-03	3.31E-03	6.10E-03	7.56E-03	2.51E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PVAJ	g/s	4.80E-08	0.00E+00	0.00E+00	2.87E-04	4.43E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.74E-06	1.01E-06	4.17E-06	1.13E-04	1.67E-05
PVKM	g/s	4.80E-08	0.00E+00	0.00E+00	2.87E-04	4.43E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.74E-06	1.01E-06	4.17E-06	1.13E-04	1.67E-05
P915	g/s	4.80E-08	0.00E+00	0.00E+00	2.87E-04	4.43E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.74E-06	1.01E-06	4.17E-06	1.13E-04	1.67E-05
PVFC	g/s	4.80E-08	0.00E+00	0.00E+00	2.87E-04	4.43E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.74E-06	1.01E-06	4.17E-06	1.13E-04	1.67E-05
PVZE	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PVZF	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DSSA	g/s	2.98E-07	0.00E+00	0.00E+00	1.78E-03	2.75E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.81E-05	6.29E-06	2.59E-05	7.04E-04	1.04E-04
DSCO	g/s	3.31E-07	0.00E+00	0.00E+00	1.98E-03	3.05E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.33E-05	6.98E-06	2.87E-05	7.81E-04	1.15E-04
DSSO	g/s	9.49E-07	0.00E+00	0.00E+00	5.67E-03	8.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-04	2.00E-05	8.23E-05	2.24E-03	3.31E-04
DSW1	g/s	1.10E-07	0.00E+00	0.00E+00	6.59E-04	1.02E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.78E-05	2.33E-06	9.56E-06	2.60E-04	3.84E-05
DSW2	g/s	4.53E-07	0.00E+00	0.00E+00	2.71E-03	4.18E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.30E-05	9.57E-06	3.93E-05	1.07E-03	1.58E-04
TRSN	g/s	5.52E-08	0.00E+00	0.00E+00	3.30E-04	5.09E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.89E-06	1.16E-06	4.79E-06	1.30E-04	1.92E-05
TRSS	g/s	5.52E-08	0.00E+00	0.00E+00	3.30E-04	5.09E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.89E-06	1.16E-06	4.79E-06	1.30E-04	1.92E-05
ZON4	g/s-m^2	3.78E-09	0.00E+00	0.00E+00	2.94E-05	4.63E-05	1.89E-08	0.00E+00	5.41E-06	0.00E+00	0.00E+00	2.09E-07	1.96E-10	0.00E+00	6.09E-07	9.70E-08	4.19E-07	1.18E-05	1.73E-06
ZON5	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	5.17E-05	8.86E-05	1.37E-07	0.00E+00	4.18E-05	0.00E+00	0.00E+00	1.59E-06	1.42E-09	0.00E+00	0.00E+00	1.30E-07	6.91E-07	2.16E-05	3.13E-06
ZON6	g/s-m^2	9.10E-09	1.25E-08	2.09E-08	7.70E-05	1.23E-04	1.23E-07	7.38E-08	1.84E-05	5.98E-08	3.49E-08	7.58E-07	8.04E-08	2.64E-08	1.47E-06	2.49E-07	1.09E-06	3.09E-05	4.54E-06
ZO7A	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	3.39E-05	5.87E-05	8.83E-08	0.00E+00	2.76E-05	0.00E+00	0.00E+00	1.04E-06	9.13E-10	0.00E+00	0.00E+00	8.52E-08	4.52E-07	1.42E-05	2.06E-06
ZO7B	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	4.94E-06	8.55E-06	1.29E-08	0.00E+00	4.02E-06	0.00E+00	0.00E+00	1.51E-07	1.33E-10	0.00E+00	0.00E+00	1.24E-08	6.59E-08	2.07E-06	3.00E-07
ZON8	g/s-m^2	0.00E+00	4.20E-09	7.05E-09	1.69E-05	2.94E-05	6.51E-08	2.48E-08	1.38E-05	2.01E-08	1.18E-08	5.40E-07	2.73E-08	8.90E-09	0.00E+00	4.25E-08	2.26E-07	7.09E-06	1.03E-06
ZO9A	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	3.20E-05	5.44E-05	8.58E-08	0.00E+00	2.57E-05	0.00E+00	0.00E+00	9.81E-07	8.88E-10	0.00E+00	0.00E+00	8.05E-08	4.27E-07	1.34E-05	1.93E-06
ZO10	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	4.29E-05	7.29E-05	1.15E-07	0.00E+00	3.44E-05	0.00E+00	0.00E+00	1.31E-06	1.19E-09	0.00E+00	0.00E+00	1.08E-07	5.73E-07	1.79E-05	2.59E-06
ZO11	g/s-m^2	2.17E-10	0.00E+00	0.00E+00	1.30E-06	2.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-08	4.59E-09	1.89E-08	5.13E-07	7.58E-08
PAVE	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
UNP1	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRCK	g/s-m^2	1.32E-09	0.00E+00	0.00E+00	7.91E-06	1.22E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.13E-07	2.79E-08	1.15E-07	3.12E-06	4.61E-07
UNP2	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table C.2a
Estimated Emission Rates of Chemicals of Concern from Facility Sources - Current
Romic Facility, East Palo Alto, California

ID	Units	Triethylamine	Urethane	Vinyl Chloride	2-Ethoxyethanol	Acetaldehyde	Acrylic Acid	Chlorobenzene	Cumene	Cyclohexanol	Diacetone alcohol	Diethylamine	Diethylaminoethanol	Diisobutyl Ketone	Ethyl Acrylate	Hexachloroethane
LBA1	g/s	1.03E-06	1.10E-07	1.12E-07	5.71E-07	5.54E-09	3.95E-11	1.40E-07	8.28E-10	8.22E-11	2.81E-08	2.35E-11	4.10E-10	9.24E-10	1.29E-09	2.45E-09
LBB2	g/s	1.03E-06	1.10E-07	1.12E-07	5.71E-07	5.54E-09	3.95E-11	1.40E-07	8.28E-10	8.22E-11	2.81E-08	2.35E-11	4.10E-10	9.24E-10	1.29E-09	2.45E-09
LBC3	g/s	1.03E-06	1.10E-07	1.12E-07	5.71E-07	5.54E-09	3.95E-11	1.40E-07	8.28E-10	8.22E-11	2.81E-08	2.35E-11	4.10E-10	9.24E-10	1.29E-09	2.45E-09
LBC4	g/s	1.03E-06	1.10E-07	1.12E-07	5.71E-07	5.54E-09	3.95E-11	1.40E-07	8.28E-10	8.22E-11	2.81E-08	2.35E-11	4.10E-10	9.24E-10	1.29E-09	2.45E-09
LBE6	g/s	1.03E-06	1.10E-07	1.12E-07	5.71E-07	5.54E-09	3.95E-11	1.40E-07	8.28E-10	8.22E-11	2.81E-08	2.35E-11	4.10E-10	9.24E-10	1.29E-09	2.45E-09
IVNT	g/s	1.03E-06	1.10E-07	1.12E-07	5.71E-07	5.54E-09	3.95E-11	1.40E-07	8.28E-10	8.22E-11	2.81E-08	2.35E-11	4.10E-10	9.24E-10	1.29E-09	2.45E-09
FLBL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LABP	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BOIL	g/s	3.25E-06	3.46E-07	3.53E-07	1.81E-06	1.75E-08	1.25E-10	4.42E-07	2.62E-09	2.60E-10	8.89E-08	7.44E-11	1.30E-09	2.92E-09	4.08E-09	7.74E-09
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZONE	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZONF	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13B	g/s	1.85E-07	1.97E-08	2.01E-08	1.03E-07	9.97E-10	7.11E-12	2.51E-08	1.49E-10	1.48E-11	5.06E-09	4.24E-12	7.38E-11	1.66E-10	2.32E-10	4.41E-10
SAMP	g/s	2.27E-05	2.42E-06	2.46E-06	1.26E-05	1.22E-07	8.72E-10	3.08E-06	1.83E-08	1.81E-09	6.21E-07	5.19E-10	9.04E-09	2.04E-08	2.85E-08	5.40E-08
CONS	g/s	1.48E-05	1.58E-06	1.60E-06	8.22E-06	7.96E-08	5.68E-10	2.01E-06	1.19E-08	1.18E-09	4.04E-07	3.38E-10	5.89E-09	1.33E-08	1.86E-08	3.52E-08
FGFB	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FUEL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PVAJ	g/s	1.91E-06	2.03E-07	2.07E-07	1.06E-06	1.03E-08	7.34E-11	2.59E-07	1.54E-09	1.53E-10	5.22E-08	4.37E-11	7.61E-10	1.72E-09	2.40E-09	4.54E-09
PVKM	g/s	1.91E-06	2.03E-07	2.07E-07	1.06E-06	1.03E-08	7.34E-11	2.59E-07	1.54E-09	1.53E-10	5.22E-08	4.37E-11	7.61E-10	1.72E-09	2.40E-09	4.54E-09
P915	g/s	1.91E-06	2.03E-07	2.07E-07	1.06E-06	1.03E-08	7.34E-11	2.59E-07	1.54E-09	1.53E-10	5.22E-08	4.37E-11	7.61E-10	1.72E-09	2.40E-09	4.54E-09
PVFC	g/s	1.91E-06	2.03E-07	2.07E-07	1.06E-06	1.03E-08	7.34E-11	2.59E-07	1.54E-09	1.53E-10	5.22E-08	4.37E-11	7.61E-10	1.72E-09	2.40E-09	4.54E-09
PVZE	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PVZF	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DSSA	g/s	1.19E-05	1.26E-06	1.29E-06	6.59E-06	6.39E-08	4.56E-10	1.61E-06	9.55E-09	9.48E-10	3.24E-07	2.71E-10	4.72E-09	1.07E-08	1.49E-08	2.82E-08
DSCO	g/s	1.31E-05	1.40E-06	1.43E-06	7.30E-06	7.08E-08	5.05E-10	1.79E-06	1.06E-08	1.05E-09	3.59E-07	3.01E-10	5.24E-09	1.18E-08	1.65E-08	3.13E-08
DSSO	g/s	3.77E-05	4.02E-06	4.09E-06	2.10E-05	2.03E-07	1.45E-09	5.13E-06	3.04E-08	3.02E-09	1.03E-06	8.64E-10	1.50E-08	3.39E-08	4.74E-08	8.98E-08
DSW1	g/s	4.38E-06	4.67E-07	4.75E-07	2.43E-06	2.36E-08	1.68E-10	5.95E-07	3.53E-09	3.50E-10	1.20E-07	1.00E-10	1.75E-09	3.94E-09	5.50E-09	1.04E-08
DSW2	g/s	1.80E-05	1.92E-06	1.95E-06	1.00E-05	9.70E-08	6.92E-10	2.45E-06	1.45E-08	1.44E-09	4.93E-07	4.12E-10	7.18E-09	1.62E-08	2.26E-08	4.29E-08
TRSN	g/s	2.19E-06	2.34E-07	2.38E-07	1.22E-06	1.18E-08	8.43E-11	2.98E-07	1.77E-09	1.75E-10	6.00E-08	5.02E-11	8.74E-10	1.97E-09	2.76E-09	5.22E-09
TRSS	g/s	2.19E-06	2.34E-07	2.38E-07	1.22E-06	1.18E-08	8.43E-11	2.98E-07	1.77E-09	1.75E-10	6.00E-08	5.02E-11	8.74E-10	1.97E-09	2.76E-09	5.22E-09
ZON4	g/s-m^2	3.52E-07	1.65E-08	1.63E-08	4.75E-07	8.09E-10	5.77E-12	3.03E-08	1.21E-10	1.20E-11	7.74E-09	3.44E-12	5.99E-11	1.35E-10	1.89E-10	2.64E-09
ZON5	g/s-m^2	1.68E-06	3.31E-09	0.00E+00	3.26E-06	0.00E+00	0.00E+00	7.47E-08	0.00E+00	0.00E+00	3.03E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.90E-08
ZON6	g/s-m^2	1.11E-06	4.00E-08	3.92E-08	1.65E-06	1.95E-09	1.39E-11	8.18E-08	2.92E-10	2.89E-11	2.33E-08	8.28E-12	1.44E-10	3.25E-10	4.54E-10	9.29E-09
ZO7A	g/s-m^2	1.15E-06	2.13E-09	0.00E+00	2.23E-06	0.00E+00	0.00E+00	4.89E-08	0.00E+00	0.00E+00	2.07E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-08
ZO7B	g/s-m^2	1.68E-07	3.11E-10	0.00E+00	3.25E-07	0.00E+00	0.00E+00	7.12E-09	0.00E+00	0.00E+00	3.01E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.89E-09
ZON8	g/s-m^2	5.83E-07	1.06E-09	0.00E+00	1.13E-06	0.00E+00	0.00E+00	2.44E-08	0.00E+00	0.00E+00	1.05E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.58E-09
ZO9A	g/s-m^2	1.02E-06	2.07E-09	0.00E+00	1.97E-06	0.00E+00	0.00E+00	4.63E-08	0.00E+00	0.00E+00	1.83E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-08
ZO10	g/s-m^2	1.35E-06	2.78E-09	0.00E+00	2.63E-06	0.00E+00	0.00E+00	6.20E-08	0.00E+00	0.00E+00	2.43E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-08
ZO11	g/s-m^2	8.64E-09	9.20E-10	9.37E-10	4.80E-09	4.65E-11	3.32E-13	1.17E-09	6.96E-12	6.91E-13	2.36E-10	1.98E-13	3.44E-12	7.76E-12	1.08E-11	2.06E-11
PAVE	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
UNP1	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRCK	g/s-m^2	5.26E-08	5.60E-09	5.70E-09	2.92E-08	2.83E-10	2.02E-12	7.14E-09	4.24E-11	4.20E-12	1.44E-09	1.20E-12	2.10E-11	4.72E-11	6.60E-11	1.25E-10
UNP2	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table C.2a
Estimated Emission Rates of Chemicals of Concern from Facility Sources - Current
Romic Facility, East Palo Alto, California

ID	Units	Hydrofluoric Acid	Isopropyl Alcohol	Methyl Methacrylate	Naphthalene	n-Butyl Alcohol	Nitric Acid	Nitrobenzene	Osmium Tetroxide	Phenol	Propylene Dichloride	Styrene	Sulfuric Acid	Toluenediisocyanate (mixed isomers)
LBA1	g/s	7.38E-07	2.43E-05	3.97E-08	6.87E-10	4.73E-07	4.22E-06	6.16E-09	1.16E-11	2.89E-08	6.46E-11	3.21E-08	9.40E-06	7.37E-12
LBB2	g/s	7.38E-07	2.43E-05	3.97E-08	6.87E-10	4.73E-07	4.22E-06	6.16E-09	1.16E-11	2.89E-08	6.46E-11	3.21E-08	9.40E-06	7.37E-12
LBC3	g/s	7.38E-07	2.43E-05	3.97E-08	6.87E-10	4.73E-07	4.22E-06	6.16E-09	1.16E-11	2.89E-08	6.46E-11	3.21E-08	9.40E-06	7.37E-12
LBC4	g/s	7.38E-07	2.43E-05	3.97E-08	6.87E-10	4.73E-07	4.22E-06	6.16E-09	1.16E-11	2.89E-08	6.46E-11	3.21E-08	9.40E-06	7.37E-12
LBE6	g/s	7.38E-07	2.43E-05	3.97E-08	6.87E-10	4.73E-07	4.22E-06	6.16E-09	1.16E-11	2.89E-08	6.46E-11	3.21E-08	9.40E-06	7.37E-12
IVNT	g/s	7.38E-07	2.43E-05	3.97E-08	6.87E-10	4.73E-07	4.22E-06	6.16E-09	1.16E-11	2.89E-08	6.46E-11	3.21E-08	9.40E-06	7.37E-12
FLBL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LABP	g/s	4.24E-08	1.49E-04	0.00E+00	0.00E+00	0.00E+00	5.68E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.55E-07	0.00E+00
BOIL	g/s	2.33E-06	7.69E-05	1.25E-07	2.17E-09	1.49E-06	1.33E-05	1.95E-08	3.68E-11	9.14E-08	2.04E-10	1.01E-07	2.97E-05	2.33E-11
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZONE	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-
ZONF	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-
T13B	g/s	1.33E-07	4.38E-06	7.14E-09	1.24E-10	8.51E-08	7.60E-07	1.11E-09	2.10E-12	5.21E-09	1.16E-11	5.78E-09	1.69E-06	1.33E-12
SAMP	g/s	1.63E-05	5.37E-04	8.76E-07	1.52E-08	1.04E-05	9.32E-05	1.36E-07	2.57E-10	6.39E-07	1.43E-09	7.08E-07	2.08E-04	1.63E-10
CONS	g/s	1.06E-05	3.50E-04	5.70E-07	9.88E-09	6.80E-06	6.07E-05	8.86E-08	1.67E-10	4.16E-07	9.29E-10	4.61E-07	1.35E-04	1.06E-10
FGFB	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FUEL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PVAJ	g/s	1.37E-06	4.52E-05	7.37E-08	1.28E-09	8.78E-07	7.84E-06	1.14E-08	2.16E-11	5.37E-08	1.20E-10	5.96E-08	1.75E-05	1.37E-11
PVKM	g/s	1.37E-06	4.52E-05	7.37E-08	1.28E-09	8.78E-07	7.84E-06	1.14E-08	2.16E-11	5.37E-08	1.20E-10	5.96E-08	1.75E-05	1.37E-11
P915	g/s	1.37E-06	4.52E-05	7.37E-08	1.28E-09	8.78E-07	7.84E-06	1.14E-08	2.16E-11	5.37E-08	1.20E-10	5.96E-08	1.75E-05	1.37E-11
PVFC	g/s	1.37E-06	4.52E-05	7.37E-08	1.28E-09	8.78E-07	7.84E-06	1.14E-08	2.16E-11	5.37E-08	1.20E-10	5.96E-08	1.75E-05	1.37E-11
PVZE	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-
PVZF	g/s	-	-	-	-	-	-	-	-	-	-	-	-	-
DSSA	g/s	8.51E-06	2.80E-04	4.57E-07	7.92E-09	5.45E-06	4.87E-05	7.10E-08	1.34E-10	3.34E-07	7.45E-10	3.70E-07	1.08E-04	8.50E-11
DSCO	g/s	9.44E-06	3.11E-04	5.07E-07	8.78E-09	6.04E-06	5.40E-05	7.87E-08	1.49E-10	3.70E-07	8.25E-10	4.10E-07	1.20E-04	9.42E-11
DSSO	g/s	2.71E-05	8.92E-04	1.46E-06	2.52E-08	1.73E-05	1.55E-04	2.26E-07	4.27E-10	1.06E-06	2.37E-09	1.18E-06	3.45E-04	2.71E-10
DSW1	g/s	3.15E-06	1.04E-04	1.69E-07	2.93E-09	2.01E-06	1.80E-05	2.62E-08	4.96E-11	1.23E-07	2.75E-10	1.37E-07	4.01E-05	3.14E-11
DSW2	g/s	1.29E-05	4.26E-04	6.95E-07	1.20E-08	8.28E-06	7.40E-05	1.08E-07	2.04E-10	5.07E-07	1.13E-09	5.62E-07	1.65E-04	1.29E-10
TRSN	g/s	1.58E-06	5.19E-05	8.46E-08	1.47E-09	1.01E-06	9.01E-06	1.31E-08	2.48E-11	6.17E-08	1.38E-10	6.85E-08	2.01E-05	1.57E-11
TRSS	g/s	1.58E-06	5.19E-05	8.46E-08	1.47E-09	1.01E-06	9.01E-06	1.31E-08	2.48E-11	6.17E-08	1.38E-10	6.85E-08	2.01E-05	1.57E-11
ZON4	g/s-m^2	1.78E-06	4.69E-06	5.80E-09	1.00E-10	6.91E-08	6.17E-07	9.00E-10	1.70E-12	1.05E-08	9.44E-12	4.69E-09	1.37E-06	1.08E-12
ZON5	g/s-m^2	1.31E-05	8.49E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.21E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON6	g/s-m^2	6.00E-06	1.23E-05	1.40E-08	2.42E-10	1.66E-07	1.49E-06	2.17E-09	4.10E-12	3.33E-08	2.27E-11	1.13E-08	3.31E-06	2.59E-12
ZO7A	g/s-m^2	8.69E-06	5.53E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.56E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO7B	g/s-m^2	1.27E-06	8.07E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.19E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON8	g/s-m^2	4.36E-06	2.76E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO9A	g/s-m^2	8.01E-06	5.27E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.14E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO10	g/s-m^2	1.07E-05	7.07E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.19E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO11	g/s-m^2	6.20E-09	2.04E-07	3.33E-10	5.77E-12	3.97E-09	3.55E-08	5.17E-11	9.78E-14	2.43E-10	5.42E-13	2.70E-10	7.90E-08	6.19E-14
PAVE	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
UNP1	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRCK	g/s-m^2	3.78E-08	1.24E-06	2.03E-09	3.51E-11	2.42E-08	2.16E-07	3.15E-10	5.95E-13	1.48E-09	3.30E-12	1.64E-09	4.81E-07	3.77E-13
UNP2	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table C.2a
Estimated Emission Rates of Chemicals of Concern from Facility Sources - Current
Romic Facility, East Palo Alto, California

ID	Units	Vinyl Acetate	Xylene (mixed isomers)	Bromine	Chlorine	Methacrylate	Phosphine
LBA1	g/s	1.21E-08	1.38E-05	1.13E-09	4.94E-07	1.52E-10	3.83E-10
LBB2	g/s	1.21E-08	1.38E-05	1.13E-09	4.94E-07	1.52E-10	3.83E-10
LBC3	g/s	1.21E-08	1.38E-05	1.13E-09	4.94E-07	1.52E-10	3.83E-10
LBC4	g/s	1.21E-08	1.38E-05	1.13E-09	4.94E-07	1.52E-10	3.83E-10
LBE6	g/s	1.21E-08	1.38E-05	1.13E-09	4.94E-07	1.52E-10	3.83E-10
IVNT	g/s	1.21E-08	1.38E-05	1.13E-09	4.94E-07	1.52E-10	3.83E-10
FLBL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LABP	g/s	0.00E+00	1.24E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BOIL	g/s	3.83E-08	4.37E-05	3.57E-09	1.56E-06	4.80E-10	1.21E-09
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZONE	g/s	-	-	-	-	-	-
ZONF	g/s	-	-	-	-	-	-
T13B	g/s	2.18E-09	2.49E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SAMP	g/s	2.67E-07	3.05E-04	2.49E-08	1.09E-05	3.35E-09	8.45E-09
CONS	g/s	1.74E-07	1.99E-04	1.63E-08	7.10E-06	2.18E-09	5.51E-09
FGFB	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FUEL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PVAJ	g/s	2.25E-08	2.57E-05	1.68E-09	7.34E-07	2.26E-10	5.69E-10
PVKM	g/s	2.25E-08	2.57E-05	2.10E-09	9.17E-07	2.82E-10	7.11E-10
P915	g/s	2.25E-08	2.57E-05	2.10E-09	9.17E-07	2.82E-10	7.11E-10
PVFC	g/s	2.25E-08	2.57E-05	2.10E-09	9.17E-07	2.82E-10	7.11E-10
PVZE	g/s	-	-	-	-	-	-
PVZF	g/s	-	-	-	-	-	-
DSSA	g/s	1.40E-07	1.59E-04	1.30E-08	5.69E-06	1.75E-09	4.42E-09
DSCO	g/s	1.55E-07	1.77E-04	1.44E-08	6.31E-06	1.94E-09	4.90E-09
DSSO	g/s	4.44E-07	5.07E-04	4.15E-08	1.81E-05	5.57E-09	1.41E-08
DSW1	g/s	5.16E-08	5.89E-05	4.82E-09	2.10E-06	6.47E-10	1.63E-09
DSW2	g/s	2.12E-07	2.42E-04	1.98E-08	8.65E-06	2.66E-09	6.71E-09
TRSN	g/s	2.58E-08	2.95E-05	2.41E-09	1.05E-06	3.24E-10	8.17E-10
TRSS	g/s	2.58E-08	2.95E-05	2.41E-09	1.05E-06	3.24E-10	8.17E-10
ZON4	$g/s\text{-}m^2$	1.77E-09	2.60E-06	1.65E-10	7.22E-08	2.22E-11	5.60E-11
ZON5	$g/s\text{-}m^2$	0.00E+00	4.34E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON6	$g/s\text{-}m^2$	4.26E-09	6.76E-06	3.98E-10	1.74E-07	5.34E-11	1.35E-10
ZO7A	$g/s\text{-}m^2$	0.00E+00	2.83E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO7B	$g/s\text{-}m^2$	0.00E+00	4.13E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON8	$g/s\text{-}m^2$	0.00E+00	1.41E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO9A	$g/s\text{-}m^2$	0.00E+00	2.69E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO10	$g/s\text{-}m^2$	0.00E+00	3.61E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO11	$g/s\text{-}m^2$	1.02E-10	1.16E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PAVE	$g/s\text{-}m^2$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
UNP1	$g/s\text{-}m^2$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRCK	$g/s\text{-}m^2$	6.19E-10	7.07E-07	5.78E-11	2.53E-08	7.77E-12	1.96E-11
UNP2	$g/s\text{-}m^2$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table C.2b
Estimated Emission Rates of Chemicals of Concern from Facility Sources - Future
Romic Facility, East Palo Alto, California

ID	Units	1,1,1-Trichloroethane	1,1-Dichloroethene	1,2-Dibromo-3-chloropropane	1,2-Dichlorobenzene	1,2-Dichloroethane	1,4-Dichlorobenzene	1,4-Dioxane	2-Butanone	2-Nitropropane	4-Methyl-2-pentanone	Acetone	Acetonitrile
LBA1	g/s	2.70E-05	6.77E-06	0.00E+00	5.07E-07	1.35E-06	1.01E-08	9.63E-07	1.18E-07	1.17E-07	8.35E-06	1.14E-05	2.03E-05
LBB2	g/s	2.70E-05	6.77E-06	0.00E+00	5.07E-07	1.35E-06	1.01E-08	9.63E-07	1.18E-07	1.17E-07	8.35E-06	1.14E-05	2.03E-05
LBC3	g/s	2.70E-05	6.77E-06	0.00E+00	5.07E-07	1.35E-06	1.01E-08	9.63E-07	1.18E-07	1.17E-07	8.35E-06	1.14E-05	2.03E-05
LBC4	g/s	2.70E-05	6.77E-06	0.00E+00	5.07E-07	1.35E-06	1.01E-08	9.63E-07	1.18E-07	1.17E-07	8.35E-06	1.14E-05	2.03E-05
LBE6	g/s	2.70E-05	6.77E-06	0.00E+00	5.07E-07	1.35E-06	1.01E-08	9.63E-07	1.18E-07	1.17E-07	8.35E-06	1.14E-05	2.03E-05
IVNT	g/s	2.70E-05	6.77E-06	0.00E+00	5.07E-07	1.35E-06	1.01E-08	9.63E-07	1.18E-07	1.17E-07	8.35E-06	1.14E-05	2.03E-05
FLBL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LABP	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E-06	0.00E+00	0.00E+00	1.47E-03	1.80E-04
BOIL	g/s	8.54E-05	2.14E-05	0.00E+00	1.60E-06	4.25E-06	3.18E-08	3.05E-06	3.74E-07	3.70E-07	2.64E-05	3.61E-05	6.41E-05
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZONE	g/s	2.05E-05	1.14E-05	0.00E+00	4.42E-07	9.80E-07	1.89E-07	4.56E-07	0.00E+00	0.00E+00	2.33E-05	9.05E-06	1.40E-05
ZONF	g/s	9.41E-08	5.24E-08	0.00E+00	2.03E-09	4.51E-09	8.70E-10	2.10E-09	0.00E+00	0.00E+00	1.07E-07	4.16E-08	6.44E-08
T13B	g/s	4.86E-06	1.22E-06	0.00E+00	9.12E-08	2.42E-07	1.81E-09	1.73E-07	2.13E-08	2.11E-08	1.50E-06	2.06E-06	3.65E-06
SAMP	g/s	5.97E-04	1.49E-04	0.00E+00	1.12E-05	2.97E-05	2.22E-07	2.13E-05	2.61E-06	2.58E-06	1.84E-04	2.52E-04	4.47E-04
CONS	g/s	3.89E-04	9.74E-05	0.00E+00	7.29E-06	1.93E-05	1.45E-07	1.39E-05	1.70E-06	1.68E-06	1.20E-04	1.64E-04	2.91E-04
FGFB	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FUEL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PVAJ	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PVKM	g/s	5.02E-05	1.26E-05	0.00E+00	9.41E-07	2.50E-06	1.87E-08	1.79E-06	2.20E-07	2.17E-07	1.55E-05	2.12E-05	3.76E-05
P915	g/s	5.02E-05	1.26E-05	0.00E+00	9.41E-07	2.50E-06	1.87E-08	1.79E-06	2.20E-07	2.17E-07	1.55E-05	2.12E-05	3.76E-05
PVFC	g/s	5.02E-05	1.26E-05	0.00E+00	9.41E-07	2.50E-06	1.87E-08	1.79E-06	2.20E-07	2.17E-07	1.55E-05	2.12E-05	3.76E-05
PVZE	g/s	5.02E-05	1.26E-05	0.00E+00	9.41E-07	2.50E-06	1.87E-08	1.79E-06	2.20E-07	2.17E-07	1.55E-05	2.12E-05	3.76E-05
PVZF	g/s	5.02E-05	1.26E-05	0.00E+00	9.41E-07	2.50E-06	1.87E-08	1.79E-06	2.20E-07	2.17E-07	1.55E-05	2.12E-05	3.76E-05
DSSA	g/s	3.12E-04	7.81E-05	0.00E+00	5.84E-06	1.55E-05	1.16E-07	1.11E-05	1.36E-06	1.35E-06	9.63E-05	1.32E-04	2.34E-04
DSCO	g/s	3.45E-04	8.65E-05	0.00E+00	6.48E-06	1.72E-05	1.29E-07	1.23E-05	1.51E-06	1.50E-06	1.07E-04	1.46E-04	2.59E-04
DSSO	g/s	9.92E-04	2.48E-04	0.00E+00	1.86E-05	4.94E-05	3.69E-07	3.53E-05	4.34E-06	4.30E-06	3.07E-04	4.20E-04	7.44E-04
DSW1	g/s	1.15E-04	2.88E-05	0.00E+00	2.16E-06	5.73E-06	4.29E-08	4.10E-06	5.04E-07	4.99E-07	3.56E-05	4.87E-05	8.64E-05
DSW2	g/s	4.74E-04	1.19E-04	0.00E+00	8.88E-06	2.36E-05	1.76E-07	1.69E-05	2.07E-06	2.05E-06	1.46E-04	2.00E-04	3.55E-04
TRSN	g/s	5.77E-05	1.44E-05	0.00E+00	1.08E-06	2.87E-06	2.15E-08	2.06E-06	2.52E-07	2.50E-07	1.78E-05	2.44E-05	4.32E-05
TRSS	g/s	5.77E-05	1.44E-05	0.00E+00	1.08E-06	2.87E-06	2.15E-08	2.06E-06	2.52E-07	2.50E-07	1.78E-05	2.44E-05	4.32E-05
ZON4	$g/s\text{-}m^2$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON5	$g/s\text{-}m^2$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON6	$g/s\text{-}m^2$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO7A	$g/s\text{-}m^2$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO7B	$g/s\text{-}m^2$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON8	$g/s\text{-}m^2$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO9A	$g/s\text{-}m^2$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO10	$g/s\text{-}m^2$	5.05E-06	2.42E-06	0.00E+00	9.41E-08	2.44E-07	4.03E-08	1.15E-07	0.00E+00	0.00E+00	4.96E-06	2.22E-06	3.47E-06
ZO11	$g/s\text{-}m^2$	2.27E-07	5.69E-08	0.00E+00	4.26E-09	1.13E-08	8.45E-11	8.09E-09	9.93E-10	9.84E-10	7.02E-08	9.60E-08	1.70E-07
PAVE	$g/s\text{-}m^2$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
UNP1	$g/s\text{-}m^2$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRCK	$g/s\text{-}m^2$	1.38E-06	3.46E-07	0.00E+00	2.59E-08	6.88E-08	5.14E-10	4.93E-08	6.05E-09	5.99E-09	4.27E-07	5.85E-07	1.04E-06
UNP2	$g/s\text{-}m^2$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table C.2b
Estimated Emission Rates of Chemicals of Concern from Facility Sources - Future
Romic Facility, East Palo Alto, California

ID	Units	Acrylonitrile	Ammonia	Benzene	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Cyclohexane	Dichlorofluoroethane	Dimethyl Formamide	Epichlorohydrin	Ethane	Ethylene Oxide	Formaldehyde	Gasoline	Hexane	Hydrazine
LBA1	g/s	3.35E-08	3.37E-07	9.58E-06	2.52E-06	1.40E-06	8.20E-06	0.00E+00	6.24E-06	1.50E-06	3.90E-09	0.00E+00	3.58E-09	3.94E-06	8.15E-05	1.13E-04	4.53E-08
LBB2	g/s	3.35E-08	3.37E-07	9.58E-06	2.52E-06	1.40E-06	8.20E-06	0.00E+00	6.24E-06	1.50E-06	3.90E-09	0.00E+00	3.58E-09	3.94E-06	8.15E-05	1.13E-04	4.53E-08
LBC3	g/s	3.35E-08	3.37E-07	9.58E-06	2.52E-06	1.40E-06	8.20E-06	0.00E+00	6.24E-06	1.50E-06	3.90E-09	0.00E+00	3.58E-09	3.94E-06	8.15E-05	1.13E-04	4.53E-08
LBC4	g/s	3.35E-08	3.37E-07	9.58E-06	2.52E-06	1.40E-06	8.20E-06	0.00E+00	6.24E-06	1.50E-06	3.90E-09	0.00E+00	3.58E-09	3.94E-06	8.15E-05	1.13E-04	4.53E-08
LBE6	g/s	3.35E-08	3.37E-07	9.58E-06	2.52E-06	1.40E-06	8.20E-06	0.00E+00	6.24E-06	1.50E-06	3.90E-09	0.00E+00	3.58E-09	3.94E-06	8.15E-05	1.13E-04	4.53E-08
IVNT	g/s	3.35E-08	3.37E-07	9.58E-06	2.52E-06	1.40E-06	8.20E-06	0.00E+00	6.24E-06	1.50E-06	3.90E-09	0.00E+00	3.58E-09	3.94E-06	8.15E-05	1.13E-04	4.53E-08
FLBL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.44E-06	0.00E+00	0.00E+00	0.00E+00	6.44E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LABP	g/s	0.00E+00	2.45E-05	1.94E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-07	0.00E+00	0.00E+00	0.00E+00	3.06E-04	2.95E-06	6.27E-05	0.00E+00
BOIL	g/s	1.06E-07	1.07E-06	3.03E-05	7.98E-06	4.42E-06	2.59E-05	0.00E+00	1.97E-05	4.75E-06	1.23E-08	0.00E+00	1.13E-08	1.25E-05	2.58E-04	3.58E-04	1.43E-07
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BOIL	g/s	0.00E+00	0.00E+00	8.82E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.15E-04	0.00E+00	0.00E+00	0.00E+00
ZONE	g/s	0.00E+00	0.00E+00	7.24E-06	0.00E+00	1.49E-06	5.02E-06	0.00E+00	3.08E-07	8.98E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.78E-04	0.00E+00	0.00E+00
ZONF	g/s	0.00E+00	0.00E+00	3.33E-08	0.00E+00	6.87E-09	2.31E-08	0.00E+00	1.42E-09	4.13E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.18E-07	0.00E+00	0.00E+00
T13B	g/s	6.03E-09	6.08E-08	1.73E-06	4.54E-07	2.52E-07	1.48E-06	0.00E+00	1.12E-06	2.71E-07	7.01E-10	0.00E+00	6.44E-10	7.10E-07	1.47E-05	2.04E-05	8.15E-09
SAMP	g/s	7.40E-07	7.45E-06	2.12E-04	5.57E-05	3.09E-05	1.81E-04	0.00E+00	1.38E-04	3.32E-05	8.60E-08	0.00E+00	7.90E-08	8.70E-05	1.80E-03	2.50E-03	9.99E-07
CONS	g/s	4.82E-07	4.85E-06	1.38E-04	3.63E-05	2.01E-05	1.18E-04	0.00E+00	8.98E-05	2.16E-05	5.60E-08	0.00E+00	5.14E-08	5.67E-05	1.17E-03	1.63E-03	6.51E-07
FGFB	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.34E-04	0.00E+00	0.00E+00	0.00E+00	4.34E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FUEL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.73E-04	0.00E+00	0.00E+00	0.00E+00	4.73E-04	0.00E+00	0.00E+00	6.45E-03	0.00E+00	0.00E+00
PVAJ	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PVKM	g/s	6.22E-08	6.27E-07	1.78E-05	4.68E-06	2.60E-06	1.52E-05	0.00E+00	1.16E-05	2.79E-06	7.24E-09	0.00E+00	6.64E-09	7.32E-06	1.51E-04	2.10E-04	8.41E-08
P915	g/s	6.22E-08	6.27E-07	1.78E-05	4.68E-06	2.60E-06	1.52E-05	0.00E+00	1.16E-05	2.79E-06	7.24E-09	0.00E+00	6.64E-09	7.32E-06	1.51E-04	2.10E-04	8.41E-08
PVFC	g/s	6.22E-08	6.27E-07	1.78E-05	4.68E-06	2.60E-06	1.52E-05	0.00E+00	1.16E-05	2.79E-06	7.24E-09	0.00E+00	6.64E-09	7.32E-06	1.51E-04	2.10E-04	8.41E-08
PVZE	g/s	6.22E-08	6.27E-07	1.78E-05	4.68E-06	2.60E-06	1.52E-05	0.00E+00	1.16E-05	2.79E-06	7.24E-09	0.00E+00	6.64E-09	7.32E-06	1.51E-04	2.10E-04	8.41E-08
PVZF	g/s	6.22E-08	6.27E-07	1.78E-05	4.68E-06	2.60E-06	1.52E-05	0.00E+00	1.16E-05	2.79E-06	7.24E-09	0.00E+00	6.64E-09	7.32E-06	1.51E-04	2.10E-04	8.41E-08
DSSA	g/s	3.86E-07	3.89E-06	1.11E-04	2.91E-05	1.61E-05	9.45E-05	0.00E+00	7.20E-05	1.73E-05	4.49E-08	0.00E+00	4.12E-08	4.55E-05	9.40E-04	1.30E-03	5.22E-07
DSCO	g/s	4.28E-07	4.31E-06	1.23E-04	3.23E-05	1.79E-05	1.05E-04	0.00E+00	7.98E-05	1.92E-05	4.98E-08	0.00E+00	4.57E-08	5.04E-05	1.04E-03	1.45E-03	5.79E-07
DSSO	g/s	1.23E-06	1.24E-05	3.52E-04	9.26E-05	5.13E-05	3.01E-04	0.00E+00	2.29E-04	5.52E-05	1.43E-07	0.00E+00	1.31E-07	1.45E-04	2.99E-03	4.15E-03	1.66E-06
DSW1	g/s	1.43E-07	1.44E-06	4.08E-05	1.08E-05	5.96E-06	3.49E-05	0.00E+00	2.66E-05	6.41E-06	1.66E-08	0.00E+00	1.52E-08	1.68E-05	3.47E-04	4.82E-04	1.93E-07
DSW2	g/s	5.87E-07	5.91E-06	1.68E-04	4.42E-05	2.45E-05	1.44E-04	0.00E+00	1.09E-04	2.64E-05	6.83E-08	0.00E+00	6.27E-08	6.91E-05	1.43E-03	1.98E-03	7.93E-07
TRSN	g/s	7.15E-08	7.20E-07	2.05E-05	5.38E-06	2.98E-06	1.75E-05	0.00E+00	1.33E-05	3.21E-06	8.31E-09	0.00E+00	7.63E-09	8.41E-06	1.74E-04	2.41E-04	9.66E-08
TRSS	g/s	7.15E-08	7.20E-07	2.05E-05	5.38E-06	2.98E-06	1.75E-05	0.00E+00	1.33E-05	3.21E-06	8.31E-09	0.00E+00	7.63E-09	8.41E-06	1.74E-04	2.41E-04	9.66E-08
ZON4	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON5	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON6	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO7A	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO7B	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON8	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO9A	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO10	g/s-m^2	0.00E+00	0.00E+00	1.79E-06	0.00E+00	3.67E-07	1.24E-06	1.30E-08	7.50E-08	2.38E-07	0.00E+00	1.30E-08	0.00E+00	0.00E+00	4.21E-05	0.00E+00	0.00E+00
ZO11	g/s-m^2	2.82E-10	2.84E-09	8.05E-08	2.12E-08	1.17E-08	6.89E-08	0.00E+00	5.25E-08	1.26E-08	3.27E-11	0.00E+00	3.00E-11	3.31E-08	6.85E-07	9.51E-07	3.80E-10
PAVE	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
UNP1	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRCK	g/s-m^2	1.71E-09	1.73E-08	4.90E-07	1.29E-07	7.15E-08	4.19E-07	0.00E+00	3.19E-07	7.69E-08	1.99E-10	0.00E+00	1.83E-10	2.02E-07	4.17E-06	5.79E-06	2.32E-09
UNP2	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table C.2b
Estimated Emission Rates of Chemicals of Concern from Facility Sources - Future
Romic Facility, East Palo Alto, California

ID	Units	Hydrochloric Acid	Hydrogen Sulfide	Isobutane	Methane	Methanol	Methylene Chloride	n-Butane	n-Decane	n-Heptane	n-Hexane	n-Nonane	n-Octane	n-Pentane	Propane	Propylene Oxide	Pyridine	Tetrachloroethene	Toluene
LBA1	g/s	1.41E-06	2.59E-08	0.00E+00	0.00E+00	1.55E-04	2.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-06	5.46E-07	2.24E-06	6.11E-05
LBB2	g/s	1.41E-06	2.59E-08	0.00E+00	0.00E+00	1.55E-04	2.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-06	5.46E-07	2.24E-06	6.11E-05
LBC3	g/s	1.41E-06	2.59E-08	0.00E+00	0.00E+00	1.55E-04	2.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-06	5.46E-07	2.24E-06	6.11E-05
LBC4	g/s	1.41E-06	2.59E-08	0.00E+00	0.00E+00	1.55E-04	2.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-06	5.46E-07	2.24E-06	6.11E-05
LBE6	g/s	1.41E-06	2.59E-08	0.00E+00	0.00E+00	1.55E-04	2.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-06	5.46E-07	2.24E-06	6.11E-05
IVNT	g/s	1.41E-06	2.59E-08	0.00E+00	0.00E+00	1.55E-04	2.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-06	5.46E-07	2.24E-06	6.11E-05
FLBL	g/s	0.00E+00	0.00E+00	1.61E-05	2.70E-05	0.00E+00	0.00E+00	8.18E-05	9.53E-05	6.82E-05	7.72E-05	4.51E-05	8.30E-05	1.03E-04	3.41E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LABP	g/s	8.65E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-06	0.00E+00	2.07E-05
BOIL	g/s	4.44E-06	8.18E-08	0.00E+00	0.00E+00	4.89E-04	7.54E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.32E-05	1.73E-06	7.09E-06	1.93E-04
BOIL	g/s	5.25E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-05
ZONE	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.76E-05	1.73E-04	2.42E-07	0.00E+00	8.08E-05	0.00E+00	0.00E+00	2.99E-06	2.49E-09	0.00E+00	0.00E+00	2.44E-07	1.30E-06	4.09E-05
ZONF	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.49E-07	7.97E-07	1.12E-09	0.00E+00	3.72E-07	0.00E+00	0.00E+00	1.37E-08	1.15E-11	0.00E+00	0.00E+00	1.12E-09	5.97E-09	1.88E-07
T13B	g/s	2.53E-07	4.66E-09	0.00E+00	0.00E+00	2.78E-05	4.29E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.50E-07	9.83E-08	4.04E-07	1.10E-05
SAMP	g/s	3.10E-05	5.71E-07	0.00E+00	0.00E+00	3.41E-03	5.27E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.20E-05	1.20E-05	4.95E-05	1.35E-03
CONS	g/s	2.02E-05	3.72E-07	0.00E+00	0.00E+00	2.22E-03	3.43E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.99E-05	7.85E-06	3.23E-05	8.78E-04
FGFB	g/s	0.00E+00	0.00E+00	1.08E-03	1.82E-03	0.00E+00	0.00E+00	5.51E-03	6.42E-03	4.60E-03	5.21E-03	3.04E-03	5.60E-03	6.94E-03	2.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FUEL	g/s	0.00E+00	0.00E+00	1.18E-03	1.99E-03	0.00E+00	0.00E+00	6.00E-03	7.00E-03	5.01E-03	5.67E-03	3.31E-03	6.10E-03	7.56E-03	2.51E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PVAJ	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PVKM	g/s	2.61E-06	4.80E-08	0.00E+00	0.00E+00	2.87E-04	4.43E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.74E-06	1.01E-06	4.17E-06	1.13E-04
P915	g/s	2.61E-06	4.80E-08	0.00E+00	0.00E+00	2.87E-04	4.43E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.74E-06	1.01E-06	4.17E-06	1.13E-04
PVFC	g/s	2.61E-06	4.80E-08	0.00E+00	0.00E+00	2.87E-04	4.43E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.74E-06	1.01E-06	4.17E-06	1.13E-04
PVZE	g/s	2.61E-06	4.80E-08	0.00E+00	0.00E+00	2.87E-04	4.43E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.74E-06	1.01E-06	4.17E-06	1.13E-04
PVZF	g/s	2.61E-06	4.80E-08	0.00E+00	0.00E+00	2.87E-04	4.43E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.74E-06	1.01E-06	4.17E-06	1.13E-04
DSSA	g/s	1.62E-05	2.98E-07	0.00E+00	0.00E+00	1.78E-03	2.75E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.81E-05	6.29E-06	2.59E-05	7.04E-04
DSCO	g/s	1.80E-05	3.31E-07	0.00E+00	0.00E+00	1.98E-03	3.05E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.33E-05	6.98E-06	2.87E-05	7.81E-04
DSSO	g/s	5.16E-05	9.49E-07	0.00E+00	0.00E+00	5.67E-03	8.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-04	2.00E-05	8.23E-05	2.24E-03
DSW1	g/s	5.99E-06	1.10E-07	0.00E+00	0.00E+00	6.59E-04	1.02E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.78E-05	2.33E-06	9.56E-06	2.60E-04
DSW2	g/s	2.46E-05	4.53E-07	0.00E+00	0.00E+00	2.71E-03	4.18E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.30E-05	9.57E-06	3.93E-05	1.07E-03
TRSN	g/s	3.00E-06	5.52E-08	0.00E+00	0.00E+00	3.30E-04	5.09E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.89E-06	1.16E-06	4.79E-06	1.30E-04
TRSS	g/s	3.00E-06	5.52E-08	0.00E+00	0.00E+00	3.30E-04	5.09E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.89E-06	1.16E-06	4.79E-06	1.30E-04
ZON4	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON5	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON6	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO7A	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO7B	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON8	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO9A	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO10	g/s-m^2	0.00E+00	0.00E+00	3.24E-08	5.45E-08	2.47E-05	4.20E-05	2.31E-07	1.92E-07	2.00E-05	1.56E-07	9.09E-08	9.25E-07	2.08E-07	6.88E-08	0.00E+00	6.22E-08	3.30E-07	1.03E-05
ZO11	g/s-m^2	1.18E-08	2.17E-10	0.00E+00	0.00E+00	1.30E-06	2.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E-08	4.59E-09	1.89E-08	5.13E-07
PAVE	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
UNP1	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRCK	g/s-m^2	7.19E-08	1.32E-09	0.00E+00	0.00E+00	7.91E-06	1.22E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.13E-07	2.79E-08	1.15E-07	3.12E-06
UNP2	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table C.2b
Estimated Emission Rates of Chemicals of Concern from Facility Sources - Future
Romic Facility, East Palo Alto, California

ID	Units	Trichloroethene	Triethylamine	Urethane	Vinyl Chloride	2-Ethoxyethanol	Acetaldehyde	Acrylic Acid	Chlorobenzene	Cumene	Cyclohexanol	Diacetone alcohol	Diethylamine	Diethylaminoethanol	Diisobutyl Ketone	Ethyl Acrylate
LBA1	g/s	9.02E-06	1.03E-06	1.10E-07	1.12E-07	5.71E-07	5.54E-09	3.95E-11	1.40E-07	8.28E-10	8.22E-11	2.81E-08	2.35E-11	4.10E-10	9.24E-10	1.29E-09
LBB2	g/s	9.02E-06	1.03E-06	1.10E-07	1.12E-07	5.71E-07	5.54E-09	3.95E-11	1.40E-07	8.28E-10	8.22E-11	2.81E-08	2.35E-11	4.10E-10	9.24E-10	1.29E-09
LBC3	g/s	9.02E-06	1.03E-06	1.10E-07	1.12E-07	5.71E-07	5.54E-09	3.95E-11	1.40E-07	8.28E-10	8.22E-11	2.81E-08	2.35E-11	4.10E-10	9.24E-10	1.29E-09
LBC4	g/s	9.02E-06	1.03E-06	1.10E-07	1.12E-07	5.71E-07	5.54E-09	3.95E-11	1.40E-07	8.28E-10	8.22E-11	2.81E-08	2.35E-11	4.10E-10	9.24E-10	1.29E-09
LBE6	g/s	9.02E-06	1.03E-06	1.10E-07	1.12E-07	5.71E-07	5.54E-09	3.95E-11	1.40E-07	8.28E-10	8.22E-11	2.81E-08	2.35E-11	4.10E-10	9.24E-10	1.29E-09
IVNT	g/s	9.02E-06	1.03E-06	1.10E-07	1.12E-07	5.71E-07	5.54E-09	3.95E-11	1.40E-07	8.28E-10	8.22E-11	2.81E-08	2.35E-11	4.10E-10	9.24E-10	1.29E-09
FLBL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LABP	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BOIL	g/s	2.85E-05	3.25E-06	3.46E-07	3.53E-07	1.81E-06	1.75E-08	1.25E-10	4.42E-07	2.62E-09	2.60E-10	8.89E-08	7.44E-11	1.30E-09	2.92E-09	4.08E-09
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZONE	g/s	5.95E-06	3.67E-06	5.84E-09	0.00E+00	7.11E-06	0.00E+00	0.00E+00	1.40E-07	0.00E+00	0.00E+00	6.59E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZONF	g/s	2.74E-08	1.69E-08	2.69E-11	0.00E+00	3.27E-08	0.00E+00	0.00E+00	6.42E-10	0.00E+00	0.00E+00	3.03E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00
T13B	g/s	1.62E-06	1.85E-07	1.97E-08	2.01E-08	1.03E-07	9.97E-10	7.11E-12	2.51E-08	1.49E-10	1.48E-11	5.06E-09	4.24E-12	7.38E-11	1.66E-10	2.32E-10
SAMP	g/s	1.99E-04	2.27E-05	2.42E-06	2.46E-06	1.26E-05	1.22E-07	8.72E-10	3.08E-06	1.83E-08	1.81E-09	6.21E-07	5.19E-10	9.04E-09	2.04E-08	2.85E-08
CONS	g/s	1.30E-04	1.48E-05	1.58E-06	1.60E-06	8.22E-06	7.96E-08	5.68E-10	2.01E-06	1.19E-08	1.18E-09	4.04E-07	3.38E-10	5.89E-09	1.33E-08	1.86E-08
FGFB	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FUEL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PVAJ	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PVKM	g/s	1.67E-05	1.91E-06	2.03E-07	2.07E-07	1.06E-06	1.03E-08	7.34E-11	2.59E-07	1.54E-09	1.53E-10	5.22E-08	4.37E-11	7.61E-10	1.72E-09	2.40E-09
P915	g/s	1.67E-05	1.91E-06	2.03E-07	2.07E-07	1.06E-06	1.03E-08	7.34E-11	2.59E-07	1.54E-09	1.53E-10	5.22E-08	4.37E-11	7.61E-10	1.72E-09	2.40E-09
PVFC	g/s	1.67E-05	1.91E-06	2.03E-07	2.07E-07	1.06E-06	1.03E-08	7.34E-11	2.59E-07	1.54E-09	1.53E-10	5.22E-08	4.37E-11	7.61E-10	1.72E-09	2.40E-09
PVZE	g/s	1.67E-05	1.91E-06	2.03E-07	2.07E-07	1.06E-06	1.03E-08	7.34E-11	2.59E-07	1.54E-09	1.53E-10	5.22E-08	4.37E-11	7.61E-10	1.72E-09	2.40E-09
PVZF	g/s	1.67E-05	1.91E-06	2.03E-07	2.07E-07	1.06E-06	1.03E-08	7.34E-11	2.59E-07	1.54E-09	1.53E-10	5.22E-08	4.37E-11	7.61E-10	1.72E-09	2.40E-09
DSSA	g/s	1.04E-04	1.19E-05	1.26E-06	1.29E-06	6.59E-06	6.39E-08	4.56E-10	1.61E-06	9.55E-09	9.48E-10	3.24E-07	2.71E-10	4.72E-09	1.07E-08	1.49E-08
DSCO	g/s	1.15E-04	1.31E-05	1.40E-06	1.43E-06	7.30E-06	7.08E-08	5.05E-10	1.79E-06	1.06E-08	1.05E-09	3.59E-07	3.01E-10	5.24E-09	1.18E-08	1.65E-08
DSSO	g/s	3.31E-04	3.77E-05	4.02E-06	4.09E-06	2.10E-05	2.03E-07	1.45E-09	5.13E-06	3.04E-08	3.02E-09	1.03E-06	8.64E-10	1.50E-08	3.39E-08	4.74E-08
DSW1	g/s	3.84E-05	4.38E-06	4.67E-07	4.75E-07	2.43E-06	2.36E-08	1.68E-10	5.95E-07	3.53E-09	3.50E-10	1.20E-07	1.00E-10	1.75E-09	3.94E-09	5.50E-09
DSW2	g/s	1.58E-04	1.80E-05	1.92E-06	1.95E-06	1.00E-05	9.70E-08	6.92E-10	2.45E-06	1.45E-08	1.44E-09	4.93E-07	4.12E-10	7.18E-09	1.62E-08	2.26E-08
TRSN	g/s	1.92E-05	2.19E-06	2.34E-07	2.38E-07	1.22E-06	1.18E-08	8.43E-11	2.98E-07	1.77E-09	1.75E-10	6.00E-08	5.02E-11	8.74E-10	1.97E-09	2.76E-09
TRSS	g/s	1.92E-05	2.19E-06	2.34E-07	2.38E-07	1.22E-06	1.18E-08	8.43E-11	2.98E-07	1.77E-09	1.75E-10	6.00E-08	5.02E-11	8.74E-10	1.97E-09	2.76E-09
ZON4	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON5	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON6	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO7A	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO7B	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON8	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO9A	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO10	g/s-m^2	1.49E-06	7.80E-07	1.60E-09	0.00E+00	1.51E-06	0.00E+00	0.00E+00	3.57E-08	0.00E+00	0.00E+00	1.40E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO11	g/s-m^2	7.58E-08	8.64E-09	9.20E-10	9.37E-10	4.80E-09	4.65E-11	3.32E-13	1.17E-09	6.96E-12	6.91E-13	2.36E-10	1.98E-13	3.44E-12	7.76E-12	1.08E-11
PAVE	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
UNP1	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRCK	g/s-m^2	4.61E-07	5.26E-08	5.60E-09	5.70E-09	2.92E-08	2.83E-10	2.02E-12	7.14E-09	4.24E-11	4.20E-12	1.44E-09	1.20E-12	2.10E-11	4.72E-11	6.60E-11
UNP2	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table C.2b
Estimated Emission Rates of Chemicals of Concern from Facility Sources - Future
Romic Facility, East Palo Alto, California

ID	Units	Hexachloroethane	Hydrofluoric Acid	Isopropyl Alcohol	Methyl Methacrylate	Naphthalene	n-Butyl Alcohol	Nitric Acid	Nitrobenzene	Osmium Tetroxide	Phenol	Propylene Dichloride	Styrene	Sulfuric Acid
LBA1	g/s	2.45E-09	7.38E-07	2.43E-05	3.97E-08	6.87E-10	4.73E-07	4.22E-06	6.16E-09	1.16E-11	2.89E-08	6.46E-11	3.21E-08	9.40E-06
LBB2	g/s	2.45E-09	7.38E-07	2.43E-05	3.97E-08	6.87E-10	4.73E-07	4.22E-06	6.16E-09	1.16E-11	2.89E-08	6.46E-11	3.21E-08	9.40E-06
LBC3	g/s	2.45E-09	7.38E-07	2.43E-05	3.97E-08	6.87E-10	4.73E-07	4.22E-06	6.16E-09	1.16E-11	2.89E-08	6.46E-11	3.21E-08	9.40E-06
LBC4	g/s	2.45E-09	7.38E-07	2.43E-05	3.97E-08	6.87E-10	4.73E-07	4.22E-06	6.16E-09	1.16E-11	2.89E-08	6.46E-11	3.21E-08	9.40E-06
LBE6	g/s	2.45E-09	7.38E-07	2.43E-05	3.97E-08	6.87E-10	4.73E-07	4.22E-06	6.16E-09	1.16E-11	2.89E-08	6.46E-11	3.21E-08	9.40E-06
IVNT	g/s	2.45E-09	7.38E-07	2.43E-05	3.97E-08	6.87E-10	4.73E-07	4.22E-06	6.16E-09	1.16E-11	2.89E-08	6.46E-11	3.21E-08	9.40E-06
FLBL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LABP	g/s	0.00E+00	4.24E-08	1.49E-04	0.00E+00	0.00E+00	0.00E+00	5.68E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.55E-07
BOIL	g/s	7.74E-09	2.33E-06	7.69E-05	1.25E-07	2.17E-09	1.49E-06	1.33E-05	1.95E-08	3.68E-11	9.14E-08	2.04E-10	1.01E-07	2.97E-05
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZONE	g/s	4.14E-08	2.59E-05	1.57E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-07	0.00E+00	0.00E+00	0.00E+00
ZONF	g/s	1.90E-10	1.19E-07	7.21E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.22E-10	0.00E+00	0.00E+00	0.00E+00
T13B	g/s	4.41E-10	1.33E-07	4.38E-06	7.14E-09	1.24E-10	8.51E-08	7.60E-07	1.11E-09	2.10E-12	5.21E-09	1.16E-11	5.78E-09	1.69E-06
SAMP	g/s	5.40E-08	1.63E-05	5.37E-04	8.76E-07	1.52E-08	1.04E-05	9.32E-05	1.36E-07	2.57E-10	6.39E-07	1.43E-09	7.08E-07	2.08E-04
CONS	g/s	3.52E-08	1.06E-05	3.50E-04	5.70E-07	9.88E-09	6.80E-06	6.07E-05	8.86E-08	1.67E-10	4.16E-07	9.29E-10	4.61E-07	1.35E-04
FGFB	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FUEL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PVAJ	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PVKM	g/s	4.54E-09	1.37E-06	4.52E-05	7.37E-08	1.28E-09	8.78E-07	7.84E-06	1.14E-08	2.16E-11	5.37E-08	1.20E-10	5.96E-08	1.75E-05
P915	g/s	4.54E-09	1.37E-06	4.52E-05	7.37E-08	1.28E-09	8.78E-07	7.84E-06	1.14E-08	2.16E-11	5.37E-08	1.20E-10	5.96E-08	1.75E-05
PVFC	g/s	4.54E-09	1.37E-06	4.52E-05	7.37E-08	1.28E-09	8.78E-07	7.84E-06	1.14E-08	2.16E-11	5.37E-08	1.20E-10	5.96E-08	1.75E-05
PVZE	g/s	4.54E-09	1.37E-06	4.52E-05	7.37E-08	1.28E-09	8.78E-07	7.84E-06	1.14E-08	2.16E-11	5.37E-08	1.20E-10	5.96E-08	1.75E-05
PVZF	g/s	4.54E-09	1.37E-06	4.52E-05	7.37E-08	1.28E-09	8.78E-07	7.84E-06	1.14E-08	2.16E-11	5.37E-08	1.20E-10	5.96E-08	1.75E-05
DSSA	g/s	2.82E-08	8.51E-06	2.80E-04	4.57E-07	7.92E-09	5.45E-06	4.87E-05	7.10E-08	1.34E-10	3.34E-07	7.45E-10	3.70E-07	1.08E-04
DSCO	g/s	3.13E-08	9.44E-06	3.11E-04	5.07E-07	8.78E-09	6.04E-06	5.40E-05	7.87E-08	1.49E-10	3.70E-07	8.25E-10	4.10E-07	1.20E-04
DSSO	g/s	8.98E-08	2.71E-05	8.92E-04	1.46E-06	2.52E-08	1.73E-05	1.55E-04	2.26E-07	4.27E-10	1.06E-06	2.37E-09	1.18E-06	3.45E-04
DSW1	g/s	1.04E-08	3.15E-06	1.04E-04	1.69E-07	2.93E-09	2.01E-06	1.80E-05	2.62E-08	4.96E-11	1.23E-07	2.75E-10	1.37E-07	4.01E-05
DSW2	g/s	4.29E-08	1.29E-05	4.26E-04	6.95E-07	1.20E-08	8.28E-06	7.40E-05	1.08E-07	2.04E-10	5.07E-07	1.13E-09	5.62E-07	1.65E-04
TRSN	g/s	5.22E-09	1.58E-06	5.19E-05	8.46E-08	1.47E-09	1.01E-06	9.01E-06	1.31E-08	2.48E-11	6.17E-08	1.38E-10	6.85E-08	2.01E-05
TRSS	g/s	5.22E-09	1.58E-06	5.19E-05	8.46E-08	1.47E-09	1.01E-06	9.01E-06	1.31E-08	2.48E-11	6.17E-08	1.38E-10	6.85E-08	2.01E-05
ZON4	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON5	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON6	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO7A	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO7B	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON8	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO9A	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO10	g/s-m^2	8.81E-09	6.17E-06	4.07E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.42E-08	0.00E+00	0.00E+00	0.00E+00
ZO11	g/s-m^2	2.06E-11	6.20E-09	2.04E-07	3.33E-10	5.77E-12	3.97E-09	3.55E-08	5.17E-11	9.78E-14	2.43E-10	5.42E-13	2.70E-10	7.90E-08
PAVE	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
UNP1	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRCK	g/s-m^2	1.25E-10	3.78E-08	1.24E-06	2.03E-09	3.51E-11	2.42E-08	2.16E-07	3.15E-10	5.95E-13	1.48E-09	3.30E-12	1.64E-09	4.81E-07
UNP2	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table C.2b
Estimated Emission Rates of Chemicals of Concern from Facility Sources - Future
Romic Facility, East Palo Alto, California

ID	Units	Toluenediisocyanate (mixed isomers)	Vinyl Acetate	Xylene (mixed isomers)	Bromine	Chlorine	Methacrylate	Phosphine
LBA1	g/s	7.37E-12	1.21E-08	1.38E-05	1.13E-09	4.94E-07	1.52E-10	3.83E-10
LBB2	g/s	7.37E-12	1.21E-08	1.38E-05	1.13E-09	4.94E-07	1.52E-10	3.83E-10
LBC3	g/s	7.37E-12	1.21E-08	1.38E-05	1.13E-09	4.94E-07	1.52E-10	3.83E-10
LBC4	g/s	7.37E-12	1.21E-08	1.38E-05	1.13E-09	4.94E-07	1.52E-10	3.83E-10
LBE6	g/s	7.37E-12	1.21E-08	1.38E-05	1.13E-09	4.94E-07	1.52E-10	3.83E-10
IVNT	g/s	7.37E-12	1.21E-08	1.38E-05	1.13E-09	4.94E-07	1.52E-10	3.83E-10
FLBL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LABP	g/s	0.00E+00	0.00E+00	1.24E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BOIL	g/s	2.33E-11	3.83E-08	4.37E-05	3.57E-09	1.56E-06	4.80E-10	1.21E-09
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BOIL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZONE	g/s	0.00E+00	0.00E+00	8.06E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZONF	g/s	0.00E+00	0.00E+00	3.71E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
T13B	g/s	1.33E-12	2.18E-09	2.49E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SAMP	g/s	1.63E-10	2.67E-07	3.05E-04	2.49E-08	1.09E-05	3.35E-09	8.45E-09
CONS	g/s	1.06E-10	1.74E-07	1.99E-04	1.63E-08	7.10E-06	2.18E-09	5.51E-09
FGFB	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FUEL	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PVAJ	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PVKM	g/s	1.37E-11	2.25E-08	2.57E-05	2.10E-09	9.17E-07	2.82E-10	7.11E-10
P915	g/s	1.37E-11	2.25E-08	2.57E-05	2.10E-09	9.17E-07	2.82E-10	7.11E-10
PVFC	g/s	1.37E-11	2.25E-08	2.57E-05	2.10E-09	9.17E-07	2.82E-10	7.11E-10
PVZE	g/s	1.37E-11	2.25E-08	2.57E-05	1.68E-09	7.34E-07	2.26E-10	5.69E-10
PVZF	g/s	1.37E-11	2.25E-08	2.57E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
DSSA	g/s	8.50E-11	1.40E-07	1.59E-04	1.30E-08	5.69E-06	1.75E-09	4.42E-09
DSCO	g/s	9.42E-11	1.55E-07	1.77E-04	1.44E-08	6.31E-06	1.94E-09	4.90E-09
DSSO	g/s	2.71E-10	4.44E-07	5.07E-04	4.15E-08	1.81E-05	5.57E-09	1.41E-08
DSW1	g/s	3.14E-11	5.16E-08	5.89E-05	4.82E-09	2.10E-06	6.47E-10	1.63E-09
DSW2	g/s	1.29E-10	2.12E-07	2.42E-04	1.98E-08	8.65E-06	2.66E-09	6.71E-09
TRSN	g/s	1.57E-11	2.58E-08	2.95E-05	2.41E-09	1.05E-06	3.24E-10	8.17E-10
TRSS	g/s	1.57E-11	2.58E-08	2.95E-05	2.41E-09	1.05E-06	3.24E-10	8.17E-10
ZON4	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON5	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON6	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO7A	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO7B	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZON8	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO9A	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO10	g/s-m^2	0.00E+00	0.00E+00	2.08E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZO11	g/s-m^2	6.19E-14	1.02E-10	1.16E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PAVE	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
UNP1	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRCK	g/s-m^2	3.77E-13	6.19E-10	7.07E-07	5.78E-11	2.53E-08	7.77E-12	1.96E-11
UNP2	g/s-m^2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table C.3

Chemical Composition for Modeled Organics Stream[a, b]

Romic Facility, East Palo Alto, California

1,1,1-TRICHLOROETHANE	3.08	%	FORMALDEHYDE	0.45	%
1,1-DICHLOROETHENE	0.77	%	GASOLINE	9.30	%
1,2-DICHLOROBENZENE	0.058	%	HEXANE	12.9	%
1,2-DICHLOROETHANE	0.15	%	HEXACHLOROETHANE	2.79E-04	%
1,4-DICHLOROBENZENE	1.15E-03	%	HYDRAZINE	5.17E-03	%
1,4-DIOXANE	0.11	%	HYDROCHLORIC ACID	1.60E-01	%
2-BUTANONE	0.013	%	HYDROFLUORIC ACID	8.43E-02	%
2-ETHOXYETHANOL	0.065	%	HYDROGEN SULFIDE	2.95E-03	%
2-NITROPROPANE	0.013	%	ISOPROPYL ALCOHOL	2.78	%
4-METHYL-2-PENTANONE	0.95	%	MERCURY	2.81E-06	%
ACETALDEHYDE	6.32E-04	%	METHACRYLATE	1.73E-05	%
ACETONE	1.30	%	METHANOL	17.6	%
ACETONITRILE	2.31	%	METHYL METHACRYLATE	4.53E-03	%
ACRYLIC ACID	4.51E-06	%	METHYLENE CHLORIDE	27.2	%
ACRYLONITRILE	3.82E-03	%	NAPHTHALENE	7.84E-05	%
AMMONIA	0.039	%	N-BUTYL ALCOHOL	0.054	%
BENZENE	1.09	%	NITRIC ACID	0.48	%
BROMINE	1.29E-04	%	NITROBENZENE	7.03E-04	%
CARBON DISULFIDE	0.29	%	OSMIUM TETROXIDE	1.33E-06	%
CARBON TETRACHLORIDE	0.16	%	PHENOL	3.30E-03	%
CHLORINE	0.056	%	PHOSPHINE	4.37E-05	%
CHLOROBENZENE	0.016	%	PROPYLENE DICHLORIDE	7.37E-06	%
CHLOROFORM	0.94	%	PROPYLENE OXIDE	0.48	%
CUMENE	9.46E-05	%	PYRIDINE	0.062	%
CYCLOHEXANOL	9.38E-06	%	STYRENE	3.66E-03	%
DIACETONE ALCOHOL	3.21E-03	%	SULFURIC ACID	1.07E+00	%
DICHLOROFLUOROETHANE	0.71	%	TETRACHLOROETHENE	0.26	%
DIETHYLAMINE	2.69E-06	%	TOLUENE	6.97	%
DIETHYLAMINOETHANOL	4.68E-05	%	TOLUENEDIISOCYANATE (MIXED ISOMERS)	8.41E-07	%
DIISOBUTYL KETONE	1.05E-04	%	TRICHLOROETHENE	1.03	%
DIMETHYL FORMAMIDE	0.17	%	TRIETHYLAMINE	0.12	%
DIPHENYL OXIDE	1.36E-05	%	URETHANE	0.013	%
EPICHLOROHYDRIN	4.45E-04	%	VINYL ACETATE	1.38E-03	%
ETHYL ACRYLATE	1.47E-04	%	VINYL CHLORIDE	0.013	%
ETHYLENE OXIDE	4.08E-04	%	XYLENE (MIXED ISOMERS)	1.58	%
			Total[c]	**95.0**	%

Notes:

a - The aqueous organic waste stream was modeled as 95% water and 5% the composition of the organics stream.

b - The truck rinsate was modeled as the same composition as the organics stream.

c - The remaining 5% of the stream is composed of chemicals not selected for analysis in this risk assessment.

Table C.4

Chemical Composition for Modeled Lab Pack Stream[a]
Romic Facility, East Palo Alto, California

2-BUTANONE	0.05	%
ACETONE	52.06	%
ACETONITRILE	6.37	%
ACRYLIC ACID	0.01	%
AMMONIA	0.87	%
BENZENE	0.07	%
DIMETHYL FORMAMIDE	0.01	%
FORMALDEHYDE	10.84	%
GASOLINE	0.10	%
HEXANE	2.22	%
HYDROCHLORIC ACID	3.06	%
HYDROFLUORIC ACID	0.00	%
ISOPROPYL ALCOHOL	5.27	%
METHANOL	10.26	%
METHYLENE CHLORIDE	3.72	%
N-BUTYL ALCOHOL	1.83	%
NITRIC ACID	2.01	%
PYRIDINE	0.04	%
SULFURIC ACID	0.01	%
TOLUENE	0.73	%
XYLENE (MIXED ISOMERS)	0.44	%
Total	**100.0**	**%**

Note:
a - The same chemicals were selected for evaluation from the lab pack stream as were selected from the process stream; but the percentage of each chemical in the total organic vapor emitted was based on a representative two-week lab pack throughput log provided by the facility, using only the chemicals that were selected.

Table C.5:
Chemical Composition for Diesel Stream[a]
Romic Facility, East Palo Alto, California

CYCLOHEXANE	1.0%
ETHANE	1.0%
ISOBUTANE	2.5%
METHANE	4.2%
N-BUTANE	12.7%
N-DECANE	14.8%
N-HEPTANE	10.6%
N-HEXANE	12.0%
N-NONANE	7.0%
N-OCTANE	12.9%
N-PENTANE	16.0%
PROPANE	5.3%
Total	**100%**

Notes:

a - The vehicle fueling stream was modeled as 12% gasoline (not speciated) and 88% the composition of the diesel stream.

Reference:

California Air Resources Board (CARB). 1991. VOC Profile for "Evaporative Emissions - Distillate Fuel". Profile #760.

Table C.6
Chemical Composition of the Products of Natural Gas Combustion
Romic Facility, East Palo Alto, California

BENZENE	2.61%
FORMALDEHYDE	93.17%
TOLUENE	4.22%
Total	**100%**

Reference:

United States Environmental Protection Agency (USEPA). 1998. Compilation of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources. November.

Table C.7a
Emissions Information - Current
Romic Facility, East Palo Alto, California

		Modeled ER		Modeled[c]		Actual[d]			Emission Factor			Throughput Quantity			Emissions[e]		Daily	Emission Rate - Before (g/s or g/s-m2)[f]			
Model ID	**Source Description**	**(g/s or g/s-m^2)[a]**	**Area (m^2)[b]**	**Hrs/Day**	**Hrs/Yr**	**Hrs/Day**	**Hrs/Yr**	**Note**	**Value**	**Units**	**Note**	**Value**	**Units**	**Note**	**(lbs/yr)**	**(tons/yr)**	**(lbs/day)**	**One-Hour[g]**	**24-Hour[h]**	**Annual Res[i]**	**Worker[j]**
LABA1	Lab A, Fume Hood 1	1.0E-02	-	24	8760	24	8760	n	1%	% of solvent	k	17	lbs/day	l, m	61	0.03	0.17	8.76E-04	8.76E-04	8.76E-04	8.76E-04
LABB2	Lab B, Fume Hood 2	1.0E-02	-	24	8760	24	8760	n	1%	% of solvent	k	17	lbs/day	l, m	61	0.03	0.17	8.76E-04	8.76E-04	8.76E-04	8.76E-04
LABC3	Lab C, Fume Hood 3	1.0E-02	-	24	8760	24	8760	n	1%	% of solvent	k	17	lbs/day	l, m	61	0.03	0.17	8.76E-04	8.76E-04	8.76E-04	8.76E-04
LABC4	Lab C, Fume Hood 4	1.0E-02	-	24	8760	24	8760	n	1%	% of solvent	k	17	lbs/day	l, m	61	0.03	0.17	8.76E-04	8.76E-04	8.76E-04	8.76E-04
LABE6	Lab E, Fume Hood 6	1.0E-02	-	24	8760	24	8760	n	1%	% of solvent	k	17	lbs/day	l, m	61	0.03	0.17	8.76E-04	8.76E-04	8.76E-04	8.76E-04
ICPVENT	Inductively Coupled Plasma Spectroscopy Vent	1.0E-02	-	24	8760	24	8760	n	1%	% of solvent	k	17	lbs/day	l, m	61	0.03	0.17	8.76E-04	8.76E-04	8.76E-04	8.76E-04
FUELBLND	Vent for Drum Liquefaction Control System	1.0E-02	-	10	3650	10	3650	af	306.46	ppm	ap	0.001	m^3 of air/s	ao	18.66	0.01	0.05	6.44E-04	6.44E-04	6.44E-04	6.44E-04
LABPACK	Vent for Scrubber at Labpack Warehouse	1.0E-02	-	6	2190	6	626	o	0.05%	% of solvent	aq	375.18	kg/day	ar	43.13	0.02	0.41	8.68E-03	8.68E-03	2.48E-03	2.48E-03
BOILER	Vent for Boiler Control System - VOC emissions	1.0E-02	-	24	8760	24	8760	q	0.26	ppm	an	2.03	m^3 of air/s	an	192.58	0.10	0.53	2.77E-03	2.77E-03	2.77E-03	2.77E-03
BOILER - HCL	Vent for Boiler Control System - HCL emissions	1.0E-02	-	24	8760	24	8760	q	10.00	lbs/day	ah	-	-	-	3650.00	1.83	10.00	5.25E-02	5.25E-02	5.25E-02	5.25E-02
BOILER -NG	Vent for Boiler Control System - NG emissions	1.0E-02	-	24	8760	24	8760	q	7.89E-05	lb/MMBtu	at	34	MMBtu/hr	au	23.51	0.01	0.06	3.38E-04	3.38E-04	3.38E-04	3.38E-04
ZONEE	Control System for Zone E tanks	1.0E-02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZONEF	Control System for Zone F tanks	1.0E-02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13B2	T13, B2 Vent	1.0E-02	-	24	8760	24	8760	q	1.58E-04	g/s	ak	-	-	-	10.97	0.01	0.03	1.58E-04	1.58E-04	1.58E-04	1.58E-04
SAMPLING	Drum Sampling Fugitives	1.0E-02	-	10	3650	10	3650	r	2.32E-03	kg/drum	am	109,500	drums/year	s	560.24	0.28	1.53	1.93E-02	1.93E-02	1.93E-02	1.93E-02
CONSOLID	Consolidation Fugitives	1.0E-02	-	10	3650	10	3650	af	1	lb/day	ag	-	-	-	365.00	0.18	1.00	1.26E-02	1.26E-02	1.26E-02	1.26E-02
FUGFB	Drum Liquefaction Fugitives	1.0E-02	-	10	3650	10	3650	af	1%	% of diesel	as	1475	gal/month	v	1256.70	0.63	3.44	4.34E-02	4.34E-02	4.34E-02	4.34E-02
FUELST	Fueling Station Fugitives	1.0E-02	-	10	3650	10	3650	af	1400.00	mg/L	ab	133,200	gal/year	ac	1556.25	0.78	4.26	5.37E-02	5.37E-02	5.37E-02	5.37E-02
PVFAJ	Tanks A-J Fugitives	1.0E-02	-	24	8760	24	8760	q	5.86E-03	kg/hr	y	-	-	-	113.11	0.06	0.31	1.63E-03	1.63E-03	1.63E-03	1.63E-03
PVFKM	Tanks K-M Fugitives	1.0E-02	-	24	8760	24	8760	q	5.86E-03	kg/hr	y	-	-	-	113.11	0.06	0.31	1.63E-03	1.63E-03	1.63E-03	1.63E-03
PVFR915	Tanks R91-R95 Fugitives	1.0E-02	-	24	8760	24	8760	q	5.86E-03	kg/hr	y	-	-	-	113.11	0.06	0.31	1.63E-03	1.63E-03	1.63E-03	1.63E-03
PVFC	Processing Columns Fugitives	1.0E-02	-	24	8760	24	8760	q	5.86E-03	kg/hr	y	-	-	-	113.11	0.06	0.31	1.63E-03	1.63E-03	1.63E-03	1.63E-03
PVFZE	Tanks 96-98, N, & O Fugitives	1.0E-02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PVFZF	Tanks A-1 to A-5 Fugitives	1.0E-02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DSSAMP	Drum Storage Fugitives	1.0E-02	-	24	8760	24	8760	q	4.2E-05	kg/hr/drum	w	866	drums	x	702.43	0.35	1.92	1.01E-02	1.01E-02	1.01E-02	1.01E-02
DSCONS	Drum Storage North Fugitives	1.0E-02	-	24	8760	24	8760	q	4.2E-05	kg/hr/drum	w	960	drums	x	778.68	0.39	2.13	1.12E-02	1.12E-02	1.12E-02	1.12E-02
DSSOUTH	Drum Storage South Fugitives	1.0E-02	-	24	8760	24	8760	q	4.2E-05	kg/hr/drum	w	2756	drums	x	2235.46	1.12	6.12	3.22E-02	3.22E-02	3.22E-02	3.22E-02
DSWEST1	Drum Storage West 1 Fugitives	1.0E-02	-	24	8760	24	8760	q	4.2E-05	kg/hr/drum	w	320	drums	x	259.56	0.13	0.71	3.73E-03	3.73E-03	3.73E-03	3.73E-03
DSWEST2	Drum Storage West 2 Fugitives	1.0E-02	-	24	8760	24	8760	q	4.2E-05	kg/hr/drum	w	1316	drums	x	1067.44	0.53	2.92	1.54E-02	1.54E-02	1.54E-02	1.54E-02
TRKSAMPN	Truck Sampling - North	1.0E-02	-	10	3650	10	3650	t	7.08E-03	kg/truck	am	3468	trucks/year	u	54.16	0.027	0.15	1.87E-03	1.87E-03	1.87E-03	1.87E-03
TRKSAMPS	Truck Sampling - South	1.0E-02	-	10	3650	10	3650	t	7.08E-03	kg/truck	am	3468	trucks/year	u	54.16	0.027	0.15	1.87E-03	1.87E-03	1.87E-03	1.87E-03
ZONE4	Zone 4 Tank Area	1.0E-03	259.5	24	8760	24	8760	q	3070.59	lbs/year	ai,av	-	-	-	3070.59	1.54	8.41	1.70E-04	1.70E-04	1.70E-04	1.70E-04
ZONE5	Zone 5 Tank Area	1.0E-03	188.1	24	8760	24	8760	q	4929.59	lbs/year	ai,av	-	-	-	4929.59	2.46	13.51	3.77E-04	3.77E-04	3.77E-04	3.77E-04
ZONE6	Zone 6 Tank Area	1.0E-03	146.6	24	8760	24	8760	q	4674.91	lbs/year	ai,av	-	-	-	4674.91	2.34	12.81	4.59E-04	4.59E-04	4.59E-04	4.59E-04
ZONE7A	Zone 7a Tank Area	1.0E-03	201.1	24	8760	24	8760	q	3490.61	lbs/year	ai	-	-	-	3490.61	1.75	9.56	2.50E-04	2.50E-04	2.50E-04	2.50E-04
ZONE7B	Zone 7b Tank Area	1.0E-03	87.89	24	8760	24	8760	q	222.35	lbs/year	ai	-	-	-	222.35	0.11	0.61	3.64E-05	3.64E-05	3.64E-05	3.64E-05
ZONE8	Zone 8 Tank Area	1.0E-03	701.6	24	8760	24	8760	q	6111.36	lbs/year	ai	-	-	-	6111.36	3.06	16.74	1.25E-04	1.25E-04	1.25E-04	1.25E-04
ZONE9A	Zone 9a Tank Area	1.0E-03	23.08	24	8760	24	8760	q	371.74	lbs/year	ai	-	-	-	371.74	0.19	1.02	2.32E-04	2.32E-04	2.32E-04	2.32E-04
ZONE10	Zone 10 Tank Area	1.0E-03	25.64	24	8760	24	8760	q	552.78	lbs/year	ai	-	-	-	552.78	0.28	1.51	3.10E-04	3.10E-04	3.10E-04	3.10E-04
ZONE11	Zone 11 Tank Area	1.0E-05	276.8	24	8760	24	8760	q	2.04E-03	g/s	ak	-	-	-	141.65	0.07	0.39	7.36E-06	7.36E-06	7.36E-06	7.36E-06
TRCKWASH	Truck Washing	1.0E-04	388.8	8.5	3103	1.8	469	p	311.00	g/truck	al	626	trucks/year	p	429.02	0.21	1.65	4.44E-04	6.67E-04	4.48E-05	4.48E-05

Notes:

a The emission rate is in g/s for point and volume sources and g/s-m2 for area sources.
b The source area is only provided for area sources. These are the only sources that require the area to calculate the emission rate.
c The "modeled" time is the length of time the source is operating in the annual average model runs.
d The "actual" time is the amount of time the source actually operates.
e When necessary, emission rates are calculated using a liquid density of material of 720.81 kg/m3 (estimated by Site personnel as representative of the average organic wastestream).
f The emission rate is in g/s for point and volume sources and g/s-m2 for area sources.
g The one-hour emission rate is the maximum emission rate for one hour based on operating hours.
h The 24-hour emission rate is the maximum emission rate for one day based on operating hours.
i The annual residential emission rate is the annual average emission rate from the source based on the modeled hours.
j The worker emission rate is the annual average emission rate from the source based on the modeled hours.
k An evaporation loss factor of 1% has been assumed for the material brought to the laboratory via samples (USEPA provides an emission factor of 1% to 2% of solvent for agitated mixing tanks (Page 6.4-1 of AP-42 Section 6.4 “Paint and Varnish”)).
l Romic laboratory personnel estimate that the lab processes 200-250 samples per day and that each sample is 200-400 ml Brian Blagg [1/21/99 site visit]).

Table C.7a
Emissions Information - Current
Romic Facility, East Palo Alto, California

	The emissions from the laboratory was assumed to be spread out evenly among the six fume hood vents.
m	The density of the liquid being processed is assumed to be equivalent to the density of the fuels stream, which is assumed to be 42 lbs/ft^3(see 9/30/99 e-mail to John Arden).
n	According to Romic laboratory personnel, the laboratory operates 24 hours per day Brian Blagg [1/21/99 site visit]).
o	According to Site personnel, bulking processes are conducted at the Labpack Warehouse two times per week for six hours each time Carol Bonner and John Arden [9/9/99]).
p	On average, 2.4 trucks are washed per day, 5 days per week, 52 weeks per year (information from Ross Wilson on 12/1/00 from tanker truck wash logs for the period 3/13/00 to 11/22/00). Each truck takes about 30 to 60 minutes to wash according to Nick [site visit 1/21/99]). Assumed maximum of two trucks could be washed per hour and three per day.
q	This source emits continuously.
r	According to Site personnel, drum sampling is potentially conducted 10 hours per day for 365 days per year (Carol Bonner and John Arden [9/9/99]).
s	According to Site personnel, approximately 250 to 350 drums are sampled per day for 365 days per year (Carol Bonner and John Arden [9/9/99]).
t	It is assumed that tanker truck sampling occurs on the same schedule as drum sampling.
u	According to Site personnel, an average of 18 to 20 tanker trucks are sampled per day (Carol Bonner and John Arden [9/9/99]).
v	According to Site personnel, approximately 1475 gallons of diesel are used at the Tidy Bowl per month (John Arden [8/31/99]; the estimate is for time period 8/98-7/99).
w	Emission factor was assumed to be similar to the total organic compound emission factor for fittings (connectors and flanges) of equipment containing gaseous material at a marketing terminal (see Table 2.3 in the United States Environmental Protection Agency document titled Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017. November, 1995)).
x	The number of drums stored in each storage area was provided by Michael Edwards in a fax to Liz Miesner dated September 18, 2000.
y	Emission factor was derived using Site-provided VOC concentration readings (VOC measurements were conducted in November and December, 1999) and information from USEPA guidance Protocol for Equipment Leak Emission Estimates. EPA-453/R-95-017. November, 1995.)
ab	Emission factor was cited in the USEPA Compilation of Air Pollutant Emission Factors, AP-42 Section 5.2.2.3 "Motor Vehicle Refueling". It was assumed that the emission factor for diesel dispensing is similar to that for gasoline dispensing.
ac	Thruput for the fueling station comes from an email from Regina Colbert on 2/16/00. The email states that the diesel tank has a 12,000 gallon capacity and an average thruput of 9800 gallons per month and that the gasoline tank has a capacity of 2000 gallons and a thruput of 1300 gallons per month.
af	The hours of operation information was obtained from Site personnel (see E-mail from Mary Cavendish to Stacy Mann dated 3/25/99). The drum liquefaction, consolidation, and fueling station operate 10 hours per day, five days a week. Although there are times when they have operated 7 days per week so these sources will be assumed to be operating 7 days per week.
ag	It was assumed that 1 lb of VOC per day is emitted from the consolidation area (estimated by Carol Bonner and provided to ENVIRON at meeting on July 14, 1999).
ah	Assumed HCl emissions from the boiler were 10 pounds per day (i.e., the BAAQMD permit limit)
ai	The annual VOC emission factor was estimated using the USEPA TANKS program. Please refer to Table C.8 for TANKS input information.
ak	Site provided OVA measurements and a simple box model were used to estimate release rates. Wind speed measurements at a height of 10 meters were adjusted to account for release height of the source.
al	The emission factor for truck washing was obtained from Table 4.8-2 in the USEPA compilation of Air Pollutant Emission Factors, AP-42 Section 4.8. This emission factor is based on the type of residual material in the truck and is appropriate for a washing cycle of one hour (please note that on average the trucks at the Site are washed in 30 to 60 minutes). To be conservative, the highest emission factor cited for truck washing was used to estimate emissions. In addition, Mr. Ron Ryan of the USEPA confirmed that this should be the emission factor used to account for both emissions from the residual material in the truck and from the material used to wash the truck (see E-mail from Ron Ryan to Stacy Mann dated 10/8/99).
am	The emission factor was estimated by assuming the entire film thickness around the Coliwassa (the sampling device) would evaporate. The film thickness equation appropriate for slow withdrawls from Perry's Chemical Engineers' Handbook was used (see Coating Flows section in Chapter 6) and liquid properties for gasoline in contact with air. Gasoline was selected as a conservative representative of the organic wastestreams being sampled. Properties of the Coliwassas used for drum sampling (3 feet long and 1/2 in diameter) and truck sampling (6 feet long and 1 in diameter) were obtained from Romic personnel (Carol Bonner and John Arden [9/9/99]). See Table -15 and C-16 for calculations.
an	Concentration of VOC (from unburned emissions) in the boiler exhaust stream and exhaust flow rate come from 1993 Boiler Stack Test.
ao	Exit flow rate from the stack was calculated based on Site-measured exit velocity and diameter of the stack.
ap	The VOC concentration was estimated in the exit stream based on the average value of Site-provided OVA concentration measurements.
aq	An evaporation loss factor of 1% was assumed for organic liquids during the bulking process that occurs in the Labpack Warehouse. In addition, a control efficiency of 95% (was estimated by Site personnel).
ar	According to Site personnel, approximately 10 drums (half of which are filled with organics and half are used for consolidating aqueous wastes) are filled with material during a "bulking process" and "bulking process" lasts two days (Carol Bonner and John Arden [9/9/99].
as	An evaporation loss factor of 1% was assumed for the diesel used at the Drum Liquefaction unit (Tidy Bowl).
at	See USEPA Compilation of Air Pollutant Emission Factors, AP-42 Chapter 1 Table 1.4-3 for natural gas combustion.
au	The Site has two boilers: 1) rated at 20 MMBtu/hr; and 2) rated at 34 MMBtu/hr (see report from March 22, 1996 source test). Only one boiler operates at a time. Emissions were estimated for the maximum rated boiler.
av	Emissions from the 35" Column Trough and the 36" Column Trough were included.
aw	Emissions from the wash water tank were included.
ax	Emissions from the Truck Loading/Unloading Liquid Transfer Area were included.
ay	Emissions from the THF molecular sieve, tank P, and tank Q were included.

Table C.7b
Emissions Information - Future
Romic Facility, East Palo Alto, California

		Modeled ER		Modeled[c]		Actual[d]			Emission Factor			Throughput Quantity			Emissions[e]		Daily	Emission Rate - After (g/s or g/s-m2)[f]			
Model ID	Source Description	(g/s or g/s-m^2)[a]	Area (m^2)[b]	Hrs/Day	Hrs/Yr	Hrs/Day	Hrs/Yr	Note	Value	Units	Note	Value	Units	Note	(lbs/yr)	(tons/yr)	(lbs/day)	One-Hour[g]	24-Hour[h]	Annual Res[i]	Worker[j]
LABA1	Lab A, Fume Hood 1	1.0E-02	-	24	8760	24	8760	n	1%	% of solvent	k	17	lbs/day	l, m	61	0.03	0.17	8.76E-04	8.76E-04	8.76E-04	8.76E-04
LABB2	Lab B, Fume Hood 2	1.0E-02	-	24	8760	24	8760	n	1%	% of solvent	k	17	lbs/day	l, m	61	0.03	0.17	8.76E-04	8.76E-04	8.76E-04	8.76E-04
LABC3	Lab C, Fume Hood 3	1.0E-02	-	24	8760	24	8760	n	1%	% of solvent	k	17	lbs/day	l, m	61	0.03	0.17	8.76E-04	8.76E-04	8.76E-04	8.76E-04
LABC4	Lab C, Fume Hood 4	1.0E-02	-	24	8760	24	8760	n	1%	% of solvent	k	17	lbs/day	l, m	61	0.03	0.17	8.76E-04	8.76E-04	8.76E-04	8.76E-04
LABE6	Lab E, Fume Hood 6	1.0E-02	-	24	8760	24	8760	n	1%	% of solvent	k	17	lbs/day	l, m	61	0.03	0.17	8.76E-04	8.76E-04	8.76E-04	8.76E-04
ICPVENT	Inductively Coupled Plasma Spectroscopy Vent	1.0E-02	-	24	8760	24	8760	n	1%	% of solvent	k	17	lbs/day	l, m	61	0.03	0.17	8.76E-04	8.76E-04	8.76E-04	8.76E-04
FUELBLND	Vent for Drum Liquefaction Control System	1.0E-02	-	10	3650	10	3650	af	306.46	ppm	ap	0.001	m^3 of air/s	ao	18.66	0.01	0.05	6.44E-04	6.44E-04	6.44E-04	6.44E-04
LABPACK	Vent for Scrubber at Labpack Warehouse	1.0E-02	-	6	2190	6	626	o	0.05%	% of solvent	aq	375.18	kg/day	ar	43.13	0.02	0.41	8.68E-03	8.68E-03	2.48E-03	2.48E-03
BOILER	Vent for Boiler Control System - VOC emissions	1.0E-02	-	24	8760	24	8760	q	0.26	ppm	an	2.03	m^3 of air/s	an	192.58	0.10	0.53	2.77E-03	2.77E-03	2.77E-03	2.77E-03
BOILER - HCL	Vent for Boiler Control System - HCL emissions	1.0E-02	-	24	8760	24	8760	q	10.00	lbs/day	ah	-	-	-	3650.00	1.83	10.00	5.25E-02	5.25E-02	5.25E-02	5.25E-02
BOILER -NG	Vent for Boiler Control System - NG emissions	1.0E-02	-	24	8760	24	8760	q	7.89E-05	lb/MMBtu	at	34	MMBtu/hr	au	23.51	0.01	0.06	3.38E-04	3.38E-04	3.38E-04	3.38E-04
ZONEE	Control System for Zone E tanks	1.0E-02	-	24	8760	24	8760	q	1025.20	lbs/year	ai	95%	% Control	aj	51.26	0.0256	0.1404	7.37E-04	7.37E-04	7.37E-04	7.37E-04
ZONEF	Control System for Zone F tanks	1.0E-02	-	24	8760	24	8760	q	4.72	lbs/year	ai	95%	% Control	aj	0.24	0.0001	0.0006	3.39E-06	3.39E-06	3.39E-06	3.39E-06
T13B2	T13, B2 Vent	1.0E-02	-	24	8760	24	8760	q	1.58E-04	g/s	ak	-	-	-	10.97	0.01	0.03	1.58E-04	1.58E-04	1.58E-04	1.58E-04
SAMPLING	Drum Sampling Fugitives	1.0E-02	-	10	3650	10	3650	r	2.32E-03	kg/drum	am	109,500	drums/year	s	560.24	0.28	1.53	1.93E-02	1.93E-02	1.93E-02	1.93E-02
CONSOLID	Consolidation Fugitives	1.0E-02	-	10	3650	10	3650	af	1	lb/day	ag	-	-	-	365.00	0.18	1.00	1.26E-02	1.26E-02	1.26E-02	1.26E-02
FUGFB	Drum Liquefaction Fugitives	1.0E-02	-	10	3650	10	3650	af	1%	% of diesel	as	1475	gal/month	v	1256.70	0.63	3.44	4.34E-02	4.34E-02	4.34E-02	4.34E-02
FUELST	Fueling Station Fugitives	1.0E-02	-	10	3650	10	3650	af	1400.00	mg/L	ab	133,200	gal/year	ac	1556.25	0.78	4.26	5.37E-02	5.37E-02	5.37E-02	5.37E-02
PVFAJ	Tanks A-J Fugitives	1.0E-02	-	24	8760	24	8760	q	5.86E-03	kg/hr	y	-	-	-	1.13E+02	5.66E-02	3.10E-01	1.63E-03	1.63E-03	1.63E-03	1.63E-03
PVFKM	Tanks K-M Fugitives	1.0E-02	-	24	8760	24	8760	q	5.86E-03	kg/hr	y	-	-	-	113.11	0.06	0.31	1.63E-03	1.63E-03	1.63E-03	1.63E-03
PVFR915	Tanks R91-R95 Fugitives	1.0E-02	-	24	8760	24	8760	q	5.86E-03	kg/hr	y	-	-	-	113.11	5.66E-02	3.10E-01	1.63E-03	1.63E-03	1.63E-03	1.63E-03
PVFC	Processing Columns Fugitives	1.0E-02	-	24	8760	24	8760	q	5.86E-03	kg/hr	y	-	-	-	113.11	0.06	0.31	1.63E-03	1.63E-03	1.63E-03	1.63E-03
PVFZE	Tanks 96-98, N, & O Fugitives	1.0E-02	-	24	8760	24	8760	q	5.86E-03	kg/hr	y	-	-	-	113.11	5.66E-02	3.10E-01	1.63E-03	1.63E-03	1.63E-03	1.63E-03
PVFZF	Tanks A-1 to A-5 Fugitives	1.0E-02	-	24	8760	24	8760	q	5.86E-03	kg/hr	y	-	-	-	113.11	0.06	0.31	1.63E-03	1.63E-03	1.63E-03	1.63E-03
DSSAMP	Drum Storage Fugitives	1.0E-02	-	24	8760	24	8760	q	4.2E-05	kg/hr/drum	w	866	drums	x	702.43	0.35	1.92	1.01E-02	1.01E-02	1.01E-02	1.01E-02
DSCONS	Drum Storage North Fugitives	1.0E-02	-	24	8760	24	8760	q	4.2E-05	kg/hr/drum	w	960	drums	x	778.68	0.39	2.13	1.12E-02	1.12E-02	1.12E-02	1.12E-02
DSSOUTH	Drum Storage South Fugitives	1.0E-02	-	24	8760	24	8760	q	4.2E-05	kg/hr/drum	w	2756	drums	x	2235.46	1.12	6.12	3.22E-02	3.22E-02	3.22E-02	3.22E-02
DSWEST1	Drum Storage West 1 Fugitives	1.0E-02	-	24	8760	24	8760	q	4.2E-05	kg/hr/drum	w	320	drums	x	259.56	0.13	0.71	3.73E-03	3.73E-03	3.73E-03	3.73E-03
DSWEST2	Drum Storage West 2 Fugitives	1.0E-02	-	24	8760	24	8760	q	4.2E-05	kg/hr/drum	w	1316	drums	x	1067.44	0.53	2.92	1.54E-02	1.54E-02	1.54E-02	1.54E-02
TRKSAMPN	Truck Sampling - North	1.0E-02	-	10	3650	10	3650	t	7.08E-03	kg/truck	am	3468	trucks/year	u	54.16	0.027	0.15	1.87E-03	1.87E-03	1.87E-03	1.87E-03
TRKSAMPS	Truck Sampling - South	1.0E-02	-	10	3650	10	3650	t	7.08E-03	kg/truck	am	3468	trucks/year	u	54.16	0.027	0.15	1.87E-03	1.87E-03	1.87E-03	1.87E-03
ZONE4	Zone 4 Tank Area	1.0E-03	259.5	24	8760	24	8760	q	4018.33	lbs/year	ai,av	-	-	-	4018.33	2.01	11.01	2.23E-04	2.23E-04	2.23E-04	2.23E-04
ZONE5	Zone 5 Tank Area	1.0E-03	188.1	24	8760	24	8760	q	4929.59	lbs/year	ai,av	-	-	-	4929.59	2.46	13.51	3.77E-04	3.77E-04	3.77E-04	3.77E-04
ZONE6	Zone 6 Tank Area	1.0E-03	146.6	24	8760	24	8760	q	4674.91	lbs/year	ai,av	-	-	-	4674.91	2.34	12.81	4.59E-04	4.59E-04	4.59E-04	4.59E-04
ZONE7A	Zone 7a Tank Area	1.0E-03	201.1	24	8760	24	8760	q	3683.84	lbs/year	ai	-	-	-	3683.84	1.84	10.09	2.63E-04	2.63E-04	2.63E-04	2.63E-04
ZONE7B	Zone 7b Tank Area	1.0E-03	87.89	24	8760	24	8760	q	777.69	lbs/year	ai	-	-	-	777.69	0.39	2.13	1.27E-04	1.27E-04	1.27E-04	1.27E-04
ZONE8	Zone 8 Tank Area	1.0E-03	701.6	24	8760	24	8760	q	6387.09	lbs/year	ai	-	-	-	6387.09	3.19	17.50	1.31E-04	1.31E-04	1.31E-04	1.31E-04
ZONE9A	Zone 9a Tank Area	1.0E-03	23.08	24	8760	24	8760	q	371.74	lbs/year	ai	-	-	-	371.74	0.19	1.02	2.32E-04	2.32E-04	2.32E-04	2.32E-04
ZONE10	Zone 10 Tank Area	1.0E-03	25.64	24	8760	24	8760	q	320.80	lbs/year	ai	-	-	-	320.80	0.16	0.88	1.80E-04	1.80E-04	1.80E-04	1.80E-04
ZONE11	Zone 11 Tank Area	1.0E-05	276.8	24	8760	24	8760	q	2.04E-03	g/s	ak	-	-	-	141.65	0.07	0.39	7.36E-06	7.36E-06	7.36E-06	7.36E-06
TRCKWASH	Truck Washing	1.0E-04	388.8	8.5	3103	1.8	469	p	311.00	g/truck	al	626	trucks/year	p	429.02	0.21	1.65	4.44E-04	6.67E-04	4.48E-05	4.48E-05

Notes:

a The emission rate is in g/s for point and volume sources and g/s-m2 for area sources.
b The source area is only provided for area sources. These are the only sources that require the area to calculate the emission rate.
c The "modeled" time is the length of time the source is operating in the annual average model runs.
d The "actual" time is the amount of time the source actually operates.
e When necessary, emission rates are calculated using a liquid density of material of 720.81 kg/m3 (estimated by Site personnel as representative of the average organic wastestream).
f The emission rate is in g/s for point and volume sources and g/s-m2 for area sources.
g The one-hour emission rate is the maximum emission rate for one hour based on operating hours.
h The 24-hour emission rate is the maximum emission rate for one day based on operating hours.
i The annual residential emission rate is the annual average emission rate from the source based on the modeled hours.
j The worker emission rate is the annual average emission rate from the source based on the modeled hours.
k An evaporation loss factor of 1% has been assumed for the material brought to the laboratory via samples (USEPA provides an emission factor of 1% to 2% of solvent for agitated mixing tanks (Page 6.4-1 of AP-42 Section 6.4 “Paint and Varnish”)).
l Romic laboratory personnel estimate that the lab processes 200-250 samples per day and that each sample is 200-400 ml Brian Blagg [1/21/99 site visit]). The emissions from the laboratory was assumed to be spread out evenly among the six fume hood vents.
m The density of the liquid being processed is assumed to be equivalent to the density of the fuels stream, which is assumed to be 42 lbs/ft^3 (see 9/30/99 e-mail to John Arden).

Table C.7b
Emissions Information - Future
Romic Facility, East Palo Alto, California

n	According to Romic laboratory personnel, the laboratory operates 24 hours per day Brian Blagg [1/21/99 site visit]).
o	According to Site personnel, bulking processes are conducted at the Labpack Warehouse two times per week for six hours each time Carol Bonner and John Arden [9/9/99]).
p	On average, 2.4 trucks are washed per day, 5 days per week, 52 weeks per year (information from Ross Wilson on 12/1/00 from tanker truck wash logs for the period 3/13/00 to 11/22/00). Each truck takes about 30 to 60 minutes to wash according to Nick [site visit 1/21/99]). Assumed maximum of two trucks could be washed per hour and three per day.
q	This source emits continuously.
r	According to Site personnel, drum sampling is potentially conducted 10 hours per day for 365 days per year (Carol Bonner and John Arden [9/9/99]).
s	According to Site personnel, approximately 250 to 350 drums are sampled per day for 365 days per year (Carol Bonner and John Arden [9/9/99]).
t	It is assumed that tanker truck sampling occurs on the same schedule as drum sampling.
u	According to Site personnel, an average of 18 to 20 tanker trucks are sampled per day (Carol Bonner and John Arden [9/9/99]).
v	According to Site personnel, approximately 1475 gallons of diesel are used at the Tidy Bowl per month (John Arden [8/31/99]; the estimate is for time period 8/98-7/99).
w	Emission factor was assumed to be similar to the total organic compound emission factor for fittings (connectors and flanges) of equipment containing gaseous material at a marketing terminal (see Table 2.3 in the United States Environmental Protection Agency document titled Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017. November, 1995)).
x	The number of drums stored in each storage area was provided by Michael Edwards in a fax to Liz Miesner dated September 18, 2000.
y	Emission factor was derived using Site-provided VOC concentration readings (VOC measurements were conducted in November and December, 1999) and information from USEPA guidance Protocol for Equipment Leak Emission Estimates. EPA-453/R-95-017. November, 1995.)
ab	Emission factor was cited in the USEPA Compilation of Air Pollutant Emission Factors, AP-42 Section 5.2.2.3 "Motor Vehicle Refueling". It was assumed that the emission factor for diesel dispensing is similar to that for gasoline dispensing.
ac	Thruput for the fueling station comes from an email from Regina Colbert on 2/16/00. The email states that the diesel tank has a 12,000 gallon capacity and an average thruput of 9800 gallons per month and that the gasoline tank has a capacity of 2000 gallons and a thruput of 1300 gallons per month.
af	The hours of operation information was obtained from Site personnel (see E-mail from Mary Cavendish to Stacy Mann dated 3/25/99). The drum liquefaction, consolidation, and fueling station operate 10 hours per day, five days a week. Although there are times when they have operated 7 days per week so these sources will be assumed to be operating 7 days per week.
ag	It was assumed that 1 lb of VOC per day is emitted from the consolidation area (estimated by Carol Bonner and provided to ENVIRON at meeting on July 14, 1999).
ah	Assumed HCl emissions from the boiler were 10 pounds per day (i.e., the BAAQMD permit limit)
ai	The annual VOC emission factor was estimated using the USEPA TANKS program. Please refer to Table C.8 for TANKS input information.
aj	A control efficiency of 95% was estimated by Site personnel Carol Bonner and John Arden [9/9/99]).
ak	Site provided OVA measurements and a simple box model were used to estimate release rates. Wind speed measurements at a height of 10 meters were adjusted to account for release height of the source.
al	The emission factor for truck washing was obtained from Table 4.8-2 in the USEPA compilation of Air Pollutant Emission Factors, AP-42 Section 4.8. This emission factor is based on the type of residual material in the truck and is appropriate for a washing cycle of one hour (please note that on average the trucks at the Site are washed in 30 to 60 minutes). To be conservative, the highest emission factor cited for truck washing was used to estimate emissions. In addition, Mr. Ron Ryan of the USEPA confirmed that this should be the emission factor used to account for both emissions from the residual material in the truck and from the material used to wash the truck (see E-mail from Ron Ryan to Stacy Mann dated 10/8/99).
am	The emission factor was estimated by assuming the entire film thickness around the Coliwassa (the sampling device) would evaporate. The film thickness equation appropriate for slow withdrawls from Perry's Chemical Engineers' Handbook was used (see Coating Flows section in Chapter 6) and liquid properties for gasoline in contact with air. Gasoline was selected as a conservative representative of the organic wastestreams being sampled. Properties of the Coliwassas used for drum sampling (3 feet long and 1/2 in diameter) and truck sampling (6 feet long and 1 in diameter) were obtained from Romic personnel (Carol Bonner and John Arden [9/9/99]). See Table -15 and C-16 for calculations.
an	Concentration of VOC (from unburned emissions) in the boiler exhaust stream and exhaust flow rate come from 1993 Boiler Stack Test.
ao	Exit flow rate from the stack was calculated based on Site-measured exit velocity and diameter of the stack.
ap	The VOC concentration was estimated in the exit stream based on the average value of Site-provided OVA concentration measurements.
aq	An evaporation loss factor of 1% was assumed for organic liquids during the bulking process that occurs in the Labpack Warehouse. In addition, a control efficiency of 95% (was estimated by Site personnel).
ar	According to Site personnel, approximately 10 drums (half of which are filled with organics and half are used for consolidating aqueous wastes) are filled with material during a "bulking process" and "bulking process" lasts two days (Carol Bonner and John Arden [9/9/99].
as	An evaporation loss factor of 1% was assumed for the diesel used at the Drum Liquefaction unit (Tidy Bowl).
at	See USEPA Compilation of Air Pollutant Emission Factors, AP-42 Chapter 1 Table 1.4-3 for natural gas combustion.
au	The Site has two boilers: 1) rated at 20 MMBtu/hr; and 2) rated at 34 MMBtu/hr (see report from March 22, 1996 source test). Only one boiler operates at a time. Emissions were estimated for the maximum rated boiler.
av	Emissions from the 35" Column Trough and the 36" Column Trough were included.
aw	Emissions from the wash water tank were included.
ax	Emissions from the Truck Loading/Unloading Liquid Transfer Area were included.
ay	Emissions from the THF molecular sieve, tank P, and tank Q were included.

Table C.8
Tank Information
Romic Facility, East Palo Alto, California

ID	Other ID	Tank Type[a]	Shell Height/Length (ft)[b]		Diameter (ft)		Maximum Liquid Height (ft)[c]	Average Liquid Height (ft)[d]	Working Volume (gal)[e]		Turnovers Per Year[f]	Net Throughput (gal/yr)		Is the Tank Heated?[g]	Shell Color/Shade[i]		Shell Condition[h]	Roof Color/Shade[i]	Roof Condition[h]
A	-	Vertical Fixed Roof	18.0	aa, ab	7.3	ab	18.0	9.0	5687	-	34	191,957	o	No	gray/light	r	good	gray/light	good
B	-	Vertical Fixed Roof	18.0	aa, ab	7.3	ab	18.0	9.0	5687	-	34	193,350	o	No	gray/light	r	good	gray/light	good
C	-	Vertical Fixed Roof	18.0	aa, ab	7.3	ab	18.0	9.0	5687	-	31	177,444	o	No	gray/light	r	good	gray/light	good
D	-	Vertical Fixed Roof	18.0	aa, ab	7.3	ab	18.0	9.0	5687	-	51	289,465	o	No	gray/light	r	good	gray/light	good
E	-	Vertical Fixed Roof	18.0	aa, ab	7.3	ab	18.0	9.0	5687	-	29	163,358	o	No	gray/light	r	good	gray/light	good
F	-	Vertical Fixed Roof	18.0	aa, ab	7.7	ab	18.0	9.0	6216	-	34	211,678	o	No	gray/light	r	good	gray/light	good
G	-	Vertical Fixed Roof	18.0	aa, ab	7.7	ab	18.0	9.0	6216	-	44	275,569	o	No	gray/light	r	good	gray/light	good
H	-	Vertical Fixed Roof	18.0	aa, ab	7.3	ab	18.0	9.0	5687	-	37	209,791	o	No	gray/light	r	good	gray/light	good
I	-	Vertical Fixed Roof	16.5	aa, ab	8.3	ab	16.5	8.3	6732	-	37	251,670	o	No	gray/light	r	good	gray/light	good
J	-	Vertical Fixed Roof	16.5	aa, ab	8.3	ab	16.5	8.3	6732	-	42	283,841	o	No	gray/light	r	good	gray/light	good
A-2	-	Vertical Fixed Roof	5.6	aa, ab	7.8	bj	5.6	2.8	2000	ba	10	20,000	v	No	white/white	s	good	white/white	good
A-3	-	Vertical Fixed Roof	5.6	aa, ab	7.8	bj	5.6	2.8	2000	ba	10	20,000	v	No	white/white	s	good	white/white	good
A-4	-	Vertical Fixed Roof	5.6	aa, ab	7.8	bj	5.6	2.8	2000	ba	10	20,000	v	No	white/white	s	good	white/white	good
A-5	-	Vertical Fixed Roof	5.6	aa, ab	7.8	bj	5.6	2.8	2000	ba	10	20,000	v	No	white/white	s	good	white/white	good
N	-	Vertical Fixed Roof	13.4	ab, ac	10.5	ab	13.4	6.7	8705	bh	17	151,438	w	No	white/white	s	good	white/white	good
O	-	Vertical Fixed Roof	13.4	ab, ac	10.5	ab	13.4	6.7	8705	bh	17	151,438	w	No	white/white	s	good	white/white	good
T#96	A-6	Vertical Fixed Roof	10.6	ab, ac	8.5	ab	10.6	5.3	4505	-	34	151,438	w	No	white/white	s	good	white/white	good
T#97	A-7	Vertical Fixed Roof	10.6	ab, ac	8.5	ab	10.6	5.3	4505	-	34	151,438	w	No	white/white	s	good	white/white	good
T#98	T#90	Vertical Fixed Roof	14.1	bi	8.5	ab	14.1	7.1	6000	ba	25	151,438	w	No	white/white	s	good	white/white	good
T#1	-	Vertical Fixed Roof	14.1	ab, ac	7.0	ab	14.1	7.0	4056	-	17	70,977	o	No	gray/medium	q	good	gray/medium	good
T#2	-	Vertical Fixed Roof	13.3	ae	8.0	ad	13.3	6.6	5000	ad	25	124,551	o	No	aluminum/specular	t	good	aluminum/specular	good
T#3	-	Vertical Fixed Roof	13.3	ae	8.0	ad	13.3	6.6	5000	ad	40	197,689	o	No	aluminum/specular	t	good	aluminum/specular	good
T#4	-	Vertical Fixed Roof	11.8	bi	9.0	ab	11.8	5.9	5600	ba	27	152,209	o	No	gray/medium	q	good	gray/medium	good
T#5	-	Vertical Fixed Roof	10.2	bi	10.0	ad	10.2	5.1	6000	ba	1	7,868	o	No	aluminum/specular	t	good	aluminum/specular	good
T#6	-	Vertical Fixed Roof	12.0	ab	8.5	ab	12.0	6.0	5094	bh	10	52,850	o	No	aluminum/specular	t	good	aluminum/specular	good
T#7	-	Vertical Fixed Roof	12.0	ab	8.5	ab	12.0	6.0	5094	bh	9	44,974	o	No	aluminum/specular	t	good	aluminum/specular	good
T#8	-	Vertical Fixed Roof	8.9	ab, ac	9.0	ab	8.9	4.4	4234	bh	70	297,385	o	No	gray/medium	q	good	gray/medium	good
T#9	-	Vertical Fixed Roof	14.1	bi	8.5	ab	14.1	7.1	6000	ba	37	223,616	o	No	aluminum/specular	t	good	aluminum/specular	good
T#10	-	Vertical Fixed Roof	12.0	ab	8.5	ab	12.0	6.0	5094	bh	50	255,806	o	No	aluminum/specular	t	good	aluminum/specular	good
T#11	-	Vertical Fixed Roof	12.0	ab	8.5	ab	12.0	6.0	5094	bh	44	224,591	o	No	aluminum/specular	t	good	aluminum/specular	good
T#12	-	Vertical Fixed Roof	8.9	ab, ac	9.0	ab	8.9	4.4	4234	bh	50	211,975	o	No	gray/medium	q	good	gray/medium	good
T#16	-	Vertical Fixed Roof	13.8	ae	5.0	ad	13.8	6.9	2028	ad, bh	23	46,952	o	No	gray/light	r	good	gray/light	good
T#17	-	Vertical Fixed Roof	13.8	ae	5.0	ad	13.8	6.9	2028	ad, bh	33	66,678	o	No	gray/light	r	good	gray/light	good
T#18	-	Vertical Fixed Roof	6.0	ad	3.9	bj	6.0	3.0	540	ba	62	33,486	p	No	aluminum/specular	t	good	aluminum/specular	good
T#19	-	Vertical Fixed Roof	13.8	ae	5.0	ad	13.8	6.9	2025	ad, bh	25	50,721	p	No	gray/light	r	good	gray/light	good
T#20	-	Vertical Fixed Roof	14.2	ae	5.0	ad	14.2	7.1	2082	ad, bh	32	67,240	p	No	gray/light	r	good	gray/light	good
T#26	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	10	88,086	o	No	aluminum/specular	t	good	aluminum/specular	good
T#27	-	Vertical Fixed Roof	16.8	bi	9.0	ad	16.8	8.4	8000	ba	2	14,016	o	No	aluminum/specular	t	good	aluminum/specular	good
T#28	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	10	90,464	o	No	aluminum/specular	t	good	aluminum/specular	good
T#29	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	6	51,326	o	No	aluminum/specular	t	good	aluminum/specular	good
T#30	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	59	523,731	o	No	aluminum/specular	t	good	aluminum/specular	good
T#31	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	59	523,254	o	No	aluminum/specular	t	good	aluminum/specular	good
T#32	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	6	56,701	o	No	aluminum/specular	t	good	aluminum/specular	good
T#33	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	13	117,837	o	No	aluminum/specular	t	good	aluminum/specular	good
T#34	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	14	125,230	p	No	aluminum/specular	t	good	aluminum/specular	good
T#35	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	4	34,235	p	No	aluminum/specular	t	good	aluminum/specular	good
T#36	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	4	35,739	p	No	aluminum/specular	t	good	aluminum/specular	good
T#37	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	2	13,447	p	No	aluminum/specular	t	good	aluminum/specular	good
T#38	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	18	154,845	o	No	aluminum/specular	t	good	aluminum/specular	good
T#39	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	7	60,983	o	No	aluminum/specular	t	good	aluminum/specular	good
T#40	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	7	60,017	o	No	aluminum/specular	t	good	aluminum/specular	good
T#41	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	5	41,949	o	No	aluminum/specular	t	good	aluminum/specular	good

Table C.8
Tank Information
Romic Facility, East Palo Alto, California

ID	Roof Type		Roof Height (ft)		Roof Radius of a Dome (ft)[j]	Roof Slope of a Cone (ft/ft)[k]	Vacuum Setting[l]	Pressure Setting[m]	Is the Tank Underground?[n]	Location of Tank	Tank Farm	Control Measure?	Organics[y]	Diesel Oil[y]	Wastewater[y]	BAAQMD #	Current Tank	Future Tank	Location Change
A	Dome	ab	1.5	ab	5.2	-	-0.03	0.03	-	ZONE #5	C	No	80%	0%	20%	S#51	Yes	Yes	No
B	Dome	ab	1.5	ab	5.2	-	-0.03	0.03	-	ZONE #5	C	No	80%	0%	20%	S#52	Yes	Yes	No
C	Dome	ab	1.5	ab	5.2	-	-0.03	0.03	-	ZONE #5	C	No	80%	0%	20%	S#53	Yes	Yes	No
D	Dome	ab	1.5	ab	5.2	-	-0.03	0.03	-	ZONE #5	C	No	80%	0%	20%	S#54	Yes	Yes	No
E	Dome	ab	1.5	ab	5.2	-	-0.03	0.03	-	ZONE #5	C	No	80%	0%	20%	S#55	Yes	Yes	No
F	Dome	ab	1.5	ab	5.6	-	-0.03	0.03	-	ZONE #5	C	No	80%	0%	20%	S#56	Yes	Yes	No
G	Dome	ab	1.5	ab	5.6	-	-0.03	0.03	-	ZONE #5	C	No	80%	0%	20%	S#57	Yes	Yes	No
H	Dome	ab	1.5	ab	5.2	-	-0.03	0.03	-	ZONE #5	C	No	80%	0%	20%	S#58	Yes	Yes	No
I	Dome	ab	1.5	ab	6.5	-	-0.03	0.03	-	ZONE #5	C	No	80%	0%	20%	S#59	Yes	Yes	No
J	Dome	ab	1.5	ab	6.5	-	-0.03	0.03	-	ZONE #5	C	No	80%	0%	20%	S#60	Yes	Yes	No
A-2	Dome	ab	1.0	z	7.8	-	-0.03	0.03	-	Tank Farm F	F	Yes	0%	0%	100%		No	Yes	Add
A-3	Dome	ab	1.0	z	7.8	-	-0.03	0.03	-	Tank Farm F	F	Yes	0%	0%	100%		No	Yes	Add
A-4	Dome	ab	1.0	z	7.8	-	-0.03	0.03	-	Tank Farm F	F	Yes	0%	0%	100%		No	Yes	Add
A-5	Dome	ab	1.0	z	7.8	-	-0.03	0.03	-	Tank Farm F	F	Yes	0%	0%	100%		No	Yes	Add
N	Dome	ab	2.0	ab	7.9	-	-0.03	0.03	-	Tank Farm E	E	Yes	80%	0%	20%		No	Yes	Add
O	Dome	ab	2.0	ab	7.9	-	-0.03	0.03	-	Tank Farm E	E	Yes	80%	0%	20%		No	Yes	Add
T#96	Dome	ab	1.6	ab	6.4	-	-0.03	0.03	-	Tank Farm E	E	Yes	80%	0%	20%		No	Yes	Add
T#97	Dome	ab	1.6	ab	6.4	-	-0.03	0.03	-	Tank Farm E	E	Yes	80%	0%	20%		No	Yes	Add
T#98	Dome	ab	1.6	ab	6.4	-	-0.03	0.03	-	Tank Farm E	E	Yes	80%	0%	20%		No	Yes	Add
T#1	Dome	ab	1.3	ab	5.3	-	-0.03	0.03	-	ZONE #6	A	No	0%	100%	0%	S#1	Yes	Yes	No
T#2	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #6	A	No	80%	0%	20%	S#2	Yes	Yes	No
T#3	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #6	A	No	80%	0%	20%	S#3	Yes	Yes	No
T#4	Dome	ab	1.2	z	9.0	-	-0.03	0.03	-	ZONE #6	A	No	50%	0%	50%	S#4	Yes	Yes	No
T#5	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #6	A	No	80%	0%	20%	S#5	Yes	Yes	No
T#6	Cone	ab	0.5	ab	-	0.1176	-0.03	0.03	-	ZONE #6	A	No	80%	0%	20%	S#6	Yes	Yes	No
T#7	Cone	ab	0.5	ab	-	0.1176	-0.03	0.03	-	ZONE #6	A	No	80%	0%	20%	S#7	Yes	Yes	No
T#8	Dome	ab	1.2	z	9.0	-	-0.03	0.03	-	ZONE #6	A	No	50%	0%	50%	S#8	Yes	Yes	No
T#9	Cone	ab	0.5	ab	-	0.1176	-0.03	0.03	-	ZONE #6	A	No	50%	0%	50%	S#9	Yes	Yes	No
T#10	Cone	ab	0.5	ab	-	0.1176	-0.03	0.03	-	ZONE #6	A	No	80%	0%	20%	S#10	Yes	Yes	No
T#11	Cone	ab	0.5	ab	-	0.1176	-0.03	0.03	-	ZONE #6	A	No	80%	0%	20%	S#11	Yes	Yes	No
T#12	Dome	ab	1.2	z	9.0	-	-0.03	0.03	-	ZONE #6	A	No	50%	0%	50%	S#12	Yes	Yes	No
T#16	Cone	ad	0.2	ag	-	0.0625	-0.03	0.03	-	ZONE #9A	G	No	80%	0%	20%	S#16	Yes	Yes	No
T#17	Cone	ad	0.2	ag	-	0.0625	-0.03	0.03	-	ZONE #9A	G	No	80%	0%	20%	S#36	Yes	Yes	No
T#18	Cone	ah	0.1	ag	-	0.0625	-0.03	0.03	-	ZONE #9A	G	No	80%	0%	20%	S#169	Yes	Yes	No
T#19	Cone	ad	0.2	ag	-	0.0625	-0.03	0.03	-	ZONE #9A	G	No	80%	0%	20%	S#124	Yes	Yes	No
T#20	Cone	ad	0.2	ag	-	0.0625	-0.03	0.03	-	ZONE #9A	G	No	80%	0%	20%	S#125	Yes	Yes	No
T#26	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7B	H	No	20%	0%	80%	S#17	Yes	Yes	No
T#27	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7B	H	No	20%	0%	80%	S#18	Yes	Yes	No
T#28	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7B	H	No	20%	0%	80%	S#19	Yes	Yes	No
T#29	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7B	H	No	20%	0%	80%	S#20	Yes	Yes	No
T#30	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7B	H	No	20%	0%	80%	S#21	Yes	Yes	No
T#31	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7B	H	No	20%	0%	80%	S#22	Yes	Yes	No
T#32	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7A	MNO	No	80%	0%	20%	S#23	Yes	Yes	No
T#33	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7A	MNO	No	80%	0%	20%	S#24	Yes	Yes	No
T#34	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7A	MNO	No	80%	0%	20%	S#126	Yes	Yes	No
T#35	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7A	MNO	No	80%	0%	20%	S#127	Yes	Yes	No
T#36	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7A	MNO	No	100%	0%	0%	S#128	Yes	Yes	No
T#37	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7A	MNO	No	100%	0%	0%	S#129	Yes	Yes	No
T#38	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7A	MNO	No	80%	0%	20%	S#25	Yes	Yes	No
T#39	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7A	MNO	No	80%	0%	20%	S#26	Yes	Yes	No
T#40	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7A	MNO	No	100%	0%	0%	S#80	Yes	Yes	No
T#41	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7A	MNO	No	100%	0%	0%	S#79	Yes	Yes	No

Table C.8
Tank Information
Romic Facility, East Palo Alto, California

ID	Other ID	Tank Type[a]	Shell Height/Length (ft)[b]		Diameter (ft)		Maximum Liquid Height (ft)[c]	Average Liquid Height (ft)[d]	Working Volume (gal)[e]		Turnovers Per Year[f]	Net Throughput (gal/yr)		Is the Tank Heated?[g]	Shell Color/Shade[i]		Shell Condition[h]	Roof Color/Shade[i]	Roof Condition[h]
T#42	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	1	8,751	o	No	aluminum/specular	t	good	aluminum/specular	good
T#43	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	1	8,850	o	No	aluminum/specular	t	good	aluminum/specular	good
T#44	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	23	202,068	o	No	aluminum/specular	t	good	aluminum/specular	good
T#45	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	13	110,275	o	No	aluminum/specular	t	good	aluminum/specular	good
T#46	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	11	96,827	o	No	aluminum/specular	t	good	aluminum/specular	good
T#47	-	Vertical Fixed Roof	15.0	ad	10.0	ad	15.0	7.5	8813	bh	10	91,968	ai	No	aluminum/specular	t	good	aluminum/specular	good
T#48	-	Vertical Fixed Roof	10.6	bi	8.0	ad	10.6	5.3	4000	ba	19	77,532	o	No	aluminum/specular	t	good	aluminum/specular	good
T#49	-	Vertical Fixed Roof	10.6	bi	8.0	ad	10.6	5.3	4000	ba	8	31,188	o	No	aluminum/specular	t	good	aluminum/specular	good
T#50	-	Vertical Fixed Roof	10.6	bi	8.0	ad	10.6	5.3	4000	ba	16	62,496	o	No	aluminum/specular	t	good	aluminum/specular	good
T#60	-	Vertical Fixed Roof	15.4	ae	12.0	aj	15.4	7.7	13000	aj, bh	9	116,510	o	No	aluminum/specular	t	good	aluminum/specular	good
T#61	-	Vertical Fixed Roof	16.1	ae	12.0	aj	16.1	8.0	13600	aj, bh	8	111,791	o	No	aluminum/specular	t	good	aluminum/specular	good
T#62	-	Vertical Fixed Roof	16.1	ae	12.0	aj	16.1	8.0	13600	aj, bh	3	41,433	o	No	aluminum/specular	t	good	aluminum/specular	good
T#63	-	Vertical Fixed Roof	23.6	ae	12.0	aj	23.6	11.8	20000	ba	19	374,285	o	No	white/white	s	good	white/white	good
T#64	-	Vertical Fixed Roof	23.0	ad	12.0	ad	23.0	11.5	19459	bh	14	282,103	o	No	aluminum/specular	t	good	aluminum/specular	good
T#65	-	Vertical Fixed Roof	23.0	ad	12.0	ad	23.0	11.5	19459	bh	3	66,157	o	No	aluminum/specular	t	good	aluminum/specular	good
T#66	-	Vertical Fixed Roof	25.0	ad	13.0	ad	25.0	12.5	24823	bh	2	50,805	o	No	aluminum/specular	t	good	aluminum/specular	good
T#67	-	Vertical Fixed Roof	29.0	ad	11.0	ad	29.0	14.5	20616	bh	7	140,886	o	No	aluminum/specular	t	good	aluminum/specular	good
T#68	-	Vertical Fixed Roof	24.0	ad	14.6	af	24.0	12.0	30000	ba	13	383,048	o	No	aluminum/specular	t	good	aluminum/specular	good
T#69	-	Vertical Fixed Roof	25.0	ad	13.0	ad	25.0	12.5	24823	bh	29	709,590	o	No	aluminum/specular	t	good	aluminum/specular	good
T#70	-	Vertical Fixed Roof	24.0	ad	30.0	ad	24.0	12.0	126904	-	1	103,437	o	No	aluminum/specular	t	good	aluminum/specular	good
T#71	-	Vertical Fixed Roof	16.5	bi	17.0	aj	16.5	8.2	28000	ba	18	500,736	p	No	white/white	s	good	white/white	good
T#72	-	Horizontal Fixed Roof	9.5	ae	6.0	ad	-	-	2000	ad	0	0	an	No	aluminum/specular	t	good	-	-
T#73	-	Vertical Fixed Roof	20.4	ae	10.0	ad	20.4	10.2	11990	ad	2	23,416	o	No	aluminum/specular	t	good	aluminum/specular	good
T#74	-	Vertical Fixed Roof	20.4	ae	10.0	ad	20.4	10.2	11990	ad	3	36,784	o	No	aluminum/specular	t	good	aluminum/specular	good
T#75	-	Vertical Fixed Roof	23.0	ad	10.0	ad	23.0	11.5	13513	bh	8	101,915	o	No	aluminum/specular	t	good	aluminum/specular	good
T#76	-	Vertical Fixed Roof	24.0	ad	14.0	ad	24.0	12.0	27637	bh	10	276,164	o	No	aluminum/specular	t	good	aluminum/specular	good
T#77	-	Vertical Fixed Roof	21.7	bi	14.6	am	21.7	10.8	27088	ba	9	252,410	o	No	aluminum/specular	t	good	aluminum/specular	good
T#81	-	Vertical Fixed Roof	7.5	ba	8.5	ba	7.5	3.8	3184	ar	26	82,713	av	No	aluminum/specular	t	good	aluminum/specular	good
T#83	-	Vertical Fixed Roof	20.0	ad	10.0	ad	20.0	10.0	11750	bh	355	4,171,684	o	No	gray/light	r	good	gray/light	good
T#84	-	Vertical Fixed Roof	20.0	ad	10.0	ad	20.0	10.0	11750	bh	6	72,093	o	No	gray/light	r	good	gray/light	good
T#85	-	Vertical Fixed Roof	28.0	ba	10.0	ao	28.0	14.0	16450	bh	129	2,121,889	ao	No	gray/light	ao	good	gray/light	good
T#86	-	Vertical Fixed Roof	6.3	ba	6.5	ba	6.3	3.1	1500	ar	26	38,967	av	No	aluminum/specular	t	good	aluminum/specular	good
T#87	-	Vertical Fixed Roof	5.0	bb	2.7	bc	5.0	2.5	200	ar	26	5,196	av	No	aluminum/specular	t	good	aluminum/specular	good
T#88	-	Vertical Fixed Roof	6.3	ba	6.5	ba	6.3	3.1	1500	ar	26	38,967	av	No	aluminum/specular	t	good	aluminum/specular	good
T#89	-	Vertical Fixed Roof	5.0	bb	2.7	bc	5.0	2.5	200	ar	26	5,196	av	No	aluminum/specular	t	good	aluminum/specular	good
R97	-	Vertical Fixed Roof	20.4	ae	10	aw	20.4	10.2	12000	aw	5	59,081	az	No	gray/light	r	good	gray/light	good
T#101	T#78	Vertical Fixed Roof	20.2	aa, ab	10.0	ab	20.2	10.1	11893	bh	24	280,042	p	No	gray/medium	-	good	gray/medium	good
T#102	T#79	Vertical Fixed Roof	20.2	aa, ab	10.0	ab	20.2	10.1	11893	bh	33	388,779	p	No	gray/medium	-	good	gray/medium	good
T#103	T#80	Vertical Fixed Roof	20.2	aa, ab	10.0	ab	20.2	10.1	11893	bh	26	310,402	p	No	gray/medium	-	good	gray/medium	good
T#104	T#82	Vertical Fixed Roof	20.2	aa, ab	10.0	ab	20.2	10.1	11893	bh	27	318,617	p	No	gray/medium	-	good	gray/medium	good
T#105	-	Vertical Fixed Roof	18.2	ba	10.0	ab	18.2	9.1	10693	-	30	324,460	u	No	white/white	s	good	white/white	good
T#106	-	Vertical Fixed Roof	14.6	bg	10.0	bg	14.6	7.3	8578	-	38	324,460	u	No	white/white	s	good	white/white	good
T#107	-	Vertical Fixed Roof	14.6	bg	10.0	bg	14.6	7.3	8578	-	38	324,460	u	No	white/white	s	good	white/white	good
T#108	-	Vertical Fixed Roof	14.6	bg	10.0	bg	14.6	7.3	8578	-	38	324,460	u	No	white/white	s	good	white/white	good
T#109	-	Vertical Fixed Roof	14.6	bg	10.0	bg	14.6	7.3	8578	-	38	324,460	ap	No	white/white	ap	good	white/white	good
P	-	Vertical Fixed Roof	13.6	ae	5.0	be	13.6	6.8	2000	bd	9	18,584	bf	No	aluminum/specular	t	good	aluminum/specular	good
Q	-	Vertical Fixed Roof	13.6	ae	5.0	be	13.6	6.8	2000	bd	9	18,584	bf	No	aluminum/specular	t	good	aluminum/specular	good
WWT	-	Vertical Fixed Roof	12.8	bk	9.2	bk	12.8	6.4	6365	bk	11	68,281	bk	No	gray/light	bk	good	gray/light	good

Table C.8
Tank Information
Romic Facility, East Palo Alto, California

ID	Roof Type		Roof Height (ft)		Roof Radius of a Dome (ft)[j]	Roof Slope of a Cone (ft/ft)[k]	Vacuum Setting[l]	Pressure Setting[m]	Is the Tank Underground?[n]	Location of Tank	Tank Farm	Control Measure?	Organics[y]	Diesel Oil[y]	Wastewater[y]	BAAQMD #	Current Tank	Future Tank	Location Change
T#42	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7A	MNO	No	50%	0%	50%	S#78	Yes	Yes	No
T#43	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #7A	MNO	No	50%	0%	50%	S#77	Yes	Yes	No
T#44	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #5	L	No	100%	0%	0%	S#81	Yes	Yes	No
T#45	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #5	L	No	100%	0%	0%	S#83	Yes	Yes	No
T#46	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #5	L	No	100%	0%	0%	S#84	Yes	Yes	No
T#47	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #5	L	No	100%	0%	0%	S#87	Yes	Yes	No
T#48	Dome	ad	1.1	z	8.0	-	-0.03	0.03	-	ZONE #5	L	No	50%	0%	50%	S#28	Yes	Yes	No
T#49	Dome	ad	1.1	z	8.0	-	-0.03	0.03	-	ZONE #5	L	No	50%	0%	50%	S#29	Yes	Yes	No
T#50	Dome	ad	1.1	z	8.0	-	-0.03	0.03	-	ZONE #5	L	No	50%	0%	50%	S#30	Yes	Yes	No
T#60	Cone	ak	0.4	ag	-	0.0625	-0.03	0.03	-	ZONE #8	Q	No	50%	0%	50%	S#37	Yes	Yes	No
T#61	Cone	ak	0.4	ag	-	0.0625	-0.03	0.03	-	ZONE #8	Q	No	50%	0%	50%	S#38	Yes	Yes	No
T#62	Cone	ak	0.4	ag	-	0.0625	-0.03	0.03	-	ZONE #8	Q	No	0%	100%	0%	S#39	Yes	Yes	No
T#63	Cone	ak	0.4	ag	-	0.0625	-0.03	0.03	-	ZONE #8	Q	No	50%	0%	50%	S#40	Yes	Yes	No
T#64	Cone	ad	0.4	ag	-	0.0625	-0.03	0.03	-	ZONE #8	Q	No	50%	0%	50%	S#170	Yes	Yes	No
T#65	Cone	ad	0.4	ag	-	0.0625	-0.03	0.03	-	ZONE #8	Q	No	50%	0%	50%	S#171	Yes	Yes	No
T#66	Cone	ad	0.4	ag	-	0.0625	-0.03	0.03	-	ZONE #8	Q	No	50%	0%	50%	S#43	Yes	Yes	No
T#67	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #8	Q	No	50%	0%	50%	S#44	Yes	Yes	No
T#68	Cone	ad	0.5	ag	-	0.0625	-0.03	0.03	-	ZONE #8	Q	No	50%	0%	50%	S#45	Yes	Yes	No
T#69	Cone	ad	0.4	ag	-	0.0625	-0.03	0.03	-	ZONE #8	Q	No	80%	0%	20%	S#46	Yes	Yes	No
T#70	Cone	ad	0.9	ag	-	0.0625	-0.03	0.03	-	ZONE #8	Q	No	80%	0%	20%	S#47	Yes	Yes	No
T#71	Cone	ak	0.5	ag	-	0.0625	-0.03	0.03	-	ZONE #8	Q	No	80%	0%	20%	S#163	Yes	Yes	No
T#72	-	-	-	-	-	-	-0.03	0.03	No	ZONE #8	Q	No	100%	0%	0%		Yes	Yes	No
T#73	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	No	ZONE #8	Q	No	50%	0%	50%	S#32	Yes	Yes	No
T#74	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #8	Q	No	50%	0%	50%	S#35	Yes	Yes	No
T#75	Cone	ad	0.3	ag	-	0.0625	-0.03	0.03	-	ZONE #8	Q	No	50%	0%	50%	S#82	Yes	Yes	No
T#76	Cone	ad	0.4	ag	-	0.0625	-0.03	0.03	-	ZONE #8	Q	No	50%	0%	50%		Yes	Yes	No
T#77	Cone	ak	0.5	ag	-	0.0625	-0.03	0.03	-	ZONE #8	Q	No	50%	0%	50%	S#172	Yes	Yes	No
T#81	Cone	bg	0.8	bg	-	0.1961	-0.03	0.03	-	ZONE #8	Q	No	80%	0%	20%		No	Yes	Add
T#83	Dome	ad	1.3	z	10.0	-	-0.03	0.03	-	ZONE #10/4	D/I	No	50%	0%	50%	S#111	Yes	Yes	Move
T#84	Dome	ad	1.3	z	10.0	-	-0.03	0.03	-	ZONE #10/4	D/I	No	50%	0%	50%	S#112	Yes	Yes	Move
T#85	Dome	ao	1.3	ao	10.0	-	-0.03	0.03	-	ZONE #4	I	No	50%	0%	50%	S#113	No	Yes	Add
T#86	Cone	bg	0.8	bg	-	0.2308	-0.03	0.03	-	ZONE #8	Q	No	20%	0%	80%		No	Yes	Add
T#87	Cone	bg	0.5	bg	-	0.3704	-0.03	0.03	-	ZONE #8	Q	No	20%	0%	80%		No	Yes	Add
T#88	Cone	bg	0.8	bg	-	0.2308	-0.03	0.03	-	ZONE #8	Q	No	20%	0%	80%		No	Yes	Add
T#89	Cone	bg	0.5	bg	-	0.3704	-0.03	0.03	-	ZONE #8	Q	No	20%	0%	80%		No	Yes	Add
R97	Dome	ay	1.3	ay	10.0	-	-0.03	0.03	-	ZONE #10	D	No	60%	25%	15%	S#64	No	Yes	Add
T#101	Dome	ab	1.3	z	10.0	-	-0.03	0.03	-	ZONE #4	I	No	50%	0%	50%		Yes	Yes	No
T#102	Dome	ab	1.3	z	10.0	-	-0.03	0.03	-	ZONE #4	I	No	50%	0%	50%		Yes	Yes	No
T#103	Dome	ab	1.3	z	10.0	-	-0.03	0.03	-	ZONE #4	I	No	50%	0%	50%		Yes	Yes	No
T#104	Dome	ab	1.3	z	10.0	-	-0.03	0.03	-	ZONE #4	I	No	50%	0%	50%		Yes	Yes	No
T#105	Cone	ab	1.2	ab	-	0.2333	-0.03	0.03	-	ZONE #8	Q	No	50%	0%	50%		No	Yes	Add
T#106	Cone	ab	1.2	ab	-	0.2333	-0.03	0.03	-	ZONE #7B	T	No	50%	0%	50%		No	Yes	Add
T#107	Cone	ab	1.2	ab	-	0.2333	-0.03	0.03	-	ZONE #7B	T	No	50%	0%	50%		No	Yes	Add
T#108	Cone	ab	1.2	ab	-	0.2333	-0.03	0.03	-	ZONE #7B	T	No	50%	0%	50%		No	Yes	Add
T#109	Cone	ap	1.2	ap	-	0.2333	-0.03	0.03	-	ZONE #7B	T	No	50%	0%	50%		No	Yes	Add
P	Cone	bg	0.2	ab	-	0.0625	-0.03	0.03	-	ZONE #7A	U	No	100%	0%	0%		No	Yes	Add
Q	Cone	bg	0.2	ap	-	0.0625	-0.03	0.03	-	ZONE #7A	U	No	100%	0%	0%		No	Yes	Add
WWT	Dome	bk	1.2	z	9.2	-	-0.03	0.03	-	ZONE #5	L	No	20%	0%	80%		Yes	Yes	No

Table C.8
Tank Information
Romic Facility, East Palo Alto, California

Notes:

a	Information provided by Site personnel.
b	The shell height is the height of the actual tank and not the height above grade.
c	Maximum liquid height was assumed to be the height of the tank shell.
d	Average liquid height was assumed to be half the maximum liquid height.
e	Working volume is calculated from the tank shell height and the tank diameter unless otherwise noted.
f	Turnovers per year are estimated by dividing the throughput by the working volume as recommended in the *User's Guide to TANKS* .
g	It is assumed that no tanks are heated.
h	Based on observations at the Site on 1/21/99, the paint condition of the tanks is "good".
i	Colors of the tanks were obtained from site visit and information provided by Site personnel on 1/21/99 (see notes on printout titled Tank Information and data). The color of the tank roof is assumed to be the same color as the tank shell.
j	The roof radius is a necessary input to the TANKS program only if the roof is a dome. If the roof radius was unknown and the roof height was known, the roof radius was estimated from [Rr = (Hr^2 + Rs^2)/(2Hr)]. If the roof radius was unknown and the roof height was unknown, the roof radius was assumed to be equivalent to the tank diameter. (See AP-42 Chapter 7 page 7.1-12).
k	The roof slope is a necessary input to the TANKS program only if the roof is a cone. If the roof slope was unknown (i.e., the roof height and/or tank shell were unknown and therefore, could not be used to calculate the roof slope), it was assumed to be 0.0625 ft/ft as recommended in the *User's Guide to TANKS* .
l	The default vacuum setting is used as recommended in the *User's Guide to TANKS* .
m	The default pressure setting is used as recommended in the *User's Guide to TANKS* .
n	The TANKS program does not require an answer to the question "Is the tank underground?" if the tank is vertical fixed roof tank.
o	The net throughput was obtained from 1997 Site throughput information (see fax from Carol Bonner to Liz Miesner and Stacy Mann dated 5/24/99).
p	The net throughput was obtained from 1997 Site throughput information (see printout provided by Site dated 1/21/99).
q	The tank is blue. Since the TANKS program can not account for the "color" blue, it was assumed to be similar to "gray/medium".
r	The tank is green. Since the TANKS program can not account for the "color" green, it was assumed to be similar to "gray/light".
s	The color of the tank is unknown at this time. It is assumed to be "white/white" as recommended in the *User's Guide to TANKS* .
t	The tank is steel (either carbon or stainless). Since the TANKS program can not account for the "color" steel, it was assumed similar to "aluminum/specular".
u	The tank throughput is unknown as these tanks have not yet been constructed. The throughput is assumed to be the average throughput of tanks 101, 102, 103, and 104.
v	The tank throughput is unknown as these tanks have not yet been constructed. The throughput is assumed to be half the throughput of tanks T13 and B2 (see notes from meeting with Carol Bonner on 9/9/99).
w	The tank throughput is unknown as these tanks have not yet been constructed. The throughput is assumed to be the average of the throughput of tanks R91, R92, R93, R94, and R95 (see notes from meeting with Carol Bonner on 9/9/99).
y	Information regarding tank contents was obtained from Site personnel (see files and notes from conversations with Regina Colbert).
z	The roof height is estimated as [Hr = Rr - (Rr^2 - Rs^2)^0.5] (see AP-42 Chapter 7 page 7.1-12).
aa	Equivalent height of the cone bottom of the tank was calculated using methodology outlined in AP-42 Chapter 7 page 7.1-11.
ab	Information obtained from Part B Permit Application for Romic Environmental Technologies Corp. Revised August 1999 (provided by Carol Bonner).
ac	Equivalent height of the dome bottom of the tank was calculated using methodology outlined in AP-42 Chapter 7 page 7.1-12.
ad	Information obtained from document provided by Site personnel on 1/21/99 (see printout from Site titled Tank Information and data).
ae	Shell height was calculated from the working volume and the shell diameter.
af	Value from Site document on 1/21/99 seemed unreasonable (160 feet).
ag	The roof height is calculated by multiplying the roof slope and the tank radius.
ah	Information obtained from document provided by Site personnel on 1/21/99 (see printout titled Tank Information and data) indicated that the roof is flat. Since this is not an option with the TANKS program, the roof is assumed to be a cone.
ai	Information obtained from Annual Throughput Report for 1/1/97-12/31/97 that was generated on 1/28/98.
aj	Information obtained from the BAAQMD Permit that expires June 1, 2000.
ak	Information on the roof type was not available. The roof type was assumed to be a cone.
al	Information obtained from document titled "BAAQMD Permitted Equipment" and dated 1/21/99.
am	No information was available regarding the tank shell diameter. The diameter was assumed to be 14.6 feet which is the value of the diameter for tank #68 which has a similar working volume.
an	No information was available regarding tank throughput. The net throughput was assumed to the net throughput for tank #100, which is a horizontal tank of the same working volume.
ao	Parameter assumed to be equivalent to the average for T#83 and T#84.
ap	Parameter assumed to be equivalent to the value for T#108.
ar	Information obtained from Regina Colbert during phone conversation 3/28/00.
av	For Tanks 81, 86-89, the number of turnovers was assumed to be an average of the rest of the modeled tanks' number of turnovers This value and the tank volume was then used to calculate the throughput.
aw	Information obtained from Ross Wilson in a phone call on December 1, 2000.
ay	Assumed similar to Tank 83.
az	Annual Throughput for 11/01/99 to 10/31/00 provided by Ross Wilson in fax on 12/4/00.
ba	Information obtained from Regina Colbert on 12/1/00.
bb	Information obtained from Regina Colbert on 12/1/00 indicates that this tank has a shell height of 3 feet. TANKS minimum shell height requirement for a vertical fixed roof tank is 5 feet; thus, the assumed shell height is 5 feet.
bc	The shell diameter for this tank was modified due to the TANKS requirement noted in bb. The shell diameter was adjusted to maintain a tank volume of 200 gallons (from Regina Colbert) and maintain the same number of turnovers for the throughput of the tank.
bd	These proposed tanks will have a volume of 2000 gallons (from phone conversation with Ross Wilson on 12/8/00)
be	Assumed similar to T#16 and T#17, which are roughly the same size tanks.
bf	Throughput is scaled from the average of T#40-T#49, based on the relative size of the tank.
bg	Information from conversation with Ross Wilson on 12/8/00.
bh	Please note that the tank volume shown in this table is the volume modeled with TANKS. There is a discrepancy of less than 10% between the actual tank volume and the tank volume modeled in TANKS as noted.
bi	Shell height was calculated from the working volume and the shell diameter. The working volume was provided by Regina Colbert on 12/1/00.
bj	Since the shell height cannot be less than 5 feet for a vertical fixed roof tank in TANKS, shell diameter was calculated from the working volume and the shell height. The working volume was provided by Regina Colbert on 12/1/00.
bk	Information provided by Ross Wilson in a fax on 12/1/00.

Table C.9
Chemical Composition for Modeled Liquid Organic Stream in TANKS[a]
Romic Facility, East Palo Alto, California

Selected Chemicals Modeled in Waste Stream in Tanks[b]

Chemical	% in Process Stream	% of Total Vapor[c]	% in Modeled TANKS Stream	Chemical	% in Process Stream	% of Total Vapor[c]	% in Modeled TANKS Stream
1,1,1-TRICHLOROETHANE	1.23%	3.08%	1.2%	HEXACHLOROETHANE	0.06%	0.00%	0.1%
1,1-DICHLOROETHENE	0.06%	0.77%	0.1%	HYDROCHLORIC ACID	0.31%	0.16%	0.3%
1,2-DICHLOROBENZENE	1.98%	0.06%	2.0%	HYDROFLUORIC ACID	0.16%	0.08%	0.2%
1,2-DICHLOROETHANE	0.09%	0.15%	0.1%	ISOPROPYL ALCOHOL	3.09%	2.78%	3.1%
1,4-DICHLOROBENZENE	0.06%	0.00%	0.1%	METHANOL	6.50%	17.64%	6.5%
1,4-DIOXANE	0.14%	0.11%	0.1%	METHYLENE CHLORIDE	3.03%	27.23%	3.0%
2-ETHOXYETHANOL	0.82%	0.07%	0.8%	N-BUTYL ALCOHOL	0.40%	0.05%	0.4%
4-METHYL-2-PENTANONE	3.15%	0.95%	3.2%	NITRIC ACID	0.37%	0.48%	0.4%
ACETONE	0.27%	1.30%	0.3%	NITROBENZENE	0.14%	0.00%	0.1%
ACETONITRILE	1.22%	2.31%	1.2%	N-METHYL-2-PYRROLIDONE	b	b	23.0%
BENZENE	0.55%	1.09%	0.6%	PHENOL	0.57%	0.00%	0.6%
CARBON TETRACHLORIDE	0.06%	0.16%	0.1%	PYRIDINE	0.14%	0.06%	0.1%
CHLOROBENZENE	0.06%	0.02%	0.1%	SULFURIC ACID	1.71%	1.07%	1.7%
CHLOROFORM	0.22%	0.94%	0.2%	TETRACHLOROETHENE	0.65%	0.26%	0.6%
DIACETONE ALCOHOL	0.09%	0.00%	0.1%	TOLUENE	11.93%	6.97%	11.9%
DICHLOROFLUOROETHANE	0.08%	0.71%	0.1%	TRICHLOROETHENE	0.68%	1.03%	0.7%
DIMETHYL FORMAMIDE	2.14%	0.17%	2.1%	TRIETHYLAMINE	0.10%	0.12%	0.1%
ETHYLENE GLYCOL	b	b	17.3%	URETHANE	0.06%	0.01%	0.1%
GASOLINE	4.69%	9.30%	4.7%	XYLENE (MIXED ISOMERS)	8.50%	1.58%	8.5%
HEXANE	4.13%	12.91%	4.1%	**Total**	**59%**	**94%**	**100%**

Selected Chemicals Not Modeled in Waste Stream in TANKS

Chemical	% in Process Stream	% of Total Vapor[c]	% in Modeled TANKS Stream	Chemical	% in Process Stream	% of Total Vapor[c]	% in Modeled TANKS Stream
2-BUTANONE	0.01%	0.01%	0.0%	ETHYLENE OXIDE	0.00%	0.00%	0.0%
2-NITROPROPANE	0.04%	0.01%	0.0%	FORMALDEHYDE	0.03%	0.45%	0.0%
ACETALDEHYDE	0.00%	0.00%	0.0%	HYDRAZINE	0.02%	0.01%	0.0%
ACRYLIC ACID	0.00%	0.00%	0.0%	HYDROGEN SULFIDE	0.00%	0.00%	0.0%
ACRYLONITRILE	0.00%	0.00%	0.0%	M-CRESOL	0.04%	0.00%	0.0%
AMMONIA	0.04%	0.04%	0.0%	METHACRYLATE	0.00%	0.00%	0.0%
BROMINE	0.00%	0.00%	0.0%	METHYL METHACRYLATE	0.01%	0.00%	0.0%
CARBON DISULFIDE	0.04%	0.29%	0.0%	NAPHTHALENE	0.04%	0.00%	0.0%
CHLORINE	0.00%	0.06%	0.0%	OSMIUM TETROXIDE	0.00%	0.00%	0.0%
CUMENE	0.00%	0.00%	0.0%	PHOSPHINE	0.00%	0.00%	0.0%
CYCLOHEXANOL	0.00%	0.00%	0.0%	PROPYLENE DICHLORIDE	0.00%	0.00%	0.0%
DIETHYLAMINE	0.00%	0.00%	0.0%	PROPYLENE OXIDE	0.04%	0.48%	0.0%
DIETHYLAMINOETHANOL	0.00%	0.00%	0.0%	STYRENE	0.03%	0.00%	0.0%
DIISOBUTYL KETONE	0.00%	0.00%	0.0%	TOLUENEDIISOCYANATE (MIXED ISOMERS)	0.01%	0.00%	0.0%
EPICHLOROHYDRIN	0.00%	0.00%	0.0%	VINYL ACETATE	0.00%	0.00%	0.0%
ETHYL ACRYLATE	0.00%	0.00%	0.0%	VINYL CHLORIDE	0.00%	0.01%	0.0%
				Total	**0.3%**	**1.4%**	**0%**

Notes:

a - The aqueous organic waste stream was modeled as 95% water and 5% the composition of the liquid organic waste stream in TANKS.

b - In addition to the selected chemicals, 17.3% ethylene glycol and 23.0% n-methyl-2-pyrrolidone were modeled to represent the non-selected chemicals. The percentage of these two chemicals were determined based on their relative proportions in the process stream (12.6% and 16.6%, respectively) and scaled up to account for the remainder of the non-selected chemicals.

c - The percent of individual chemicals in total vapor was estimated by taking the ratio of the product of each selected chemical's molar fraction in liquid and its saturated vapor pressure, to the sum of all the molar fractions of the selected chemicals and their respective vapor pressures (see Section 5.2(a)(1) in the report).

Table C.10
Summary: Tank Stream Composition
Romic Facility, East Palo Alto, California

Tank Stream Composition					
Tank	**Source**	**Organics**	**Labpack**	**Diesel Oil**	**Wastewater**
A	ZONE #5	80%	0%	0%	20%
B	ZONE #5	80%	0%	0%	20%
C	ZONE #5	80%	0%	0%	20%
D	ZONE #5	80%	0%	0%	20%
E	ZONE #5	80%	0%	0%	20%
F	ZONE #5	80%	0%	0%	20%
G	ZONE #5	80%	0%	0%	20%
H	ZONE #5	80%	0%	0%	20%
I	ZONE #5	80%	0%	0%	20%
J	ZONE #5	80%	0%	0%	20%
A-2	Tank Farm F	0%	0%	0%	100%
A-3	Tank Farm F	0%	0%	0%	100%
A-4	Tank Farm F	0%	0%	0%	100%
A-5	Tank Farm F	0%	0%	0%	100%
N	Tank Farm E	80%	0%	0%	20%
O	Tank Farm E	80%	0%	0%	20%
T#96	Tank Farm E	80%	0%	0%	20%
T#97	Tank Farm E	80%	0%	0%	20%
T#98	Tank Farm E	80%	0%	0%	20%
T#1	ZONE #6	0%	0%	100%	0%
T#2	ZONE #6	80%	0%	0%	20%
T#3	ZONE #6	80%	0%	0%	20%
T#4	ZONE #6	50%	0%	0%	50%
T#5	ZONE #6	80%	0%	0%	20%
T#6	ZONE #6	80%	0%	0%	20%
T#7	ZONE #6	80%	0%	0%	20%
T#8	ZONE #6	50%	0%	0%	50%
T#9	ZONE #6	50%	0%	0%	50%
T#10	ZONE #6	80%	0%	0%	20%
T#11	ZONE #6	80%	0%	0%	20%
T#12	ZONE #6	50%	0%	0%	50%
T#16	ZONE #9A	80%	0%	0%	20%
T#17	ZONE #9A	80%	0%	0%	20%
T#18	ZONE #9A	80%	0%	0%	20%
T#19	ZONE #9A	80%	0%	0%	20%
T#20	ZONE #9A	80%	0%	0%	20%
T#26	ZONE #7B	20%	0%	0%	80%
T#27	ZONE #7B	20%	0%	0%	80%
T#28	ZONE #7B	20%	0%	0%	80%
T#29	ZONE #7B	20%	0%	0%	80%
T#30	ZONE #7B	20%	0%	0%	80%
T#31	ZONE #7B	20%	0%	0%	80%
T#32	ZONE #7A	80%	0%	0%	20%
T#33	ZONE #7A	80%	0%	0%	20%
T#34	ZONE #7A	80%	0%	0%	20%

Table C.10
Summary: Tank Stream Composition
Romic Facility, East Palo Alto, California

Tank Stream Composition					
Tank	**Source**	**Organics**	**Labpack**	**Diesel Oil**	**Wastewater**
T#35	ZONE #7A	80%	0%	0%	20%
T#36	ZONE #7A	100%	0%	0%	0%
T#37	ZONE #7A	100%	0%	0%	0%
T#38	ZONE #7A	80%	0%	0%	20%
T#39	ZONE #7A	80%	0%	0%	20%
T#40	ZONE #7A	100%	0%	0%	0%
T#41	ZONE #7A	100%	0%	0%	0%
T#42	ZONE #7A	50%	0%	0%	50%
T#43	ZONE #7A	50%	0%	0%	50%
T#44	ZONE #5	100%	0%	0%	0%
T#45	ZONE #5	100%	0%	0%	0%
T#46	ZONE #5	100%	0%	0%	0%
T#47	ZONE #5	100%	0%	0%	0%
T#48	ZONE #5	50%	0%	0%	50%
T#49	ZONE #5	50%	0%	0%	50%
T#50	ZONE #5	50%	0%	0%	50%
T#60	ZONE #8	50%	0%	0%	50%
T#61	ZONE #8	50%	0%	0%	50%
T#62	ZONE #8	0%	0%	100%	0%
T#63	ZONE #8	50%	0%	0%	50%
T#64	ZONE #8	50%	0%	0%	50%
T#65	ZONE #8	50%	0%	0%	50%
T#66	ZONE #8	50%	0%	0%	50%
T#67	ZONE #8	50%	0%	0%	50%
T#68	ZONE #8	50%	0%	0%	50%
T#69	ZONE #8	80%	0%	0%	20%
T#70	ZONE #8	80%	0%	0%	20%
T#71	ZONE #8	80%	0%	0%	20%
T#72	ZONE #8	100%	0%	0%	0%
T#73	ZONE #8	50%	0%	0%	50%
T#74	ZONE #8	50%	0%	0%	50%
T#75	ZONE #8	50%	0%	0%	50%
T#76	ZONE #8	50%	0%	0%	50%
T#77	ZONE #8	50%	0%	0%	50%
T#81	ZONE #8	80%	0%	0%	20%
T#83	ZONE #10/4	50%	0%	0%	50%
T#84	ZONE #10/4	50%	0%	0%	50%
T#85	ZONE #4	50%	0%	0%	50%
T#86	ZONE #8	20%	0%	0%	80%
T#87	ZONE #8	20%	0%	0%	80%
T#88	ZONE #8	20%	0%	0%	80%
T#89	ZONE #8	20%	0%	0%	80%
R97	ZONE #10	60%	0%	25%	15%
T#101	ZONE #4	50%	0%	0%	50%
T#102	ZONE #4	50%	0%	0%	50%

Table C.10
Summary: Tank Stream Composition
Romic Facility, East Palo Alto, California

Tank Stream Composition					
Tank	**Source**	**Organics**	**Labpack**	**Diesel Oil**	**Wastewater**
T#103	ZONE #4	50%	0%	0%	50%
T#104	ZONE #4	50%	0%	0%	50%
T#105	ZONE #8	50%	0%	0%	50%
T#106	ZONE #7B	50%	0%	0%	50%
T#107	ZONE #7B	50%	0%	0%	50%
T#108	ZONE #7B	50%	0%	0%	50%
T#109	ZONE #7B	50%	0%	0%	50%
P	ZONE #7A	100%	0%	0%	0%
Q	ZONE #7A	100%	0%	0%	0%
WWT	ZONE #5	20%	0%	0%	80%

Table C.11
Tank Emissions by Chemical
Romic Facility, East Palo Alto, California

Tank	Source	Total	1,1,1-Trichloroethane	1,1-Dichloroethene	1,2-Dichlorobenzene	1,2-Dichloroethane	1,4-Dichlorobenzene	1,4-Dioxane	2-Ethoxyethanol	4-Methyl-2-pentanone	Acetone	Acetonitrile	Benzene
A	ZONE #5	262.67	7.43	3.56	0.14	0.36	0.06	0.17	2.22	7.29	3.26	5.11	2.64
B	ZONE #5	263.76	7.46	3.57	0.14	0.36	0.06	0.17	2.23	7.32	3.27	5.13	2.65
C	ZONE #5	251.36	7.11	3.41	0.13	0.34	0.06	0.16	2.13	6.98	3.12	4.89	2.52
D	ZONE #5	283.65	8.02	3.84	0.15	0.39	0.06	0.18	2.40	7.88	3.52	5.51	2.85
E	ZONE #5	240.38	6.80	3.26	0.13	0.33	0.05	0.15	2.03	6.68	2.98	4.67	2.41
F	ZONE #5	290.73	8.22	3.94	0.15	0.40	0.07	0.19	2.46	8.07	3.61	5.65	2.92
G	ZONE #5	306.90	8.68	4.16	0.16	0.42	0.07	0.20	2.60	8.52	3.81	5.97	3.08
H	ZONE #5	261.48	7.39	3.54	0.14	0.36	0.06	0.17	2.21	7.26	3.24	5.08	2.63
I	ZONE #5	328.10	9.28	4.45	0.17	0.45	0.07	0.21	2.78	9.11	4.07	6.38	3.30
J	ZONE #5	323.48	9.15	4.38	0.17	0.44	0.07	0.21	2.74	8.98	4.01	6.29	3.25
A-2	Tank Farm F	1.18	0.03	0.02	0.00	0.00	0.00	0.00	0.01	0.04	0.01	0.02	0.01
A-3	Tank Farm F	1.18	0.03	0.02	0.00	0.00	0.00	0.00	0.01	0.04	0.01	0.02	0.01
A-4	Tank Farm F	1.18	0.03	0.02	0.00	0.00	0.00	0.00	0.01	0.04	0.01	0.02	0.01
A-5	Tank Farm F	1.18	0.03	0.02	0.00	0.00	0.00	0.00	0.01	0.04	0.01	0.02	0.01
N	Tank Farm E	238.77	6.63	3.69	0.14	0.32	0.06	0.15	2.30	7.55	2.93	4.54	2.35
O	Tank Farm E	238.77	6.63	3.69	0.14	0.32	0.06	0.15	2.30	7.55	2.93	4.54	2.35
T#96	Tank Farm E	176.87	4.91	2.73	0.11	0.23	0.05	0.11	1.71	5.59	2.17	3.36	1.74
T#97	Tank Farm E	176.87	4.91	2.73	0.11	0.23	0.05	0.11	1.71	5.59	2.17	3.36	1.74
T#98	Tank Farm E	193.92	5.38	2.99	0.12	0.26	0.05	0.12	1.87	6.13	2.38	3.68	1.91
T#1	ZONE #6	5.08											
T#2	ZONE #6	180.97	5.08	2.59	0.10	0.24	0.04	0.11	1.61	5.30	2.24	3.49	1.80
T#3	ZONE #6	224.17	6.29	3.20	0.12	0.30	0.05	0.14	2.00	6.56	2.77	4.32	2.23
T#4	ZONE #6	110.42	3.14	1.43	0.06	0.15	0.02	0.07	0.89	2.92	1.38	2.16	1.12
T#5	ZONE #6	117.09	3.29	1.67	0.06	0.16	0.03	0.07	1.04	3.43	1.45	2.26	1.17
T#6	ZONE #6	131.73	3.70	1.88	0.07	0.18	0.03	0.08	1.18	3.86	1.63	2.54	1.31
T#7	ZONE #6	125.91	3.53	1.80	0.07	0.17	0.03	0.08	1.12	3.69	1.56	2.43	1.25
T#8	ZONE #6	107.58	3.06	1.39	0.05	0.15	0.02	0.07	0.87	2.85	1.34	2.11	1.09
T#9	ZONE #6	109.65	3.08	1.57	0.06	0.15	0.03	0.07	0.98	3.21	1.35	2.11	1.09
T#10	ZONE #6	237.22	6.66	3.39	0.13	0.32	0.06	0.15	2.12	6.94	2.93	4.57	2.36
T#11	ZONE #6	233.35	6.55	3.33	0.13	0.32	0.06	0.15	2.08	6.83	2.88	4.50	2.32
T#12	ZONE #6	107.50	3.06	1.39	0.05	0.15	0.02	0.07	0.87	2.84	1.34	2.11	1.09
T#16	ZONE #9A	77.52	2.19	1.05	0.04	0.11	0.02	0.05	0.66	2.15	0.96	1.51	0.78
T#17	ZONE #9A	92.90	2.63	1.26	0.05	0.13	0.02	0.06	0.79	2.58	1.15	1.81	0.93
T#18	ZONE #9A	26.59	0.75	0.38	0.01	0.04	0.01	0.02	0.24	0.78	0.33	0.51	0.26
T#19	ZONE #9A	80.46	2.28	1.09	0.04	0.11	0.02	0.05	0.68	2.23	1.00	1.56	0.81
T#20	ZONE #9A	94.26	2.67	1.28	0.05	0.13	0.02	0.06	0.80	2.62	1.17	1.83	0.95
T#26	ZONE #7B	30.28	0.85	0.43	0.02	0.04	0.01	0.02	0.27	0.89	0.37	0.58	0.30
T#27	ZONE #7B	20.39	0.57	0.29	0.01	0.03	0.00	0.01	0.18	0.60	0.25	0.39	0.20
T#28	ZONE #7B	30.52	0.86	0.44	0.02	0.04	0.01	0.02	0.27	0.89	0.38	0.59	0.30
T#29	ZONE #7B	26.51	0.74	0.38	0.01	0.04	0.01	0.02	0.24	0.78	0.33	0.51	0.26
T#30	ZONE #7B	57.32	1.61	0.82	0.03	0.08	0.01	0.04	0.51	1.68	0.71	1.10	0.57
T#31	ZONE #7B	57.32	1.61	0.82	0.03	0.08	0.01	0.04	0.51	1.68	0.71	1.10	0.57
T#32	ZONE #7A	193.60	5.43	2.77	0.11	0.26	0.05	0.12	1.73	5.67	2.39	3.73	1.93
T#33	ZONE #7A	230.86	6.48	3.30	0.13	0.31	0.05	0.15	2.06	6.76	2.85	4.45	2.30
T#34	ZONE #7A	244.29	6.86	3.49	0.14	0.33	0.06	0.15	2.18	7.15	3.02	4.71	2.43
T#35	ZONE #7A	176.98	4.97	2.53	0.10	0.24	0.04	0.11	1.58	5.18	2.19	3.41	1.76
T#36	ZONE #7A	352.49	9.90	5.04	0.20	0.48	0.08	0.22	3.15	10.32	4.36	6.79	3.51
T#37	ZONE #7A	319.73	8.98	4.57	0.18	0.43	0.08	0.20	2.85	9.36	3.95	6.16	3.18
T#38	ZONE #7A	266.20	7.47	3.80	0.15	0.36	0.06	0.17	2.38	7.79	3.29	5.13	2.65
T#39	ZONE #7A	196.76	5.52	2.81	0.11	0.27	0.05	0.12	1.76	5.76	2.43	3.79	1.96
T#40	ZONE #7A	388.17	10.90	5.55	0.22	0.52	0.09	0.25	3.46	11.36	4.80	7.48	3.87

Table C.11
Tank Emissions by Chemical
Romic Facility, East Palo Alto, California

Tank	Source	Total	1,1,1-Trichloroethane	1,1-Dichloroethene	1,2-Dichlorobenzene	1,2-Dichloroethane	1,4-Dichlorobenzene	1,4-Dioxane	2-Ethoxyethanol	4-Methyl-2-pentanone	Acetone	Acetonitrile	Benzene
T#41	ZONE #7A	361.62	10.15	5.17	0.20	0.49	0.09	0.23	3.23	10.59	4.47	6.97	3.60
T#42	ZONE #7A	65.74	1.85	0.94	0.04	0.09	0.02	0.04	0.59	1.92	0.81	1.27	0.65
T#43	ZONE #7A	65.77	1.85	0.94	0.04	0.09	0.02	0.04	0.59	1.93	0.81	1.27	0.65
T#44	ZONE #5	596.96	16.76	8.53	0.33	0.81	0.14	0.38	5.33	17.47	7.38	11.50	5.94
T#45	ZONE #5	462.04	12.97	6.60	0.26	0.62	0.11	0.29	4.12	13.52	5.71	8.90	4.60
T#46	ZONE #5	442.28	12.42	6.32	0.25	0.60	0.11	0.28	3.95	12.95	5.46	8.52	4.40
T#47	ZONE #5	435.13	12.22	6.22	0.24	0.59	0.10	0.27	3.88	12.74	5.38	8.38	4.33
T#48	ZONE #5	56.00	1.57	0.80	0.03	0.08	0.01	0.04	0.50	1.64	0.69	1.08	0.56
T#49	ZONE #5	41.83	1.17	0.60	0.02	0.06	0.01	0.03	0.37	1.22	0.52	0.81	0.42
T#50	ZONE #5	51.41	1.44	0.73	0.03	0.07	0.01	0.03	0.46	1.50	0.64	0.99	0.51
T#60	ZONE #8	128.77	3.61	1.84	0.07	0.17	0.03	0.08	1.15	3.77	1.59	2.48	1.28
T#61	ZONE #8	131.29	3.69	1.88	0.07	0.18	0.03	0.08	1.17	3.84	1.62	2.53	1.31
T#62	ZONE #8	8.19											
T#63	ZONE #8	210.71	5.85	3.25	0.13	0.28	0.05	0.13	2.03	6.67	2.59	4.00	2.07
T#64	ZONE #8	214.56	6.02	3.07	0.12	0.29	0.05	0.14	1.91	6.28	2.65	4.13	2.14
T#65	ZONE #8	148.54	4.17	2.12	0.08	0.20	0.04	0.09	1.33	4.35	1.84	2.86	1.48
T#66	ZONE #8	176.00	4.94	2.51	0.10	0.24	0.04	0.11	1.57	5.15	2.17	3.39	1.75
T#67	ZONE #8	171.14	4.80	2.44	0.09	0.23	0.04	0.11	1.53	5.01	2.11	3.30	1.70
T#68	ZONE #8	313.76	8.81	4.48	0.17	0.42	0.07	0.20	2.80	9.18	3.88	6.05	3.12
T#69	ZONE #8	898.13	25.21	12.83	0.50	1.21	0.21	0.57	8.01	26.29	11.10	17.30	8.94
T#70	ZONE #8	2027.76	56.92	28.97	1.13	2.74	0.48	1.28	18.09	59.36	25.05	39.07	20.19
T#71	ZONE #8	719.12	19.96	11.10	0.43	0.96	0.18	0.44	6.93	22.75	8.82	13.66	7.07
T#72	ZONE #8	138.31	3.88	1.98	0.08	0.19	0.03	0.09	1.23	4.05	1.71	2.66	1.38
T#73	ZONE #8	88.11	2.47	1.26	0.05	0.12	0.02	0.06	0.79	2.58	1.09	1.70	0.88
T#74	ZONE #8	92.20	2.59	1.32	0.05	0.12	0.02	0.06	0.82	2.70	1.14	1.78	0.92
T#75	ZONE #8	120.07	3.37	1.72	0.07	0.16	0.03	0.08	1.07	3.51	1.48	2.31	1.20
T#76	ZONE #8	264.87	7.44	3.78	0.15	0.36	0.06	0.17	2.36	7.75	3.27	5.10	2.64
T#77	ZONE #8	259.83	7.29	3.71	0.14	0.35	0.06	0.16	2.32	7.61	3.21	5.01	2.59
T#81	ZONE #8	104.68	2.91	1.62	0.06	0.14	0.03	0.06	1.01	3.31	1.28	1.99	1.03
T#83	ZONE #10/4	433.62	12.26	5.88	0.23	0.59	0.10	0.28	3.67	12.04	5.38	8.43	4.36
T#84	ZONE #10/4	119.17	3.37	1.62	0.06	0.16	0.03	0.08	1.01	3.31	1.48	2.32	1.20
T#85	ZONE #4	394.96	11.17	5.35	0.21	0.54	0.09	0.25	3.34	10.97	4.90	7.68	3.97
T#86	ZONE #8	8.24	0.23	0.12	0.00	0.01	0.00	0.01	0.07	0.24	0.10	0.16	0.08
T#87	ZONE #8	1.12	0.03	0.02	0.00	0.00	0.00	0.00	0.01	0.03	0.01	0.02	0.01
T#88	ZONE #8	8.24	0.23	0.12	0.00	0.01	0.00	0.01	0.07	0.24	0.10	0.16	0.08
T#89	ZONE #8	1.12	0.03	0.02	0.00	0.00	0.00	0.00	0.01	0.03	0.01	0.02	0.01
R97	ZONE #10	320.80	9.01	4.32	0.17	0.43	0.07	0.20	2.70	8.84	3.95	6.19	3.20
T#101	ZONE #4	204.04	5.81	2.63	0.10	0.28	0.04	0.13	1.64	5.40	2.54	4.00	2.07
T#102	ZONE #4	240.84	6.86	3.11	0.12	0.33	0.05	0.16	1.94	6.37	3.00	4.72	2.44
T#103	ZONE #4	214.32	6.10	2.77	0.11	0.30	0.05	0.14	1.73	5.67	2.67	4.20	2.17
T#104	ZONE #4	217.10	6.18	2.80	0.11	0.30	0.05	0.14	1.75	5.74	2.70	4.25	2.20
T#105	ZONE #8	152.33	4.23	2.35	0.09	0.20	0.04	0.09	1.47	4.82	1.87	2.89	1.50
T#106	ZONE #7B	138.84	3.85	2.14	0.08	0.18	0.04	0.09	1.34	4.39	1.70	2.64	1.36
T#107	ZONE #7B	138.84	3.85	2.14	0.08	0.18	0.04	0.09	1.34	4.39	1.70	2.64	1.36
T#108	ZONE #7B	138.84	3.85	2.14	0.08	0.18	0.04	0.09	1.34	4.39	1.70	2.64	1.36
T#109	ZONE #7B	138.84	3.85	2.14	0.08	0.18	0.04	0.09	1.34	4.39	1.70	2.64	1.36
P	ZONE #7A	96.62	2.71	1.38	0.05	0.13	0.02	0.06	0.86	2.83	1.19	1.86	0.96
Q	ZONE #7A	96.62	2.71	1.38	0.05	0.13	0.02	0.06	0.86	2.83	1.19	1.86	0.96
WWT	ZONE #5	31.42	0.89	0.43	0.02	0.04	0.01	0.02	0.27	0.87	0.39	0.61	0.32

Table C.11
Tank Emissions by Chemical
Romic Facility, East Palo Alto, California

Tank	Source	Carbon Tetrachloride	Chlorobenzene	Chloroform	Cyclohexane	Diacetone Alcohol	Dichlorofluoroethane	Dimethyl Formamide	Ethane	Gasoline	Hexachloroethane	Hydrochloric Acid	Hydrofluoric Acid	Isobutane
A	ZONE #5	0.54	0.05	1.82		0.02	0.11	0.35		61.88	0.01	0.00	9.08	
B	ZONE #5	0.54	0.05	1.82		0.02	0.11	0.35		62.14	0.01	0.00	9.12	
C	ZONE #5	0.52	0.05	1.74		0.02	0.11	0.33		59.22	0.01	0.00	8.69	
D	ZONE #5	0.58	0.06	1.96		0.02	0.12	0.38		66.82	0.01	0.00	9.80	
E	ZONE #5	0.49	0.05	1.66		0.02	0.10	0.32		56.63	0.01	0.00	8.31	
F	ZONE #5	0.60	0.06	2.01		0.02	0.12	0.39		68.49	0.01	0.00	10.05	
G	ZONE #5	0.63	0.06	2.12		0.02	0.13	0.41		72.30	0.02	0.00	10.61	
H	ZONE #5	0.54	0.05	1.81		0.02	0.11	0.35		61.60	0.01	0.00	9.04	
I	ZONE #5	0.67	0.07	2.27		0.03	0.14	0.44		77.29	0.02	0.00	11.34	
J	ZONE #5	0.66	0.06	2.24		0.03	0.14	0.43		76.21	0.02	0.00	11.18	
A-2	Tank Farm F	0.00	0.00	0.01		0.00	0.00	0.00		0.28	0.00	0.00	0.04	
A-3	Tank Farm F	0.00	0.00	0.01		0.00	0.00	0.00		0.28	0.00	0.00	0.04	
A-4	Tank Farm F	0.00	0.00	0.01		0.00	0.00	0.00		0.28	0.00	0.00	0.04	
A-5	Tank Farm F	0.00	0.00	0.01		0.00	0.00	0.00		0.28	0.00	0.00	0.04	
N	Tank Farm E	0.48	0.05	1.63		0.02	0.10	0.29		57.58	0.01	0.00	8.39	
O	Tank Farm E	0.48	0.05	1.63		0.02	0.10	0.29		57.58	0.01	0.00	8.39	
T#96	Tank Farm E	0.36	0.03	1.21		0.02	0.07	0.22		42.65	0.01	0.00	6.22	
T#97	Tank Farm E	0.36	0.03	1.21		0.02	0.07	0.22		42.65	0.01	0.00	6.22	
T#98	Tank Farm E	0.39	0.04	1.32		0.02	0.08	0.24		46.77	0.01	0.00	6.82	
T#1	ZONE #6				0.05				0.05					0.13
T#2	ZONE #6	0.37	0.04	1.24		0.01	0.08	0.23		43.04	0.01	0.00	6.30	
T#3	ZONE #6	0.46	0.04	1.54		0.02	0.09	0.29		53.32	0.01	0.00	7.80	
T#4	ZONE #6	0.23	0.02	0.77		0.01	0.05	0.15		25.78	0.01	0.00	3.79	
T#5	ZONE #6	0.24	0.02	0.81		0.01	0.05	0.15		27.85	0.01	0.00	4.08	
T#6	ZONE #6	0.27	0.03	0.91		0.01	0.06	0.17		31.33	0.01	0.00	4.58	
T#7	ZONE #6	0.26	0.02	0.87		0.01	0.05	0.16		29.95	0.01	0.00	4.38	
T#8	ZONE #6	0.22	0.02	0.75		0.01	0.05	0.15		25.12	0.01	0.00	3.69	
T#9	ZONE #6	0.22	0.02	0.75		0.01	0.05	0.14		26.08	0.01	0.00	3.82	
T#10	ZONE #6	0.48	0.05	1.63		0.02	0.10	0.30		56.42	0.01	0.00	8.26	
T#11	ZONE #6	0.48	0.05	1.61		0.02	0.10	0.30		55.50	0.01	0.00	8.12	
T#12	ZONE #6	0.22	0.02	0.75		0.01	0.05	0.15		25.10	0.01	0.00	3.69	
T#16	ZONE #9A	0.16	0.02	0.54		0.01	0.03	0.10		18.26	0.00	0.00	2.68	
T#17	ZONE #9A	0.19	0.02	0.64		0.01	0.04	0.12		21.89	0.00	0.00	3.21	
T#18	ZONE #9A	0.05	0.01	0.18		0.00	0.01	0.03		6.32	0.00	0.00	0.93	
T#19	ZONE #9A	0.17	0.02	0.56		0.01	0.03	0.11		18.96	0.00	0.00	2.78	
T#20	ZONE #9A	0.19	0.02	0.65		0.01	0.04	0.13		22.21	0.00	0.00	3.26	
T#26	ZONE #7B	0.06	0.01	0.21		0.00	0.01	0.04		7.20	0.00	0.00	1.05	
T#27	ZONE #7B	0.04	0.00	0.14		0.00	0.01	0.03		4.85	0.00	0.00	0.71	
T#28	ZONE #7B	0.06	0.01	0.21		0.00	0.01	0.04		7.26	0.00	0.00	1.06	
T#29	ZONE #7B	0.05	0.01	0.18		0.00	0.01	0.03		6.31	0.00	0.00	0.92	
T#30	ZONE #7B	0.12	0.01	0.39		0.00	0.02	0.07		13.63	0.00	0.00	2.00	
T#31	ZONE #7B	0.12	0.01	0.39		0.00	0.02	0.07		13.63	0.00	0.00	1.99	
T#32	ZONE #7A	0.40	0.04	1.33		0.02	0.08	0.25		46.05	0.01	0.00	6.74	
T#33	ZONE #7A	0.47	0.05	1.59		0.02	0.10	0.30		54.91	0.01	0.00	8.03	
T#34	ZONE #7A	0.50	0.05	1.68		0.02	0.10	0.31		58.11	0.01	0.00	8.50	
T#35	ZONE #7A	0.36	0.03	1.22		0.01	0.07	0.23		42.10	0.01	0.00	6.16	
T#36	ZONE #7A	0.72	0.07	2.42		0.03	0.15	0.45		83.84	0.02	0.00	12.27	
T#37	ZONE #7A	0.65	0.06	2.20		0.03	0.13	0.41		76.05	0.02	0.00	11.13	
T#38	ZONE #7A	0.54	0.05	1.83		0.02	0.11	0.34		63.32	0.01	0.00	9.26	
T#39	ZONE #7A	0.40	0.04	1.35		0.02	0.08	0.25		46.80	0.01	0.00	6.85	
T#40	ZONE #7A	0.79	0.08	2.67		0.03	0.16	0.50		92.33	0.02	0.00	13.51	

Table C.11
Tank Emissions by Chemical
Romic Facility, East Palo Alto, California

Tank	Source	Carbon Tetrachloride	Chlorobenzene	Chloroform	Cyclohexane	Diacetone Alcohol	Dichlorofluoroethane	Dimethyl Formamide	Ethane	Gasoline	Hexachloroethane	Hydrochloric Acid	Hydrofluoric Acid	Isobutane
T#41	ZONE #7A	0.74	0.07	2.49		0.03	0.15	0.46		86.01	0.02	0.00	12.59	
T#42	ZONE #7A	0.13	0.01	0.45		0.01	0.03	0.08		15.64	0.00	0.00	2.29	
T#43	ZONE #7A	0.13	0.01	0.45		0.01	0.03	0.08		15.64	0.00	0.00	2.29	
T#44	ZONE #5	1.22	0.12	4.11		0.05	0.25	0.77		141.99	0.03	0.00	20.78	
T#45	ZONE #5	0.94	0.09	3.18		0.04	0.19	0.59		109.90	0.02	0.00	16.08	
T#46	ZONE #5	0.90	0.09	3.04		0.04	0.19	0.57		105.20	0.02	0.00	15.39	
T#47	ZONE #5	0.89	0.09	2.99		0.04	0.18	0.56		103.50	0.02	0.00	15.14	
T#48	ZONE #5	0.11	0.01	0.39		0.00	0.02	0.07		13.32	0.00	0.00	1.95	
T#49	ZONE #5	0.09	0.01	0.29		0.00	0.02	0.05		9.95	0.00	0.00	1.46	
T#50	ZONE #5	0.11	0.01	0.35		0.00	0.02	0.07		12.23	0.00	0.00	1.79	
T#60	ZONE #8	0.26	0.03	0.89		0.01	0.05	0.17		30.63	0.01	0.00	4.48	
T#61	ZONE #8	0.27	0.03	0.90		0.01	0.06	0.17		31.23	0.01	0.00	4.57	
T#62	ZONE #8				0.08				0.08					0.20
T#63	ZONE #8	0.43	0.04	1.44		0.02	0.09	0.26		50.82	0.01	0.00	7.41	
T#64	ZONE #8	0.44	0.04	1.48		0.02	0.09	0.28		51.04	0.01	0.00	7.47	
T#65	ZONE #8	0.30	0.03	1.02		0.01	0.06	0.19		35.33	0.01	0.00	5.17	
T#66	ZONE #8	0.36	0.03	1.21		0.01	0.07	0.23		41.86	0.01	0.00	6.13	
T#67	ZONE #8	0.35	0.03	1.18		0.01	0.07	0.22		40.71	0.01	0.00	5.96	
T#68	ZONE #8	0.64	0.06	2.16		0.03	0.13	0.40		74.63	0.02	0.00	10.92	
T#69	ZONE #8	1.83	0.18	6.18		0.07	0.38	1.15		213.63	0.05	0.00	31.26	
T#70	ZONE #8	4.14	0.40	13.95		0.17	0.85	2.60		482.31	0.11	0.00	70.57	
T#71	ZONE #8	1.46	0.14	4.90		0.06	0.30	0.88		173.42	0.04	0.00	25.28	
T#72	ZONE #8	0.28	0.03	0.95		0.01	0.06	0.18		32.90	0.01	0.00	4.81	
T#73	ZONE #8	0.18	0.02	0.61		0.01	0.04	0.11		20.96	0.00	0.00	3.07	
T#74	ZONE #8	0.19	0.02	0.63		0.01	0.04	0.12		21.93	0.00	0.00	3.21	
T#75	ZONE #8	0.25	0.02	0.83		0.01	0.05	0.15		28.56	0.01	0.00	4.18	
T#76	ZONE #8	0.54	0.05	1.82		0.02	0.11	0.34		63.00	0.01	0.00	9.22	
T#77	ZONE #8	0.53	0.05	1.79		0.02	0.11	0.33		61.80	0.01	0.00	9.04	
T#81	ZONE #8	0.21	0.02	0.71		0.01	0.04	0.13		25.25	0.01	0.00	3.68	
T#83	ZONE #10/4	0.89	0.09	3.00		0.03	0.18	0.58		102.15	0.02	0.00	14.99	
T#84	ZONE #10/4	0.24	0.02	0.82		0.01	0.05	0.16		28.07	0.01	0.00	4.12	
T#85	ZONE #4	0.81	0.08	2.73		0.03	0.17	0.53		93.05	0.02	0.00	13.65	
T#86	ZONE #8	0.02	0.00	0.06		0.00	0.00	0.01		1.96	0.00	0.00	0.29	
T#87	ZONE #8	0.00	0.00	0.01		0.00	0.00	0.00		0.27	0.00	0.00	0.04	
T#88	ZONE #8	0.02	0.00	0.06		0.00	0.00	0.01		1.96	0.00	0.00	0.29	
T#89	ZONE #8	0.00	0.00	0.01		0.00	0.00	0.00		0.27	0.00	0.00	0.04	
R97	ZONE #10	0.65	0.06	2.20	0.02	0.03	0.13	0.42	0.02	75.03	0.02	0.00	11.01	0.06
T#101	ZONE #4	0.42	0.04	1.42		0.02	0.09	0.28		47.64	0.01	0.00	7.00	
T#102	ZONE #4	0.50	0.05	1.67		0.02	0.10	0.33		56.23	0.01	0.00	8.27	
T#103	ZONE #4	0.44	0.04	1.49		0.02	0.09	0.29		50.03	0.01	0.00	7.36	
T#104	ZONE #4	0.45	0.04	1.51		0.02	0.09	0.30		50.68	0.01	0.00	7.45	
T#105	ZONE #8	0.31	0.03	1.04		0.01	0.06	0.19		36.74	0.01	0.00	5.36	
T#106	ZONE #7B	0.28	0.03	0.95		0.01	0.06	0.17		33.48	0.01	0.00	4.88	
T#107	ZONE #7B	0.28	0.03	0.95		0.01	0.06	0.17		33.48	0.01	0.00	4.88	
T#108	ZONE #7B	0.28	0.03	0.95		0.01	0.06	0.17		33.48	0.01	0.00	4.88	
T#109	ZONE #7B	0.28	0.03	0.95		0.01	0.06	0.17		33.48	0.01	0.00	4.88	
P	ZONE #7A	0.20	0.02	0.66		0.01	0.04	0.12		22.98	0.01	0.00	3.36	
Q	ZONE #7A	0.20	0.02	0.66		0.01	0.04	0.12		22.98	0.01	0.00	3.36	
WWT	ZONE #5	0.06	0.01	0.22		0.00	0.01	0.04		7.40	0.00	0.00	1.09	

Table C.11
Tank Emissions by Chemical
Romic Facility, East Palo Alto, California

Tank	Source	Isopropyl Alcohol	Methane	Methanol	Methylene Chloride	n-Butane	n-Decane	n-Heptane	n-Hexane	n-Nonane	n-Octane	n-Pentane	Phenol	Propane	Pyridine	Styrene	Sulfuric Acid	Tetrachloroethene	Toluene
A	ZONE #5	5.99		36.30	61.72	0.10		29.16			1.11	0.00	0.04		0.09		0.00	0.49	15.17
B	ZONE #5	6.01		36.45	61.98	0.10		29.28			1.12	0.00	0.04		0.09		0.00	0.49	15.24
C	ZONE #5	5.73		34.74	59.07	0.09		27.91			1.07	0.00	0.03		0.09		0.00	0.46	14.52
D	ZONE #5	6.47		39.20	66.65	0.11		31.49			1.20	0.00	0.04		0.10		0.00	0.52	16.38
E	ZONE #5	5.48		33.22	56.49	0.09		26.69			1.02	0.00	0.03		0.08		0.00	0.44	13.88
F	ZONE #5	6.63		40.18	68.32	0.11		32.28			1.23	0.00	0.04		0.10		0.00	0.54	16.79
G	ZONE #5	7.00		42.42	72.12	0.11		34.07			1.30	0.00	0.04		0.11		0.00	0.57	17.73
H	ZONE #5	5.96		36.14	61.44	0.10		29.03			1.11	0.00	0.04		0.09		0.00	0.48	15.10
I	ZONE #5	7.48		45.35	77.10	0.12		36.42			1.39	0.00	0.04		0.11		0.00	0.61	18.95
J	ZONE #5	7.37		44.71	76.01	0.12		35.91			1.37	0.00	0.04		0.11		0.00	0.60	18.69
A-2	Tank Farm F	0.03		0.16	0.28	0.00		0.13			0.00	0.00	0.00		0.00		0.00	0.00	0.07
A-3	Tank Farm F	0.03		0.16	0.28	0.00		0.13			0.00	0.00	0.00		0.00		0.00	0.00	0.07
A-4	Tank Farm F	0.03		0.16	0.28	0.00		0.13			0.00	0.00	0.00		0.00		0.00	0.00	0.07
A-5	Tank Farm F	0.03		0.16	0.28	0.00		0.13			0.00	0.00	0.00		0.00		0.00	0.00	0.07
N	Tank Farm E	5.07		31.62	56.13	0.08		26.18			0.97	0.00	0.04		0.08		0.00	0.42	13.24
O	Tank Farm E	5.07		31.62	56.13	0.08		26.18			0.97	0.00	0.04		0.08		0.00	0.42	13.24
T#96	Tank Farm E	3.76		23.42	41.58	0.06		19.39			0.72	0.00	0.03		0.06		0.00	0.31	9.81
T#97	Tank Farm E	3.76		23.42	41.58	0.06		19.39			0.72	0.00	0.03		0.06		0.00	0.31	9.81
T#98	Tank Farm E	4.12		25.68	45.59	0.06		21.26			0.79	0.00	0.03		0.06		0.00	0.34	10.76
T#1	ZONE #6		0.21			0.65	0.75	0.54	0.61	0.36	0.66	0.81		0.27					
T#2	ZONE #6	4.01		24.59	42.54	0.06		19.99			0.75	0.00	0.03		0.06		0.00	0.33	10.29
T#3	ZONE #6	4.97		30.46	52.70	0.08		24.77			0.93	0.00	0.03		0.08		0.00	0.41	12.74
T#4	ZONE #6	2.58		15.50	25.93	0.04		12.31			0.48	0.00	0.01		0.04		0.00	0.21	6.47
T#5	ZONE #6	2.60		15.91	27.52	0.04		12.94			0.49	0.00	0.02		0.04		0.00	0.21	6.66
T#6	ZONE #6	2.92		17.90	30.97	0.05		14.55			0.55	0.00	0.02		0.04		0.00	0.24	7.49
T#7	ZONE #6	2.79		17.11	29.60	0.04		13.91			0.52	0.00	0.02		0.04		0.00	0.23	7.16
T#8	ZONE #6	2.52		15.10	25.27	0.04		11.99			0.46	0.00	0.01		0.04		0.00	0.20	6.31
T#9	ZONE #6	2.43		14.90	25.78	0.04		12.11			0.46	0.00	0.02		0.04		0.00	0.20	6.23
T#10	ZONE #6	5.26		32.23	55.76	0.08		26.21			0.99	0.00	0.03		0.08		0.00	0.43	13.48
T#11	ZONE #6	5.17		31.71	54.85	0.08		25.78			0.97	0.00	0.03		0.08		0.00	0.42	13.26
T#12	ZONE #6	2.51		15.09	25.25	0.04		11.98			0.46	0.00	0.01		0.04		0.00	0.20	6.30
T#16	ZONE #9A	1.77		10.71	18.22	0.03		8.61			0.33	0.00	0.01		0.03		0.00	0.14	4.48
T#17	ZONE #9A	2.12		12.84	21.83	0.03		10.31			0.39	0.00	0.01		0.03		0.00	0.17	5.37
T#18	ZONE #9A	0.59		3.61	6.25	0.01		2.94			0.11	0.00	0.00		0.01		0.00	0.05	1.51
T#19	ZONE #9A	1.83		11.12	18.91	0.03		8.93			0.34	0.00	0.01		0.03		0.00	0.15	4.65
T#20	ZONE #9A	2.15		13.03	22.15	0.04		10.47			0.40	0.00	0.01		0.03		0.00	0.17	5.44
T#26	ZONE #7B	0.67		4.11	7.12	0.01		3.35			0.13	0.00	0.00		0.01		0.00	0.05	1.72
T#27	ZONE #7B	0.45		2.77	4.79	0.01		2.25			0.08	0.00	0.00		0.01		0.00	0.04	1.16
T#28	ZONE #7B	0.68		4.15	7.18	0.01		3.37			0.13	0.00	0.00		0.01		0.00	0.06	1.74
T#29	ZONE #7B	0.59		3.60	6.23	0.01		2.93			0.11	0.00	0.00		0.01		0.00	0.05	1.51
T#30	ZONE #7B	1.27		7.79	13.48	0.02		6.33			0.24	0.00	0.01		0.02		0.00	0.10	3.26
T#31	ZONE #7B	1.27		7.79	13.47	0.02		6.33			0.24	0.00	0.01		0.02		0.00	0.10	3.26
T#32	ZONE #7A	4.29		26.31	45.51	0.07		21.39			0.81	0.00	0.03		0.07		0.00	0.35	11.00
T#33	ZONE #7A	5.12		31.37	54.27	0.08		25.51			0.96	0.00	0.03		0.08		0.00	0.42	13.12
T#34	ZONE #7A	5.41		33.20	57.43	0.09		26.99			1.02	0.00	0.03		0.08		0.00	0.44	13.89
T#35	ZONE #7A	3.92		24.05	41.60	0.06		19.55			0.74	0.00	0.03		0.06		0.00	0.32	10.06
T#36	ZONE #7A	7.81		47.90	82.86	0.12		38.94			1.47	0.00	0.05		0.12		0.00	0.64	20.04
T#37	ZONE #7A	7.09		43.45	75.16	0.11		35.32			1.33	0.00	0.05		0.11		0.00	0.58	18.17
T#38	ZONE #7A	5.90		36.17	62.58	0.09		29.41			1.11	0.00	0.04		0.09		0.00	0.48	15.13
T#39	ZONE #7A	4.36		26.74	46.25	0.07		21.74			0.82	0.00	0.03		0.07		0.00	0.36	11.18
T#40	ZONE #7A	8.60		52.75	91.25	0.14		42.89			1.62	0.00	0.06		0.13		0.00	0.70	22.06

Table C.11
Tank Emissions by Chemical
Romic Facility, East Palo Alto, California

Tank	Source	Isopropyl Alcohol	Methane	Methanol	Methylene Chloride	n-Butane	n-Decane	n-Heptane	n-Hexane	n-Nonane	n-Octane	n-Pentane	Phenol	Propane	Pyridine	Styrene	Sulfuric Acid	Tetrachloroethene	Toluene
T#41	ZONE #7A	8.02		49.14	85.01	0.13		39.95			1.51	0.00	0.05		0.12		0.00	0.66	20.55
T#42	ZONE #7A	1.46		8.93	15.45	0.02		7.26			0.27	0.00	0.01		0.02		0.00	0.12	3.74
T#43	ZONE #7A	1.46		8.94	15.46	0.02		7.27			0.27	0.00	0.01		0.02		0.00	0.12	3.74
T#44	ZONE #5	13.23		81.12	140.33	0.21		65.96			2.49	0.00	0.09		0.20		0.00	1.08	33.93
T#45	ZONE #5	10.24		62.78	108.62	0.16		51.05			1.92	0.00	0.07		0.16		0.00	0.84	26.26
T#46	ZONE #5	9.80		60.10	103.97	0.16		48.86			1.84	0.00	0.06		0.15		0.00	0.80	25.14
T#47	ZONE #5	9.65		59.13	102.29	0.15		48.08			1.81	0.00	0.06		0.15		0.00	0.79	24.73
T#48	ZONE #5	1.24		7.61	13.17	0.02		6.19			0.23	0.00	0.01		0.02		0.00	0.10	3.18
T#49	ZONE #5	0.93		5.68	9.83	0.01		4.62			0.17	0.00	0.01		0.01		0.00	0.08	2.38
T#50	ZONE #5	1.14		6.99	12.08	0.02		5.68			0.21	0.00	0.01		0.02		0.00	0.09	2.92
T#60	ZONE #8	2.85		17.50	30.27	0.05		14.23			0.54	0.00	0.02		0.04		0.00	0.23	7.32
T#61	ZONE #8	2.91		17.84	30.86	0.05		14.51			0.55	0.00	0.02		0.04		0.00	0.24	7.46
T#62	ZONE #8		0.34			1.04	1.21	0.87	0.98	0.57	1.06	1.31		0.43					
T#63	ZONE #8	4.48		27.91	49.54	0.07		23.10			0.85	0.00	0.03		0.07		0.00	0.37	11.69
T#64	ZONE #8	4.76		29.16	50.44	0.08		23.71			0.89	0.00	0.03		0.07		0.00	0.39	12.20
T#65	ZONE #8	3.29		20.18	34.92	0.05		16.41			0.62	0.00	0.02		0.05		0.00	0.27	8.44
T#66	ZONE #8	3.90		23.92	41.37	0.06		19.45			0.73	0.00	0.03		0.06		0.00	0.32	10.00
T#67	ZONE #8	3.79		23.26	40.23	0.06		18.91			0.71	0.00	0.02		0.06		0.00	0.31	9.73
T#68	ZONE #8	6.95		42.64	73.76	0.11		34.67			1.31	0.00	0.04		0.11		0.00	0.57	17.83
T#69	ZONE #8	19.91		122.04	211.13	0.32		99.23			3.74	0.00	0.13		0.31		0.00	1.63	51.05
T#70	ZONE #8	44.95		275.54	476.68	0.72		224.04			8.44	0.01	0.29		0.69		0.00	3.67	115.26
T#71	ZONE #8	15.28		95.24	169.06	0.24		78.84			2.91	0.00	0.11		0.24		0.00	1.27	39.89
T#72	ZONE #8	3.07		18.79	32.51	0.05		15.28			0.58	0.00	0.02		0.05		0.00	0.25	7.86
T#73	ZONE #8	1.95		11.97	20.71	0.03		9.73			0.37	0.00	0.01		0.03		0.00	0.16	5.01
T#74	ZONE #8	2.04		12.53	21.67	0.03		10.19			0.38	0.00	0.01		0.03		0.00	0.17	5.24
T#75	ZONE #8	2.66		16.32	28.22	0.04		13.27			0.50	0.00	0.02		0.04		0.00	0.22	6.82
T#76	ZONE #8	5.87		35.99	62.26	0.09		29.26			1.10	0.00	0.04		0.09		0.00	0.48	15.06
T#77	ZONE #8	5.76		35.31	61.08	0.09		28.71			1.08	0.00	0.04		0.09		0.00	0.47	14.77
T#81	ZONE #8	2.22		13.86	24.61	0.03		11.48			0.42	0.00	0.02		0.03		0.00	0.18	5.81
T#83	ZONE #10/4	9.89		59.93	101.89	0.16		48.14			1.84	0.00	0.06		0.15		0.00	0.80	25.05
T#84	ZONE #10/4	2.72		16.47	28.00	0.04		13.23			0.51	0.00	0.02		0.04		0.00	0.22	6.88
T#85	ZONE #4	9.00		54.59	92.81	0.15		43.85			1.67	0.00	0.05		0.14		0.00	0.73	22.81
T#86	ZONE #8	0.18		1.12	1.94	0.00		0.91			0.03	0.00	0.00		0.00		0.00	0.01	0.47
T#87	ZONE #8	0.02		0.15	0.26	0.00		0.12			0.00	0.00	0.00		0.00		0.00	0.00	0.06
T#88	ZONE #8	0.18		1.12	1.94	0.00		0.91			0.03	0.00	0.00		0.00		0.00	0.01	0.47
T#89	ZONE #8	0.02		0.15	0.26	0.00		0.12			0.00	0.00	0.00		0.00		0.00	0.00	0.06
R97	ZONE #10	7.26	0.10	44.02	74.84	0.41	0.34	35.60	0.28	0.16	1.65	0.37	0.04	0.12	0.11		0.00	0.59	18.40
T#101	ZONE #4	4.77		28.64	47.92	0.08		22.75			0.88	0.00	0.03		0.07		0.00	0.38	11.96
T#102	ZONE #4	5.63		33.80	56.56	0.09		26.85			1.04	0.00	0.03		0.09		0.00	0.45	14.12
T#103	ZONE #4	5.01		30.08	50.33	0.08		23.89			0.92	0.00	0.03		0.08		0.00	0.40	12.56
T#104	ZONE #4	5.08		30.47	50.99	0.08		24.20			0.94	0.00	0.03		0.08		0.00	0.41	12.72
T#105	ZONE #8	3.24		20.17	35.81	0.05		16.70			0.62	0.00	0.02		0.05		0.00	0.27	8.45
T#106	ZONE #7B	2.95		18.39	32.64	0.05		15.22			0.56	0.00	0.02		0.05		0.00	0.24	7.70
T#107	ZONE #7B	2.95		18.39	32.64	0.05		15.22			0.56	0.00	0.02		0.05		0.00	0.24	7.70
T#108	ZONE #7B	2.95		18.39	32.64	0.05		15.22			0.56	0.00	0.02		0.05		0.00	0.24	7.70
T#109	ZONE #7B	2.95		18.39	32.64	0.05		15.22			0.56	0.00	0.02		0.05		0.00	0.24	7.70
P	ZONE #7A	2.14		13.13	22.71	0.03		10.67			0.40	0.00	0.01		0.03		0.00	0.18	5.49
Q	ZONE #7A	2.14		13.13	22.71	0.03		10.67			0.40	0.00	0.01		0.03		0.00	0.18	5.49
WWT	ZONE #5	0.72		4.34	7.38	0.01		3.49			0.13	0.00	0.00		0.01		0.00	0.06	1.81

Table C.11
Tank Emissions by Chemical
Romic Facility, East Palo Alto, California

Tank	Source	Trichloroethene	Triethylamine	Urethane	Xylene (mixed isomers)
A	ZONE #5	2.19	1.15	0.00	3.06
B	ZONE #5	2.20	1.15	0.00	3.07
C	ZONE #5	2.10	1.10	0.00	2.93
D	ZONE #5	2.37	1.24	0.00	3.30
E	ZONE #5	2.01	1.05	0.00	2.80
F	ZONE #5	2.43	1.27	0.00	3.38
G	ZONE #5	2.56	1.34	0.00	3.57
H	ZONE #5	2.18	1.14	0.00	3.04
I	ZONE #5	2.74	1.43	0.00	3.82
J	ZONE #5	2.70	1.41	0.00	3.76
A-2	Tank Farm F	0.01	0.01	0.00	0.01
A-3	Tank Farm F	0.01	0.01	0.00	0.01
A-4	Tank Farm F	0.01	0.01	0.00	0.01
A-5	Tank Farm F	0.01	0.01	0.00	0.01
N	Tank Farm E	1.93	1.19	0.00	2.61
O	Tank Farm E	1.93	1.19	0.00	2.61
T#96	Tank Farm E	1.43	0.88	0.00	1.93
T#97	Tank Farm E	1.43	0.88	0.00	1.93
T#98	Tank Farm E	1.57	0.96	0.00	2.12
T#1	ZONE #6				
T#2	ZONE #6	1.49	0.83	0.00	2.05
T#3	ZONE #6	1.85	1.03	0.00	2.54
T#4	ZONE #6	0.93	0.46	0.00	1.31
T#5	ZONE #6	0.97	0.54	0.00	1.33
T#6	ZONE #6	1.09	0.61	0.00	1.50
T#7	ZONE #6	1.04	0.58	0.00	1.43
T#8	ZONE #6	0.91	0.45	0.00	1.28
T#9	ZONE #6	0.90	0.50	0.00	1.24
T#10	ZONE #6	1.96	1.09	0.00	2.69
T#11	ZONE #6	1.92	1.07	0.00	2.65
T#12	ZONE #6	0.91	0.45	0.00	1.28
T#16	ZONE #9A	0.65	0.34	0.00	0.90
T#17	ZONE #9A	0.78	0.41	0.00	1.08
T#18	ZONE #9A	0.22	0.12	0.00	0.30
T#19	ZONE #9A	0.67	0.35	0.00	0.94
T#20	ZONE #9A	0.79	0.41	0.00	1.10
T#26	ZONE #7B	0.25	0.14	0.00	0.34
T#27	ZONE #7B	0.17	0.09	0.00	0.23
T#28	ZONE #7B	0.25	0.14	0.00	0.35
T#29	ZONE #7B	0.22	0.12	0.00	0.30
T#30	ZONE #7B	0.47	0.26	0.00	0.65
T#31	ZONE #7B	0.47	0.26	0.00	0.65
T#32	ZONE #7A	1.60	0.89	0.00	2.20
T#33	ZONE #7A	1.90	1.06	0.00	2.62
T#34	ZONE #7A	2.01	1.12	0.00	2.77
T#35	ZONE #7A	1.46	0.81	0.00	2.01
T#36	ZONE #7A	2.91	1.62	0.00	4.00
T#37	ZONE #7A	2.64	1.47	0.00	3.63
T#38	ZONE #7A	2.19	1.23	0.00	3.02
T#39	ZONE #7A	1.62	0.91	0.00	2.23
T#40	ZONE #7A	3.20	1.79	0.00	4.41

Table C.11
Tank Emissions by Chemical
Romic Facility, East Palo Alto, California

Tank	Source	Trichloroethene	Triethylamine	Urethane	Xylene (mixed isomers)
T#41	ZONE #7A	2.98	1.66	0.00	4.10
T#42	ZONE #7A	0.54	0.30	0.00	0.75
T#43	ZONE #7A	0.54	0.30	0.00	0.75
T#44	ZONE #5	4.92	2.75	0.01	6.78
T#45	ZONE #5	3.81	2.13	0.00	5.24
T#46	ZONE #5	3.65	2.04	0.00	5.02
T#47	ZONE #5	3.59	2.00	0.00	4.94
T#48	ZONE #5	0.46	0.26	0.00	0.64
T#49	ZONE #5	0.34	0.19	0.00	0.47
T#50	ZONE #5	0.42	0.24	0.00	0.58
T#60	ZONE #8	1.06	0.59	0.00	1.46
T#61	ZONE #8	1.08	0.60	0.00	1.49
T#62	ZONE #8				
T#63	ZONE #8	1.70	1.05	0.00	2.30
T#64	ZONE #8	1.77	0.99	0.00	2.44
T#65	ZONE #8	1.22	0.68	0.00	1.69
T#66	ZONE #8	1.45	0.81	0.00	2.00
T#67	ZONE #8	1.41	0.79	0.00	1.94
T#68	ZONE #8	2.59	1.44	0.00	3.56
T#69	ZONE #8	7.40	4.14	0.01	10.20
T#70	ZONE #8	16.72	9.34	0.02	23.02
T#71	ZONE #8	5.81	3.58	0.01	7.86
T#72	ZONE #8	1.14	0.64	0.00	1.57
T#73	ZONE #8	0.73	0.41	0.00	1.00
T#74	ZONE #8	0.76	0.42	0.00	1.05
T#75	ZONE #8	0.99	0.55	0.00	1.36
T#76	ZONE #8	2.18	1.22	0.00	3.01
T#77	ZONE #8	2.14	1.20	0.00	2.95
T#81	ZONE #8	0.85	0.52	0.00	1.14
T#83	ZONE #10/4	3.62	1.89	0.00	5.05
T#84	ZONE #10/4	1.00	0.52	0.00	1.39
T#85	ZONE #4	3.30	1.73	0.00	4.60
T#86	ZONE #8	0.07	0.04	0.00	0.09
T#87	ZONE #8	0.01	0.01	0.00	0.01
T#88	ZONE #8	0.07	0.04	0.00	0.09
T#89	ZONE #8	0.01	0.01	0.00	0.01
R97	ZONE #10	2.66	1.39	0.00	3.71
T#101	ZONE #4	1.73	0.85	0.00	2.43
T#102	ZONE #4	2.04	1.00	0.00	2.87
T#103	ZONE #4	1.81	0.89	0.00	2.55
T#104	ZONE #4	1.84	0.90	0.00	2.58
T#105	ZONE #8	1.23	0.76	0.00	1.67
T#106	ZONE #7B	1.12	0.69	0.00	1.52
T#107	ZONE #7B	1.12	0.69	0.00	1.52
T#108	ZONE #7B	1.12	0.69	0.00	1.52
T#109	ZONE #7B	1.12	0.69	0.00	1.52
P	ZONE #7A	0.80	0.44	0.00	1.10
Q	ZONE #7A	0.80	0.44	0.00	1.10
WWT	ZONE #5	0.26	0.14	0.00	0.37

Table C.12
Equipment Leak Emission Factors
Romic Facility, East Palo Alto, California

EPA-453/R-95-017. November 1995. Protocol for Equipment Leak Emission Estimates.

Leak Rate/Screening Value Correlations				
Equipment Type	**Service**	**Leak Rate (kg/hr)**	**Note**	**Reference**
Valves	Gas	1.87E-6 * (SV)^(0.873)	b,c	Table 2-9. SOCMI Leak Rate/Screening Value Correlations
Valves	Light Liquid	6.41E-6 * (SV)^(0.797)	b,c	Table 2-9. SOCMI Leak Rate/Screening Value Correlations
Connectors	All	3.05E-6 * (SV)^(0.885)	b,c	Table 2-9. SOCMI Leak Rate/Screening Value Correlations

Default-Zero Screening Value Emission Rates				
Equipment Type	**Service**	**Emission Rate (kg/hr/source)**	**Note**	**Reference**
Valves	Gas	6.6E-07	a	Table 2-11. SOCMI Leak Rate/Screening Value Correlations
Valves	Light Liquid	4.9E-07	a	Table 2-11. SOCMI Leak Rate/Screening Value Correlations
Pump	Light Liquid	7.5E-06	a,d	Table 2-11. SOCMI Leak Rate/Screening Value Correlations
Connectors	All	6.1E-07	a	Table 2-11. SOCMI Leak Rate/Screening Value Correlations

Pegged Screening Value Emission Rates				
Equipment Type	**Service**	**10,000 ppmv Pegged Emission Rate (kg/hr/source)**	**Note**	**Reference**
Valves	Gas	0.024	a	Table 2-13. SOCMI Leak Rate/Screening Value Correlations
Valves	Light Liquid	0.036	a	Table 2-13. SOCMI Leak Rate/Screening Value Correlations
Pump Seals	Light Liquid	0.14	a,e	Table 2-13. SOCMI Leak Rate/Screening Value Correlations
Connectors	All	0.044	a	Table 2-13. SOCMI Leak Rate/Screening Value Correlations

Note

a These factors are for total organic compound emission rates.
b These correlations predict total organic compound emission rates.
c SV = Screening Value in ppmv
d Light liquid pump default zero values can be applied to pressure relief valves.
e Light liquid pump seal pegged emission rates can be applied to pressure relief valves.

Table C.13
Fugitive Emissions Inventory for Pumps, Valves, and Flanges
Romic Facility, East Palo Alto, California

OVA Sampling Data

ID	Date Sampled	Sampling List				Detections				Detection Value (ppmv)	Equipment ID	Location
		Valves	Flanges	Sampling Ports	Pump	Valves	Flanges	Sampling Ports	Pump			
A	12/29/1998	1	4	1	0	0	0	0	0			
B	12/29/1998	1	4	1	0	0	0	0	0			
C	12/29/1998	1	4	1	0	0	0	0	0			
D	12/29/1998	1	4	1	0	0	0	0	0			
E	12/29/1998	1	4	1	0	0	0	0	0			
F	12/29/1998	1	3	1	0	0	0	0	0			
G	12/29/1998	1	4	1	0	0	0	0	0			
H	12/29/1998	1	4	1	0	0	0	0	0			
I	12/29/1998	1	4	1	0	0	0	0	0			
J	12/29/1998	1	4	1	0	0	0	0	0			
K	12/3/1998	13	13	1	0	0	0	0	0			
L	12/29/1998	6	13	1	0	0	0	0	0			
						see note a				>10,000	TL-V2	Top of tank, P-relief, back of gauge
M	11/10/1998	5	12	1	0	0	0	0	0			
R91	12/8/1998	7	24	4	0	0	0	0	0			
R92	12/8/1998	6	19	3	0	2	1	0	0			
										1	R92-V3	Level 1 - Below F16
										3	R92-F18	Level 1
										5	R92-V5	Level 2
R93	12/8/1998	9	21	4	0	0	0	0	0			
R94	12/8/1998	9	25	4	0	0	0	0	0			
R95	12/8/1998	9	25	5	0	0	0	0	0			
32" Column	12/22/1998	24	21	5	1	3	4	0	0			
										2	C32-V14	gate valve suction side of circulation pump
										22	C32-V12	
										15	C32-V11	
										5	C32-F16	into heat exchanger
										5	C32-F13	into bottom/side of reboiler
										3	C32-F5	bottom of separator
										3	C32-F8	top of reboiler - up ladder
35" Column	1998	45	26	6	2	0	0	0	0			
36" Column	11/17/1998	26	23	1	1	6	1	0	0			
										25	C36-V18	In line between V28 and V19
										30	C36-V20	loading valve
										30	C36-V23	bottom of filter
										25	C36-V2	valve leading to separator
										980	C36-V3	bottom of separator
										130	C36-V1	leading to column
										10	C36-F6	level 2--on column--up ladder
42" Column	12/22/1998	27	24	4	1	1	0	0	0			
										5	C42-V23	double valved-below filter, along the ground
48" Column	12/22/1998	11	12	2	0	0	0	1	0			
										2	C48-SP1	sample port
		207	297	51	5	12	6	1	0			

Emissions Estimation

Parameter	Value	Units	Notes
Average Component Emission Rate	5.1E-06	kg/hr/source	b
Number of Components	4627	sources	c
Annual VOC Emissions	0.23	tons per year	-

Notes:
a - A review of Facility records for a year showed that this measurement was an anomoly and the detected leak was quickly fixed. This measurement was not included in the analysis.
b - All valves and sampling ports are considered light liquid valves; all flanges are considered connectors; and, all pumps are considered light liquid pumps.
c - From Facility count of all components at the Facility.

Table C.14
Drum Storage
Romic Facility, East Palo Alto, California

Model ID	Source Description	# of Drums[a]
DSSAMP	Drum Sampling Area	866
DSCONS	North Drum Storage Building	960
DSSOUTH	South Drum Storage Building	2756
DSWEST1	West Storage Area #1	320
DSWEST2	West Storage Area #2	1316
	Total	**6218**

Notes

a - Values from email from Regina Colbert to Liz Miesner 12/1/00.

Table C.15
Calculation of mass emitted per one Drum sampling event
Romic Facility, East Palo Alto, California

Parameter	Symbol	Value	Units	Note
Density	ρ	720.81	kg/m^3	a
Acceleration of Gravity	g	9.8	m/s^2	-
Angle of Inclination from Horizontal	ϕ	90	degrees	c
Surface Tension	σ	2.16E-02	N/m (=kg/s^2)	b
Viscosity	μ	2.92E-04	N-s/m^2 (=kg-m/s)	b
Withdrawl Velocity	v	0.9144	m/s	d
Length of Coliwassi	L	0.9144	m	e
Diameter of Coliwassi	D	0.0127	m	e
Capillary Number	Ca	0.012	-	f
Film Thickness	h	8.83E-05	m	g
Volume of Liquid on Coliwassa sampling tube	V	3.22E-06	m^3	-
Mass of Liquid on Coliwassa sampling tube	m	0.00232	kg/sample	-

Notes
a - Value for gasoline from Perry's Chemical Engineers'Handbook page 2-120.
b - Values for gasoline (surface tension value is in contact with air) obtained from: White, Frank M. Fluid Mechanics. New York: McGraw-Hill, Inc., 1986.
c - Assumed the Coliwassa sampling tube will be pulled straight out of the drum vertically.
d - Assumed the three foot Coliwassa sampling tube will be pulled out of the drum in one second.
e - Obtained information from facility personnel that the coliwassi is three feet long and 1/2 inch in diameter (see notes from meeting with Carol Bonner and John Arden 9/9/99).
f - The capillary number is equal to $\mu v/\sigma$ (see Perry's Chemical Engineers'Handbook page 6-42).
g - Film thickness is estimated from the following equation:

$$h\ (\rho g/\sigma)^{1/2} = (0.944 * Ca^{2/3})/(1-\cos\phi)^{1/2}$$

where Ca is less than about 0.01 and 0.03

This equation is for calculating film-thickness adhering to flat plates withdrawn from a liquid and comes from Perry's Chemical Engineers'Handbook page 6-42. The equation applicable to cylinders withdrawn from liquids was not used because it states that "a cylinder surface with $R\ (\rho g/\sigma)^{1/2}$>3 may be treated as a flat plate" (where R is the radius of the cylinder). For this situation, $R\ (\rho g/\sigma)1/2$ = 3.63

Table C.16
Calculation of mass emitted per one Truck sampling event
Romic Facility, East Palo Alto, California

Parameter	Symbol	Value	Units	Note
Density	ρ	720.81	kg/m^3	a
Acceleration of Gravity	g	9.8	m/s^2	-
Angle of Inclination from Horizontal	ϕ	90	degrees	c
Surface Tension	σ	2.16E-02	N/m (=kg/s^2)	b
Viscosity	μ	2.92E-04	N-s/m^2 (=kg-m/s)	b
Withdrawl Velocity	v	0.6096	m/s	d
Length of Coliwassi	L	1.8288	m	e
Diameter of Coliwassi	D	0.0254	m	e
Capillary Number	Ca	0.008	-	f
Film Thickness	h	6.73E-05	m	g
Volume of Liquid on Coliwassi	V	9.83E-06	m^3	-
Mass of Liquid on Coliwassi	m	0.00708	kg/sample	-

Notes

a - Value for gasoline from Perry's Chemical Engineers' Handbook page 2-120.

b - Values for gasoline (surface tension value is in contact with air) obtained from: White, Frank M. Fluid Mechanics. McGraw-Hill, Inc., 1986.

c - Assumed the coliwassi will be pulled straight out of the truck vertically.

d - Assumed the six foot coliwassi will be pulled out of the drum in three seconds.

e - Obtained information from facility personnel that the coliwassi is six feet long and one inch in diameter (see notes from meeting with Carol Bonner and John Arden 9/9/99).

f - The capillary number is equal to $\mu v/\sigma$ (see Perry's Chemical Engineers' Handbook page 6-42).

g - Film thickness is estimated from the following equation:

$$h\,(\rho g/\sigma)^{1/2} = (0.944 * Ca^{2/3})/(1-\cos\phi)^{1/2}$$

where Ca is less than about 0.01 and 0.03

This equation is for calculating film-thickness adhering to flat plates withdrawn from a liquid and comes from Perry's Chemical Engineers' Handbook page 6-42. The equation applicable to cylinders withdrawn from liquids was not used because it states that "a cylinder surface with $R(\rho g/\sigma)^{1/2}>3$ may be treated as a flat plate" (where R is the radius of the cylinder). For this situation, $R(\rho g/\sigma)1/2 = 3.63$

Table C.17
Total VOC Emissions from Labpack Processing
Romic Facility, East Palo Alto, California

Variable	Value	Units	Reference
Number of drums during one consolidation period	10	drums/consolidation	a
% of each drum filled with organics	50%		a
Volume of drum	55	gallons/drum	a
Density of organics in drum	45	lbs/ft^3	b
% organics lost through evaporation	1%		c
Control efficiency of scrubber	95%		a
Duration of consolidation	2	days/consolidation	a
Days per year	365	days/year	-
VOC emissions from labpack consolidating	0.075	tons/year	-

Notes:

a - Estimate from facility personnel (Carol Bonner and John Arden of Romic on 9/9/1999)

b - Value for gasoline from Perry's Chemical Engineers' Handbook page 2-120.

c - Lower bound of the emission factor for solvent for agitated mixing tanks (Page 6.4-1 of AP-42 Section 6.4 “Paint and Varnish”).

Table C.18a
Drum Liquefaction Scrubber Emissions Estimate
Romic Facility, East Palo Alto, California

Parameter	Value	Unit	Notes
Concentration of Exit Stream	306.5	ppm	a
Flow Rate of Exhuast	0.00079	cubic meters/second	b
MW of Stream	65.4	grams/mole	c
Time Period	3650	hours/year	d
Annual VOC Emissions	0.009	tons/year	-

Notes:

a - See table below for determination of concentration of VOCs in the exhaust stream leaving the scrubber for the drum liquefaction unit.

b - Exit flow rate from the stack was calculated based on facility-measured exit velocity and diameter of the stack.

c - Weighted average molecular weight of the organic vapor stream.

d - Assumed the unit runs 10 hours per day, seven days per week although it typically only runs five days per week.

Date Measured	OVA Measurement (ppm)
2-Jan-98	80
9-Jan-98	90
13-Jan-98	100
20-Jan-98	220
30-Jan-98	55
9-Feb-98	70
20-Feb-98	175
27-Feb-98	90
6-Mar-98	300
10-Mar-98	25
19-Mar-98	60
26-Mar-98	800
30-Mar-98	1300
7-Apr-98	900
22-Apr-98	250
28-Apr-98	125
7-May-98	300
15-May-98	400
18-May-98	300
2-Jun-98	175
17-Jun-98	600
25-Jun-98	800
1-Jul-98	5000
7-Jul-98	400
16-Jul-98	150
22-Jul-98	90
30-Jul-98	80
5-Aug-98	70
12-Aug-98	80
20-Aug-98	40
25-Aug-98	60
3-Sep-98	45
9-Sep-98	70
18-Sep-98	60
23-Sep-98	50
29-Sep-98	90
7-Oct-98	95
14-Oct-98	150
29-Oct-98	10
4-Nov-98	100
9-Nov-99	125
16-Nov-99	90
24-Nov-99	50
2-Dec-99	90
8-Dec-99	100
17-Dec-99	150
22-Dec-99	100
30-Dec-99	150
Average	306.5

Table C.18b
Drum Liquefaction Fugitive Emission Estimate
Romic Facility, East Palo Alto, California

Parameter	Value	Units	Notes
Fuel Throughput	17,700	gallons/year	a
Density of Diesel	7.1	pounds/gallon	b
Emission Factor	1%	-	c
Annual VOC Emissions	0.63	tons/year	-

Notes:

a - On average, the monthly diesel throughput is 1475 gallons.

b - Liquid density from TANKS for "Distillate fuel oil no. 2".

c - Although according to AP-42 Section 4.8 "Tank and Drum Cleaning", the emissions from drum washing are considered neglibile, it was estimated that the fugitive emissions of diesel from this operation may be as high as 1% loss of thruput.

Table C.19
Tanks and Units Controlled by Triple Scrubber/Boiler System
Romic Facility, East Palo Alto, California

ID	Tank Contents	Notes
24" Column	Organic liquid	a
32" Column	Organic liquid	a
35" Column	Organic liquid	a
36" Column	Organic liquid	a
37" Column	Organic liquid	a
42" Column	Organic liquid	b
43" Column	Organic liquid	a
48" Column	Organic liquid	a
49" Column	Organic liquid	a
Reboiler 24	Organic liquid	a
Reboiler 32	Organic liquid	a
Reboiler 35	Organic liquid	a
Reboiler 36	Organic liquid	a
Reboiler 37	Organic liquid	a
Reboiler 42	Organic liquid	b
Reboiler 43	Organic liquid	a
Reboiler 48	Organic liquid	a
Reboiler 49	Organic liquid	a
High Temperature Unit	Organic liquid	a
K	Fuels	a
L	Fuels	a
M	Fuels	a
R91	Fuels	a
R92	Fuels	a
R93	Fuels	a
R94	Fuels	a
R95	Fuels	a
R96	Diesel	b
Stainless Steel Kettle	Organic liquid	a
T#24	Organic liquid	b
T#25	Organic liquid	b
TF 1 - Thin Film Evaporator	Organic liquid	a
TF 2 - Thin Film Evaporator	Organic liquid	a
TF 3 - Thin Film Evaporator	Organic liquid	a
Vacuum Pot 24	Organic liquid	a
Vacuum Pot 25	Organic liquid	a

Notes

a - See the Bay Area Air Quality Management District (BAAQMD) Permit to Operate that expires June 1, 2000 and Romic's Part B Permit application.

b - Information from site personnel.

Table C.20
DaRos Associates' Boiler Exhaust Source Test Results
Romic Facility, East Palo Alto, California

Measurement	Value/Units	Run 1	Run 2	Run 3	Note	Average
Chloride Ion (from HCl measurements)	mass (mg)	63.7	61.1	57.8	a	-
	sample volume (dscf)	16.8	16.5	16.8	a	-
	sample volume (dscm)	0.476	0.466	0.475	-	-
	ppm	92.4	90.4	83.9	b	**88.9**
VOCs (after triple scrubber)	ppm	2770	2750		c	**2760**
VOCs (after boiler)	ppm	58	56	33	d	**49**
Post-scrubber volumetric flow rate	cfm	4	-	-	e	-
Post-incinerator volumetric flow rate	dscfm	4333.5	4321.7	4255	a	**4303**
% total volumetric outflow from scrubber	percentage	0.09%	-	-	-	-
Average chloride ion concentration in boiler exhaust	g/m3	0.129	-	-	f	-
	ppm	88.9	-	-	f	-
Average chloride ion concentration in scrubber throughput	g/m3	138.6	-	-	f	-
	ppm	95,651	-	-	f	-
Ratio of post-scrubber system VOCs to Cl-		0.029	-	-	-	-
VOCs in boiler exhaust (due to dilution; no thermal oxidation)	ppm	2.57	-	-	g	-
VOCs in boiler exhaust from scrubber	ppm	0.26	-	-	h	-

Note:

a Data comes from Table 3 of the VOC Reduction System Compliance Test Report from the stack test on May 10, 1993.

b Calculation comes from Ideal Gas equation, assuming 1 atm pressure and 25 degrees Celsius.

c Data comes from Table 2 of the VOC Reduction System Compliance Test Report for the last stage (S-2) of the triple scrubber unit.

d Data comes from Table 1 of the VOC Reduction System Compliance Test Report for the outlet of the incinerator. This value includes both VOCs from the waste stream entering the boiler and VOCs from the natural gas consumed in the boiler.

e The scrubber has an approximate volumetric flowrate of 4 cfm (Julia Bussey).

f These calculations come from a mass balance on the boiler. We assume that the absolute content of chloride ion in the system remains unchanged from post--scrubber system to post-boiler exhaust, ie chloride ions are not reacted in the boiler.

g This VOC value for the boiler exhaust is for VOCs solely from the waste stream entering the boiler.

h The boiler burns at least 90% of the VOC stream from the scrubber, so the balance of VOCs must be from fuel.

Table C.21
Natural Gas Combustion
Romic Facility, East Palo Alto, California

Compound	Emission Factor	
	lb/10^6scf	lb/MMBtu
Benzene	2.10E-03	2.06E-06
Formaldehyde	7.50E-02	7.35E-05
Toluene	3.40E-03	3.33E-06
Total	8.05E-02	7.89E-05

Reference:

United States Environmental Protection Agency (USEPA). 1998. Compilation of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources. November. Chapter 1 Table 1.4-3.

Table C.22

Emissions Estimates for Sieves[a]

Romic Facility, East Palo Alto, California

Emissions from the sieves occur during regeneration of the sieves

THF Molecular Sieve

Parameter	Value	Units	Notes
Regeneration Events	4	number/year	b
Total Volume	37.4	cubic feet	c
Percent of Volume Containing Solvent Vapors	10%	percent	d
Density of Solvent	42	pounds/cubic feet	e
Annual VOC Emissions	628	pounds/year	f

Freon Molecular Sieve

Parameter	Value	Units	Notes
Regeneration Events	0	number/year	g
Annual VOC Emissions	0	pounds/year	-

Portable Molecular Sieve

Parameter	Value	Units	Notes
Annual VOC Emissions	0	pounds/year	h

Notes:

a - Emissions estimates based on the period from June 2000 through December 2000 (e-mail from Brian Blagg dated 1/11/01).

b - The sieves are regenerated after every 3000 gallons processed and 5000 gallons were processed in the THF molecular sieves between June 2000 and December 2000 (e-mail from Brian Blagg dated 1/11/01).

c - Volume based on a cylinder with a circumference of 57 inches and a height of 125 inches (fax from Ross Wilson dated 12/1/00 and e-mail from Brian Blagg dated 1/11/01).

d - Estimate of 10% based on information that prior to the regeneration process, the residual in the sieves is blown back into the "wet tank" with air coming from the top of the sieves and there are valves in the piping to the wet tank that do not allow back flow (please note that much of the air space in the sieves is taken up by the adsorbent) (conversation with Red Howard during site visit on 12/21/00).

e - Density of fuels stream mixture (email from John Arden dated 9/30/99).

f - Assume solvent vapor within sieves prior to regeneration is emitted.

g - According to facility records, the freon molecular sieves did not operate between June 2000 and December 2000 (e-mail from Brian Blagg 1/11/01).

h - During regeneration, the portable molecular sieves exhaust to the vacuum pots which exhaust to the VOC abatement system. Therefore, emissions from the portable molecular sieves are included with emissions from the VOC abatement system.

Table C.23a
OVA Readings for Clarifier B#3
Romic Facility, East Palo Alto, California

Date	Reading (ppm)	Methane (ppm)	VOC (C1) (ppm)	VOC (C1) (ppm) w/1/2DL	Background (ppm)
2-Jan-98	3	1	2	2	
9-Jan-98	7	1.5	5.5	5.5	4
13-Jan-98	9	1.5	7.5	7.5	5
20-Jan-98	4	0	4	4	7
30-Jan-98	7	0.5	7	7	7
4-Feb-98	5.5	1	4.5	4.5	4.5
9-Feb-98	4	0	4	4	7
20-Feb-98	4	1	3	3	6
27-Feb-98	4	0	4	4	9
6-Mar-98	10	3	7	7	6
10-Mar-98	1	0	1	1	3
19-Mar-98	3.5	1	2.5	2.5	3.5
26-Mar-98	3.5	1	2.5	2.5	3
30-Mar-98	0	0	0	0	9
7-Apr-98	1	0	1	1	2.5
17-Apr-98	3	0.5	2.5	2.5	6
22-Apr-98	4	0	4	4	9
28-Apr-98	7	2.5	4.5	4.5	4
7-May-98	5	0.5	4.5	4.5	5
15-May-98	3	< 1	3	3	2.5
18-May-98	1	0.5	0.5	0.5	2
29-May-98	5.5	1	4.5	4.5	2
2-Jun-98	3	1	2	2	2
8-Jun-98	2	1	1	1	1
17-Jun-98	7	5	2	2	5
25-Jun-98	5	2	3	3	6
1-Jul-98	6	3	3	3	6
7-Jul-98	3	1	2	2	4
16-Jul-98	3	1	2	2	2
22-Jul-98	7	2.5	4.5	4.5	1
30-Jul-98	5	2	3	3	2
5-Aug-98	3	1	2	2	3
12-Aug-98	3	0	3	3	2
20-Aug-98	2	1	1	1	1
25-Aug-98	1.5	0	1.5	1.5	3
3-Sep-98	1	0	1	1	2
9-Sep-98	3	1	2	2	1
18-Sep-98	0	0	0	0	2
23-Sep-98	1	1	0	0	2
29-Sep-98	1	0	1	1	2
7-Oct-98	0	0	0	0	3
14-Oct-98	6	2	4	4	4
29-Oct-98	7	0	7	7	3
4-Nov-98	3	0	3	3	3
9-Nov-98	2	0	2	2	2
16-Nov-98	0	0	0	0	3
24-Nov-98	3	1	2	2	6
2-Dec-98	4	2	2	2	3
8-Dec-98	0	0	0	0	0
17-Dec-98	0	0	0	0	0
22-Dec-98	1	0	1	1	0
30-Dec-98	0	0	0	0	0
Average				2.58	

Note that some measurements are below background.

Table C.23b
OVA Readings for Clarifier B#3A
Romic Facility, East Palo Alto, California

Date	Reading (ppm)	Methane (ppm)	VOC (C1) (ppm)	VOC (C1) (ppm) w/1/2DL	Background (ppm)
2-Jan-98	4	1	3	3	
9-Jan-98	6	2	4	4	4
13-Jan-98	5	1	4	4	5
20-Jan-98	8	3	5	5	7
30-Jan-98	9	4	5	5	7
4-Feb-98	2	0.5	1.5	1.5	4.5
9-Feb-98	5.5	0.5	5	5	7
20-Feb-98	3	0	3	3	6
27-Feb-98	3	0.5	2.5	2.5	9
6-Mar-98	10	2	8	8	6
10-Mar-98	1	0	1	1	3
19-Mar-98	6	2	4	4	3.5
26-Mar-98	2	1	1	1	3
30-Mar-98	0	0	0	0	9
7-Apr-98	1	0.5	0.5	0.5	2.5
17-Apr-98	3	0	3	3	6
22-Apr-98	4	0	4	4	9
28-Apr-98	6	2	4	4	4
7-May-98	5	1	4	4	5
15-May-98	4	2.5	1.5	1.5	2.5
18-May-98	6	2	4	4	2
29-May-98	1	0	1	1	2
2-Jun-98	7	3.5	3.5	3.5	2
8-Jun-98	2	0	2	2	1
17-Jun-98	8	5	3	3	5
25-Jun-98	8	4	4	4	6
1-Jul-98	7	3	4	4	6
7-Jul-98	2	1	1	1	4
16-Jul-98	2	1	1	1	2
22-Jul-98	2	2	0	0	1
30-Jul-98	4	1	3	3	2
5-Aug-98	1	0	1	1	3
12-Aug-98	4	1	3	3	2
20-Aug-98	0	0	0	0	1
25-Aug-98	0	0	0	0	3
3-Sep-98	0	0	0	0	2
9-Sep-98	2	0	2	2	1
18-Sep-98	0	0	0	0	2
23-Sep-98	1	0	1	1	2
29-Sep-98	1	0	1	1	2
7-Oct-98	1	0	1	1	3
14-Oct-98	10	8	2	2	4
29-Oct-98	5	1	4	4	3
4-Nov-98	4	0	4	4	3
9-Nov-98	1	0	1	1	2
16-Nov-98	1	0	1	1	3
24-Nov-98	3	0	3	3	6
2-Dec-98	3	0	3	3	3
8-Dec-98	0	0	0	0	0
17-Dec-98	0	0	0	0	0
22-Dec-98	2	0	2	2	0
30-Dec-98	0	0	0	0	0
Average				2.30	

Note that some measurements are below background.

Table C.23c
OVA Readings for Clarifier B#4
Romic Facility, East Palo Alto, California

Date	Reading (ppm)	Methane (ppm)	VOC (C1) (ppm)	VOC (C1) (ppm) w/1/2DL	Background (ppm)
2-Jan-98	0	0	0	0	
9-Jan-98	< 1	< 1	< 1	0.5	4
13-Jan-98	2	0	2	2	5
20-Jan-98	0	0	0	0	7
30-Jan-98	1.5	0	1.5	1.5	6
4-Feb-98	1	0	1	1	4.5
9-Feb-98	2.5	0	2.5	2.5	7
20-Feb-98	1	0	1	1	6
27-Feb-98	0	0	0	0	9
6-Mar-98	2	0	2	2	6
10-Mar-98	0.5	0	0.5	0.5	3
19-Mar-98	0	0	0	0	3.5
26-Mar-98	0.5	0	0.5	0.5	3
30-Mar-98	2	0	2	2	13
7-Apr-98	0	0	0	0	2.5
17-Apr-98	1	0	1	1	6
22-Apr-98	2	1	1	1	9
28-Apr-98	1	0	1	1	3
7-May-98	1	0	1	1	5
15-May-98	2.5	0	2.5	2.5	2.5
18-May-98	0	0	0	0	2
29-May-98	1	0	1	1	2
2-Jun-98	0	0	0	0	2
8-Jun-98	0	0	0	0	1
17-Jun-98	0	0	0	0	5
25-Jun-98	1	1	0	0	6
1-Jul-98	2	1	1	1	6
7-Jul-98	1	0	1	1	4
16-Jul-98	0	0	0	0	2
22-Jul-98	0	0	0	0	1
30-Jul-98	2	1	1	1	2
5-Aug-98	1	0	1	1	3
12-Aug-98	2	1	1	1	2
20-Aug-98	1	0	1	1	1
25-Aug-98	0.5	0.5	0	0	3
3-Sep-98	1	0	1	1	2
9-Sep-98	1	0	1	1	1
18-Sep-98	0	0	0	0	2
23-Sep-98	0	0	0	0	2
29-Sep-98	0	0	0	0	2
7-Oct-98	0	0	0	0	3
14-Oct-98	3	2	1	1	4
29-Oct-98	2	0	2	2	3
4-Nov-98	0	0	0	0	3
9-Nov-98	0	0	0	0	2
16-Nov-98	0	0	0	0	3
24-Nov-98	0	0	0	0	6
2-Dec-98	0	0	0	0	3
8-Dec-98	2	0	2	2	0
17-Dec-98	3	0	3	3	0
22-Dec-98	0	0	0	0	0
30-Dec-98	0	0	0	0	0
Average				0.712	

Note that some measurements are below background.

Table C.23d
OVA Readings for Clarifier B#4A
Romic Facility, East Palo Alto, California

Date	Reading (ppm)	Methane (ppm)	VOC (C1) (ppm)	VOC (C1) (ppm) w/1/2DL	Background (ppm)
2-Jan-98	0	0	0	0	
9-Jan-98	2	0	2	2	4
13-Jan-98	2	< 1	1	1	5
20-Jan-98	0	0	0	0	7
30-Jan-98	4	0.5	3.5	3.5	6
4-Feb-98	1	0	1	1	4.5
9-Feb-98	1.5	0	1.5	1.5	7
20-Feb-98	1	0	1	1	6
27-Feb-98	0	0	0	0	9
6-Mar-98	4	0	4	4	6
10-Mar-98	1	0	1	1	3
19-Mar-98	0.5	0	0.5	0.5	3.5
26-Mar-98	0.5	0.5	0	0	3
30-Mar-98	0	0	0	0	13
7-Apr-98	0	0	0	0	2.5
17-Apr-98	2.5	0	2.5	2.5	6
22-Apr-98	1	0	1	1	9
28-Apr-98	2	0	2	2	3
7-May-98	1	< 1	< 1	0.5	5
15-May-98	2	2	0	0	2
18-May-98	0.5	0	0.5	0.5	2
29-May-98	0	0	0	0	2
2-Jun-98	0	0	0	0	2
8-Jun-98	0	0	0	0	1
17-Jun-98	2.5	1	1.5	1.5	5
25-Jun-98	2	2	0	0	6
1-Jul-98	0	0	0	0	6
7-Jul-98	1	0	1	1	4
16-Jul-98	0	0	0	0	2
22-Jul-98	0.5	0	0.5	0.5	1
30-Jul-98	2	1	1	1	2
5-Aug-98	1	0	1	1	3
12-Aug-98	2	0	2	2	2
20-Aug-98	1	0	1	1	1
25-Aug-98	0	0	0	0	3
3-Sep-98	1	0	1	1	2
9-Sep-98	0	0	0	0	1
18-Sep-98	0	0	0	0	2
23-Sep-98	0	0	0	0	2
29-Sep-98	1	0	1	1	2
7-Oct-98	0	0	0	0	3
14-Oct-98	2	0	2	2	4
29-Oct-98	2	0	2	2	3
4-Nov-98	0	0	0	0	3
9-Nov-98	1	0	1	1	2
16-Nov-98	0	0	0	0	3
24-Nov-98	0	0	0	0	6
2-Dec-98	1	1	0	0	3
8-Dec-98	1	0	1	1	0
17-Dec-98	4	1	3	3	0
22-Dec-98	1	1	0	0	0
30-Dec-98	0	0	0	0	0
Average				0.788	

Note that some measurements are below background.

Table C.23e
Waste Water Treatment Operations Emission Estimate
Romic Facility, East Palo Alto, California

Parameter	Symbol	Value	Unit	Notes
Average Local Wind Speed at 10 meters	u_z	3.0	meters/second	-
Height of Clarifier from Ground	z_a	3.7	meters	-
Average Wind Speed at Top of Clarifier	u_a	2.2	meters/second	a
Height of Edge of Clarifier to Liquid Surface	h	0.042	feet	-
Diameter of Clarifiers B#3 and B#3A	d	4.43	meters	-
Diameter of Clarifiers B#4 and B#4A	d	3.50	meters	-
MW of Stream	-	65.4	grams/mole	b
Average Concentration above Tank 3	C_{OVA}	2.58	ppm	c,h
		7012	micrograms/cubic meter	-
VOC Emission Rate Tank 3	E_{VOC}	8.7E-04	grams/second	d
Average Concentration above Tank 3A	C_{OVA}	2.30	ppm	e,h
		6253	micrograms/cubic meter	-
VOC Emission Rate Tank 3A	E_{VOC}	7.7E-04	grams/second	d
Average Concentration above Tank 4	C_{OVA}	0.712	ppm	f,h
		1936	micrograms/cubic meter	-
VOC Emission Rate Tank 4	E_{VOC}	1.9E-04	grams/second	d
Average Concentration above Tank 4A	C_{OVA}	0.788	ppm	g,h
		2146	micrograms/cubic meter	-
VOC Emission Rate Tank 4A	E_{VOC}	2.1E-04	grams/second	d
Total Annual VOC Emissions	-	0.07	tons/year	-

Notes:

a - Determined using the power-law for wind speed (Reference: Turner, Bruce D. *Workbook of Atmospheric Dispersion Estimates: An Introduction to Dispersion Modeling* . Boca Raton: Lewis Publishers, 1994.) where $u_a = u_z (z_a/z)^p$, z is the height of the anemometer, and p varies from 0.07 for unstable conditions to about 0.55 for stable conditions. An average p value of 0.31 was used.

b - Weighted average molecular weight of the organic vapor stream.

c - See Table D-17a

d - $E_{VOC} = uhd(C_{OVA})$

e - See Table D-17b

f - See Table D-17c

g - See Table D-17d

h - Note that concentrations are conservative since measured backgound concentrations were not subtracted from measured values.

Table C.24
T13 and B2 Emission Estimate
Romic Facility, East Palo Alto, California

Parameter	Symbol	Value	Unit	Notes
Average Wind Speed at 10 meters	u_z	3.0	meters/second	-
Source Release Height	z_a	3.4	meters	-
Average Wind Speed at Top of Clarifier	u_a	2.1	meters/second	a
Height of Source	h	0.58	feet	-
Width of Source	d	0.58	feet	-
MW of Stream	-	65.4	grams/mole	b
Average Concentration at Outlet of Source	C_{OVA}	0.864	ppm	c
		2350	micrograms/cubic meter	-
VOC Emission Rate	E_{VOC}	1.6E-04	grams/second	d
Total Annual VOC Emissions		0.005	tons/year	-

Notes:

a - Determined using the power-law for wind speed (Reference: Turner, Bruce D. *Workbook of Atmospheric Dispersion Estimates: An Introduction to Dispersion Modeling* . Boca Raton: Lewis Publishers, 1994.) where $u_a = u_z (z_a/z)^p$, z is the height of the anemometer, and p varies from 0.07 for unstable conditions to about 0.55 for stable conditions. An average p value of 0.31 was used.

b - Weighted average molecular weight of the organic vapor stream.
c - See table below.
d - $E_{VOC} = uhd(C_{OVA})$

OVA Readings for Outlet of Carbon Adsorption Unit

Date	Inlet	Midstream (btw. C bed)	Outlet	Outlet (ppm) w/1/2DL	Background
2-Jan-98	21250	515	< 1	0.5	13ppm
9-Jan-98	1050	250	2	2	11ppm
13-Jan-98	2150	650	< 1	0.5	
20-Jan-98	1075	450	< 1	0.5	
30-Jan-98	1750	200	1	1	12ppm
4-Feb-98	1050	250	1	1	4ppm
9-Feb-98	2000	500	< 1	0.5	
20-Feb-98	1000	500	< 1	0.5	
27-Feb-98	2500	850	1	1	8ppm
6-Mar-98	3000	280	1	1	
10-Mar-98	5000	150	1	1	10ppm
19-Mar-98	2000	275	1	1	4ppm
26-Mar-98	1050	175	1	1	2 ppm
30-Mar-98	2000	600	< 1	0.5	8ppm
7-Apr-98	900	600	1	1	
17-Apr-98	1000	130	1	1	5ppm
22-Apr-98	2025	250	1	1	
28-Apr-98	1025	65	< 1	0.5	3ppm
7-May-98	1075	425	1	1	6.5ppm
15-May-98	950	300	2.5	2.5	2.75ppm
18-May-98	1100	300	1	1	2ppm
29-May-98	1000	80	< 1	0.5	1.5ppm
2-Jun-98	1025	100	< 1	0.5	2.5ppm
8-Jun-98	2000	175	< 1	0.5	1ppm
17-Jun-98	2025	250	1	1	5 ppm
25-Jun-98	2050	1000	1	1	3 ppm
1-Jul-98	1750	250	1.5	1.5	5ppm
7-Jul-98	1950	1000	1	1	3 ppm
16-Jul-98	1075	125	<1	0.5	2 ppm
22-Jul-98	1050	100	<1	0.5	2ppm
30-Jul-98	1000	80	<1	0.5	2ppm
5-Aug-98	1200	150	<1	0.5	4ppm
12-Aug-98	1000	90	<1	0.5	2ppm
20-Aug-98	1000	70	<1	0.5	2ppm
25-Aug-98	150	5	4	4	1ppm
3-Sep-98	700	80	<1	0.5	2ppm
9-Sep-98	1000	100	<1	0.5	2ppm
18-Sep-98	1050	30	<1	0.5	2ppm
23-Sep-98	1000	80	<1	0.5	2ppm
29-Sep-98	1000	170	<1	0.5	
7-Oct-98	100	150	<1	0.5	
14-Oct-98	800	85	<1	0.5	4ppm
29-Oct-98	1700	150	<1	0.5	4ppm
4-Nov-98	1050	700	1	1	3ppm
Average				0.864	

Table C.25
Truck Cleaning
Romic Facility, East Palo Alto, California

AP-42 Table 4.8-2 Emission Factors for Tank Truck Cleaning

Compound	Chemical Class		Total Emissions		%	g/truck
	Vapor Pressure	Viscosity	g/truck	lb/truck		
Acetone	high	low	311	0.686	100%	311
Perchloroethylene	high	low	215	0.474	0%	0
Methyl methacrylate	medium	medium	32.4	0.071	0%	0
Phenol	low	low	5.5	0.012	0%	0
Propylene glycol	low	high	1.07	0.002	0%	0
				Total	**100%**	**311**

Data for Truck Washing comes from AP-42 Section 4.8 "Tank and Drum Cleaning". We assumed that the composition of residue in the trucks was 100% acetone, since that value yields the most conservative estimate for emissions for truck cleaning.

Reference:

United States Environmental Protection Agency (USEPA). 1998.
Compilation of Air Pollutant Emission Factors AP-42, Fifth Edition,
Volume I: Stationary Point and Area Sources. November.

APPENDIX D
Air Dispersion Model Files

Appendix D

Air Dispersion Modeling Files

Description of file naming scheme:

Included on this CD-ROM are the output files for ENVIRON's air dispersion modeling runs for Romic's, East Palo Alto, California, Health Risk Assessment. Below is a list of all of the files and a description of each file.

Filename	Description
Rom89an.lst	Model with 24 hours per day emissions and 1989 Moffett Field surface meteorological data.
Rom89wa.lst	Model with 8 hours per day emissions (Hours 1-8) and 1989 Moffett Field surface meteorological data.
Rom89wb.lst	Model with 8 hours per day emissions (Hours 9-16) and 1989 Moffett Field surface meteorological data.
Rom89wc.lst	Model with 8 hours per day emissions (Hours 17-24) and 1989 Moffett Field surface meteorological data.
Rom90an.lst	Model with 24 hours per day emissions and 1990 Moffett Field surface meteorological data.
Rom90wa.lst	Model with 8 hours per day emissions (Hours 1-8) and 1990 Moffett Field surface meteorological data.
Rom90wb.lst	Model with 8 hours per day emissions (Hours 9-16) and 1990 Moffett Field surface meteorological data.
Rom90wc.lst	Model with 8 hours per day emissions (Hours 17-24) and 1990 Moffett Field surface meteorological data.
Rom91an.lst	Model with 24 hours per day emissions and 1991 Moffett Field surface meteorological data.
Rom91wa.lst	Model with 8 hours per day emissions (Hours 1-8) and 1991 Moffett Field surface meteorological data.
Rom91wb.lst	Model with 8 hours per day emissions (Hours 9-16) and 1991 Moffett Field surface meteorological data.
Rom91wc.lst	Model with 8 hours per day emissions (Hours 17-24) and 1991 Moffett Field surface meteorological data.
Rom92an.lst	Model with 24 hours per day emissions and 1992 Moffett Field surface meteorological data.
Rom92wa.lst	Model with 8 hours per day emissions (Hours 1-8) and 1992 Moffett Field surface meteorological data.
Rom92wb.lst	Model with 8 hours per day emissions (Hours 9-16) and 1992 Moffett Field surface meteorological data.
Rom92wc.lst	Model with 8 hours per day emissions (Hours 17-24) and 1992 Moffett Field surface meteorological data.
Rom93an.lst	Model with 24 hours per day emissions and 1993 Moffett Field surface meteorological data.

Rom93wa.lst	Model with 8 hours per day emissions (Hours 1-8) and 1993 Moffett Field surface meteorological data.
Rom93wb.lst	Model with 8 hours per day emissions (Hours 9-16) and 1993 Moffett Field surface meteorological data.
Rom93wc.lst	Model with 8 hours per day emissions (Hours 17-24) and 1993 Moffett Field surface meteorological data.
Rom94an.lst	Model with 24 hours per day emissions and 1994 San Carlos surface meteorological data.
Rom94wa.lst	Model with 8 hours per day emissions (Hours 1-8) and 1994 San Carlos surface meteorological data.
Rom94wb.lst	Model with 8 hours per day emissions (Hours 9-16) and 1994 San Carlos surface meteorological data.
Rom94wc.lst	Model with 8 hours per day emissions (Hours 17-24) and 1994 San Carlos surface meteorological data.
Rom95an.lst	Model with 24 hours per day emissions and 1995 San Carlos surface meteorological data.
Rom95wa.lst	Model with 8 hours per day emissions (Hours 1-8) and 1995 San Carlos surface meteorological data.
Rom95wb.lst	Model with 8 hours per day emissions (Hours 9-16) and 1995 San Carlos surface meteorological data.
Rom95wc.lst	Model with 8 hours per day emissions (Hours 17-24) and 1995 San Carlos surface meteorological data.
Rom96an.lst	Model with 24 hours per day emissions and 1996 San Carlos surface meteorological data.
Rom96wa.lst	Model with 8 hours per day emissions (Hours 1-8) and 1996 San Carlos surface meteorological data.
Rom96wb.lst	Model with 8 hours per day emissions (Hours 9-16) and 1996 San Carlos surface meteorological data.
Rom96wc.lst	Model with 8 hours per day emissions (Hours 17-24) and 1996 San Carlos surface meteorological data.
Rom97an.lst	Model with 24 hours per day emissions and 1997 San Carlos surface meteorological data.
Rom97wa.lst	Model with 8 hours per day emissions (Hours 1-8) and 1997 San Carlos surface meteorological data.
Rom97wb.lst	Model with 8 hours per day emissions (Hours 9-16) and 1997 San Carlos surface meteorological data.
Rom97wc.lst	Model with 8 hours per day emissions (Hours 17-24) and 1997 San Carlos surface meteorological data.
Rom98an.lst	Model with 24 hours per day emissions and 1998 San Carlos surface meteorological data.
Rom98wa.lst	Model with 8 hours per day emissions (Hours 1-8) and 1998 San Carlos surface meteorological data.
Rom98wb.lst	Model with 8 hours per day emissions (Hours 9-16) and 1998 San Carlos surface meteorological data.
Rom98wc.lst	Model with 8 hours per day emissions (Hours 17-24) and 1998 San Carlos surface meteorological data.

For Appendix D Modeling Files see hard copy document.

APPENDIX E
Ecological Risk Assessment