APPENDIX F

Pilot Study No. 3 Emissions Assessment, Emissions Control Agent Testing, and Dispersion Modeling Analysis

Appendix F
Pilot Study No. 3 Emissions Assessment, Emissions Control Agent Testing, and Dispersion Modeling Analysis

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F1	The Technical Memorandum titled "Results of the Air Pathway Analysis Using the USEPA Downhole Flux Chamber and Surface Flux Chamber Technology" by C. E. Schmidt, Ph.D, August 2004
F2	"Emissions Potential Analysis" by GeoSyntec Consultants
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APPENDIX F
PILOT STUDY NO. 3 EMISSIONS ASSESSMENT, EMISSIONS CONTROL AGENT TESTING, AND DISPERSION MODELING ANALYSIS

Introduction

The second main objective of Pilot Study No. 3 was to “collect data on the nature, magnitude, and possible rates of odor and chemical emissions that may be generated by the buried waste materials at the Site when excavated and handled” (PNL, 2004a). This objective was needed because investigations prior to Pilot Study No. 3 focused on steady-state impacts to perimeter air during periods without remedial activities at the Site. In contrast, Pilot Study No. 3 included collection of data to investigate emission potential of the various wastes found onsite and impacts to perimeter air during remedial activity.

This objective was fulfilled, in part, through collection of downhole flux data to estimate the emissions potential of waste when exposed to ambient air. Concentrations of chemical compounds and odor from downhole flux were quantified for use in dispersion modeling. This dispersion modeling estimated the threshold excavation cut-face surface areas and respective distances from the Site perimeter that could be exposed without adversely impacting receptors at the fence line. Perimeter air collection and analyses (see Section 3.4) focused on measuring impacts to ambient air during the more invasive Phases of assessment--Phase III (trenching), Phase IV (lagoon trenching), and Phase VIII (Pit F and Pit F area sampling).

In addition to downhole flux assessment, freshly exposed samples of waste were tested *ex situ* for volatile emissions using surface flux assessment technology. After establishing an emission baseline for each waste type, various emission control agents were applied to each waste to assess effectiveness in emission control using the same apparatus.

The remainder of Appendix F is organized as follows:

- Section F.1 — Contains a summary of downhole flux testing results,
- Section F.2 — Contains a summary of emission control agent testing results,
- Section F.3 — Contains an overview of the dispersion modeling methods and considerations toward implementation of excavation at the Site,
- Attachment F1 — The Technical Memorandum titled “Results of the Air Pathway Analysis Using the USEPA Downhole Flux Chamber and Surface Flux Chamber Technology” by C. E. Schmidt, Ph.D., documenting the downhole and surface flux objectives, fieldwork, analytical results, and QA/QC and presenting the analysis of the flux data, with accompanying tables. Attached to Attachment F1 are the field data collection sheets, the chain-of-custody forms, all analytical laboratory reports for chemical and odor analyses of flux, and downhole flux emission profile plots. This attachment documents all the down-hold flux testing and emission control agent testing (surface flux testing) done as part of Pilot Study No. 3.
- Attachment F2 — The memorandum titled “Emissions Potential Analysis” by GeoSyntec Consultants explaining the dispersion modeling approach and results, with accompanying tables.

- Attachment F3 – Index of laboratory reports.

F.1 Pilot Study No. 3 Downhole Flux Data

Field measurements of downhole flux were conducted at the Site in spring and summer of 2004. The testing was conducted by Project Navigator in association with Geosyntec Consultants and by Dr. CE Schmidt and is documented in the attached technical memorandum, "Results of the Air Pathway Analysis Using the USEPA Downhole Flux Chamber and Surface Flux Chamber Technology," (Attachment F1).

The project consisted of measuring the subsurface flux of project compounds (VOCs, sulfur compounds, and odor) at multiple depths and at selected locations accessed by hollow-stem drill rig augering. The downhole flux measurements were part of Phases I and VIII of Pilot Study No. 3. The emphasis of this testing effort was to determine the nature and extent of vapor phase emissions of subsurface compounds that may be evolved during Site remedial activities.

Hydrocarbon speciation data are reported in Attachment F-1 in concentration units (ppmv as reported by the laboratory for TO-3 and ug/m3 for TO-15) and in flux units (ug/m2,min-1 [micrograms per square meter per minute]). Likewise, reduced sulfur compound data are reported in concentration units (ug/m3) and flux units (ug/m2,min-1). Odor data are reported in odor concentration units (D/T- dilution to threshold levels) as well as in odor flux units ((D/T)/m2,min-1). Emission control agent test data are reported in percent control efficiency, where appropriate.

F.1.1 Pilot Study No. 3: Downhole Flux Chamber Chemical Testing

Subsurface flux was measured using the USEPA Downhole Flux Chamber (flux chamber) at a total of 15 Phase I locations and 7 Phase VIII locations at one or more depths between the shallow soil (5' below land surface ["BLS"]) to just above groundwater (approximately 27' BLS). The standard approach during Phase I was to measure the subsurface flux downhole in the boring at six-foot intervals in and around the waste material layers in selected Site locations. Phase VIII flux measurements were done as impacted materials were observed. Some exploratory borings had only one or a few interval tests.

The purpose of this component of Phase I was to assess the subsurface flux of project compounds at depth. Real time data were collected using a flame ionization detector ("FID") and photoionization detector ("PID") to learn something about the characteristics of the waste at depth per location. Each downhole flux measurement was assigned a characteristic emission profile: soil gas, source like, and source.

- A soil gas character generates an emission profile that is rather transient and does not persist. It may not need the same level of emission control as a source character material.

- Source emissions is characterized as persistent profile and would be more likely requiring emissions control as compared to other materials will lesser emissions potential.

A summary of these emission profiles arranged to represent the soil column is shown in Attachment F-1 for all borings.

In addition, typically one sample was collected using evacuated canisters for offsite analysis by USEPA Method TO-15 for volatile organic compounds ("VOC"), USEPA Method TO-3 for total petroleum hydrocarbons, and, during Phase VIII, ASTM D-5504-91 for sulfur compounds. **Tables F.1-1** to **F.1-6** summarize all of the compounds detected in downhole flux from the borings associated with each waste stream[1].

These chemical data are used along with excavation/waste handling scenarios to estimate potential impacts to offsite receptors. The flux data serve as input to a dispersion model for estimating offsite ambient concentrations (see Section F.3 and Attachment F2).

F.1.2 Pilot Study No. 3: Downhole Flux Chamber Odor Testing

Sample collection from downhole testing was also conducted at selected locations for offsite analysis by ASTM E-679-91 for olfactory odor. These samples were analyzed for olfactory characteristics including intensity and odor characteristics. Laboratory reports that include details regarding the testing methods are found in Attachment 3 of Attachment F1. From these data, odor is characterized by relative intensity to help forecast any potential odor problems during phases of Site remediation. The odor data are also used along with excavation/waste handling scenarios to estimate potential adverse impacts to offsite receptors (see Section F.3 and Attachment F2).

F.2 Pilot Study No. 3 -- Emission Control Agent Testing

During Phases II, IV, and VIII of Pilot Study No. 3, representative waste materials from the former lagoon areas, the lagoons, and the Pit F area were used to evaluate the surface flux of untreated waste materials and to evaluate the efficiency of select emission agent control compounds. The emission rate testing was performed using the USEPA surface emission isolation flux chamber (flux chamber). The data from the downhole flux chamber testing were used to specifically identify the highest emitting subsurface waste material for testing.

Emission control agent testing during Phase II included the evaluation of control efficiency of seven control agents-- Rusmar® foam, Petroclean®, Microblaze®, Biosolve®, Alabaster CS1®, Alabaster CS1 with Microbes, and water. Subsequent testing during Phase IV and VIII included only the Alabaster and Rusmar products as they had the most promising results from Phase II testing.

For each waste type, the waste material was placed in a wheelbarrow and tested without agent (uncontrolled) and then with each agent. Real time data (FID/PID) were reported and used to determine control efficiency. Some testing included canister and bag sample collection for off site analysis by USEPA Method TO-15 for VOCs, USEPA Method TO-3 for total petroleum hydrocarbons, ASTM E-679-91 for olfactory odor, and, during Phases IV and VIII, ASTM D-5504-91 for sulfur compounds. Summaries of the testing data and odor data are provided in Attachment F-1. In general, Rusmar foam was the agent that best controlled emissions and odors.

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1 The applicable waste streams and their corresponding borings used to develop the figures and tables are as follows:

Fill Soils:	PNL-8, PNL-10A, PNL-15, PNL-19
Drilling Muds:	PNL-1, PNL-2, PNL-3, PNL-9, PNL-12, PNL-13
Drilling Muds with High Liquids:	PNL-6, PNL-8, PNL-14
Impacted Soil:	PNL-4, PNL-5A
Pit F Area Soil:	PNL-F1, PNL-11
Native Soil:	PNL-F5, PNL-7, PNL-F19.

Hydrocarbon speciation flux data and odor flux data have been summarized for selected or key compounds for the emission control agent testing effort. Uncontrolled flux data as well as controlled flux data and calculated percent control efficiencies are reported for benzene, toluene, ethylbenzene, xylenes, styrene, and odor in Tables 20, 21, and 22 of Attachment F1.

F.3 Implementation Considerations Related to Emissions and Odors

Potential emissions of VOCs and odors from the waste materials must be considered during the evaluation of remedial alternatives. Dispersion modeling was performed using meteorological data that is considered conservative (e.g., results in higher predicted concentrations) to estimate the transport of chemicals from an excavation area to a hypothetical receptor at the property perimeter. Site-specific data on the flux rate of volatile chemicals and odor from waste materials were used in conjunction with the dispersion modeling results to evaluate potential hourly average (short-term) and annual average (long-term) receptor concentrations. **Figure F.3-1** presents a simplified summary of the process used for this analysis and illustrates the conceptual approach used to estimate potential emissions.

Ambient air concentrations of chemicals and odors were predicted for excavations of varying surface areas, consisting of 2,500, 5,000 and 7,500 square feet. Receptor distances of 100, 300, 600, and 1,000 feet were evaluated for each excavation scenario.

Average and maximum flux testing results for specific VOCs and odors were grouped into one of several waste stream designations including:

- Drilling muds (DM),
- Highly liquid drilling muds (HLDM),
- Fill materials (Fill),
- Impacted soils (IS),
- Pit area wastes, including Pit F area, and
- Native soils (Native).

The estimated average hourly and average annual exposure point concentrations for each of the receptor distance and excavation area scenarios were compared to risk-based (specific chemicals) and nuisance (odor) threshold values. If estimated concentrations exceeded threshold values the percent exceedance was calculated. A summary of these instances is included on **Tables F.3-1** through **F.3-9**. Percent exceedances greater than 90% are shown in bold face type, as these values exceed the likely efficiency of foams or suppressants in reducing chemical and odor emissions from waste materials for the specific cases analyzed. Details on the dispersion modeling and ambient air predictions are included in Attachment F2.

Based on the simplified modeling and calculations performed, specific key findings include:

- Nearly all exceedances of threshold criteria for specific chemicals are due to benzene. Ethylbenzene was the only other chemical where estimated exposure point concentrations exceeded threshold criteria.

- Waste streams that resulted in exceedances were drilling muds, highly liquid drilling muds, and Pit F waste materials. Native soil shows exceedance; however, the flux data assigned to the native soil material is likely not representative of true vapor conditions due to the close proximity of overlying impacted drilling mud.

The following comments are based on a simple mathematical extrapolation of the effectiveness of the foam suppressants in reducing impacts at the source and extending the same reduction to the receptors without remodeling each situation. In reality, these simple reductions of 80% to 90% at the source area would need to be modeled for each waste stream considering the sequence of construction, production rate, areas exposed, and other potential engineering controls. Based on the simplified averaging technique applied for this preliminary screening process, the following tentative findings should be considered when evaluating the alternatives and developing the final design and implementation sequence. Additional analyses and further pilot field testing of other types of emissions and odor controls may be required before a detailed emissions management plan can be developed during the final design.

- For a 2,500 ft^2 excavation area emission control measures such as foam is required for benzene emissions from drilling mud at distances less than 300 feet. Average benzene emissions from drilling muds at distances greater than 300 feet do not appear to require any special controls. At a distance of 100 feet the average benzene emissions will likely require mitigation measures beyond the use of foams or suppressants alone and may require a reduction in the exposed surface area by at least a factor of two.

- For the 5,000 ft^2 excavation area, benzene emissions from Pit F waste materials appear to require mitigation measures beyond the use of foams or suppressants alone at distances of 600 feet or less. Ethylbenzene emissions from the Pit F waste materials appear to only require controls such as foams at distances of less than 300 feet (**Tables F.3-1** and **F.3-2**). Alternatively, smaller excavation areas and lower production rates should be evaluated as an emission control strategy during the final design process. It may also be necessary to provide other emissions control technologies for the removal of the Pit F waste materials (e.g., enclosed structures with a negative pressure system of air control, or maintaining the excavation in a flooded condition during excavation to reduce emissions).

- For the 7,500 ft^2 excavation area, a similar trend to the 2,500 ft^2 excavation area for benzene and ethylbenzene emissions is predicted. However, the predicted concentrations are greater for specific receptor distances. Results indicate that the average benzene emissions from drilling muds require mitigation measures beyond the use of foams or suppressants alone at distances of 600 feet or less, and that foams alone are sufficient at distances of approximately 1,000 ft. Benzene emissions from the Pit F waste materials appear to require mitigation measures beyond use of foams or suppressants alone as discussed above (**Tables F.3-5** and **F.3-6**).

- Based on the calculations performed, it appears that short-term odors may be problematic during excavation of drilling muds, fill, and the Pit F waste materials for all distances and excavation sizes evaluated. Supplemental controls beyond the use of foams may be required (**Tables F.3-7** to **F.3-8**).

Note that the simplified modeling described above did not take into account the dilution affect that occurs once the foam suppressants are applied to the waste materials at the source area. Further evaluation of these issues should be conducted during the remedial design and monitored during implementation. The contractors selected to implement the remedy will develop the precise sequence of implementation activities, and therefore further evaluation of the potential for emissions and odors impacts should be deferred until the preferred remedy and a remedial contractor are selected. (See Attachment F2 for additional discussion of these issues.)

Table F.1-1

Chemical Detections from Downhole Flux Measurements in Fill
Ascon Landfill Site

			PNL-10A-13 DHF	PNL-15-12DHF	PNL-8-6-DHF	PNL-F19-4-S	PNL-F19-4-T
Component		Units	(TO-3/TO-15)	(TO-3/TO-15)	(TO-3/TO-15)	(ASTM D5504-98)	(TO-3/TO-15)
1,3-Butadiene		ug/m3	4.4	13	8.1	NA	6.15
2-Butanone (MEK)		ug/m3	21	14	51	NA	4.6
Acetone		ug/m3	91	ND	ND	NA	ND
Benzene		ug/m3	24	130	22	NA	ND
C4 as n-Butane		ppmv	ND	0.84	ND	NA	ND
C5 as n-Pentane		ppmv	ND	1.1	ND	NA	ND
C6+ as n-Hexane		ppmv	5.1	11	6	NA	3.3
Carbon Disulfide		ug/m3	13	6	6.1	45.9	7.15
Carbonyl Sulfide		ppbv	NA	NA	NA	7.6	NA
Dichloromethane (Methylene Chloride)		ug/m3	ND	ND	36	NA	ND
Ethylbenzene		ug/m3	63	140	100	NA	795
Hydrogen Sulfide		ppbv	NA	NA	NA	2.09	NA
m,p-Xylenes		ug/m3	52	160	190	NA	ND
Methane		ppmv	1700	1600	370	NA	4.4
o-Xylene		ug/m3	27	100	32	NA	ND
Styrene		ug/m3	5.2	ND	ND	NA	5
Toluene		ug/m3	20	86	13	NA	11
1,2,3-Trimethylbenzene	TIC	ug/m3	ND	ND	300	NA	ND
2-Methylpentane	TIC	ug/m3	ND	600	ND	NA	ND
alpha-Methylstyrene	TIC	ug/m3	ND	ND	ND	NA	50
alpha-Pinene	TIC	ug/m3	200	ND	ND	NA	ND
Biphenyl	TIC	ug/m3	ND	ND	ND	NA	95
C10H12 Aromatic Compound	TIC	ug/m3	ND	ND	ND	NA	200
C10H14 Aromatic Compounds	TIC	ug/m3	ND	ND	ND	NA	700
C10H22 Branched Alkane	TIC	ug/m3	90	500	ND	NA	ND
C12H18 Aromatic Compounds	TIC	ug/m3	ND	ND	ND	NA	70
C9H10 Aromatic Compound	TIC	ug/m3	ND	ND	ND	NA	300
C9H16 Compound	TIC	ug/m3	ND	500	400	NA	ND
C9H18 Compound	TIC	ug/m3	ND	ND	300	NA	ND
Cumene	TIC	ug/m3	ND	ND	ND	NA	2000
Dimethylcyclohexane Isomer	TIC	ug/m3	90	600	ND	NA	ND
Dimethylcyclopentane Isomers	TIC	ug/m3	380	2100	1600	NA	ND
d-Limonene	TIC	ug/m3	50	ND	ND	NA	ND

Table F.1-1
Chemical Detections from Downhole Flux Measurements in Fill
Ascon Landfill Site

			PNL-10A-13 DHF	PNL-15-12DHF	PNL-8-6-DHF	PNL-F19-4-S	PNL-F19-4-T
Hexamethylcyclotrisiloxane (Possible Artifact)	TIC	ug/m3	ND	ND	ND	NA	90
Isobutylbenzene	TIC	ug/m3	ND	ND	ND	NA	100
Isopentane	TIC	ug/m3	ND	900	300	NA	ND
Methylcyclohexane	TIC	ug/m3	100	800	600	NA	ND
Methylcyclopentane	TIC	ug/m3	200	900	600	NA	ND
Naphthalene	TIC	ug/m3	ND	ND	ND	NA	50
n-Butane	TIC	ug/m3	ND	700	ND	NA	ND
n-Hexane	TIC	ug/m3	40	ND	ND	NA	ND
n-Nonane	TIC	ug/m3	40	ND	ND	NA	ND
n-Pentane	TIC	ug/m3	ND	800	ND	NA	ND
n-Propylbenzene	TIC	ug/m3	ND	ND	ND	NA	40
Propane + Propene	TIC	ug/m3	90	ND	ND	NA	ND
Propene	TIC	ug/m3	ND	ND	ND	NA	50
sec-Butylbenzene	TIC	ug/m3	ND	ND	ND	NA	300
Tetramethylcyclohexane Isomer	TIC	ug/m3	90	ND	400	NA	ND
Tetramethylcyclopentane Isomer	TIC	ug/m3	ND	ND	300	NA	ND
Trimethylcyclohexane Isomer	TIC	ug/m3	200	900	700	NA	ND
Trimethylcyclopentane Isomers	TIC	ug/m3	100	1400	1600	NA	ND

TIC: Tentatively Identified Compound. Results are estimated.
ug/m3: micrograms per cubic meter
ppbv: parts per billion by volume
ND: not detected above reporting limit
NA: no analysis

Table F.1-2
Chemical Detections from Downhole Flux Measurements in Impacted Soil
Ascon Landfill Site

Component		Units	PNL-5A-11DHF (TO-3/TO-15)	PNL-F4-15-S (ASTM D5504-98)	PNL-F4-15-T (TO-3/TO-15)
2-Butanone (MEK)		ug/m3	8.2	NA	ND
Benzene		ug/m3	3.1	NA	15000
C6+ as n-Hexane		ppmv	2.1	NA	230
Carbon Disulfide		ppbv	0.69	23.6	ND
Carbonyl Sulfide		ppbv	NA	146	NA
Diethyl Sulfide		ppbv	NA	27.9	NA
Dimethyl Sulfide		ppbv	NA	6.79	NA
Ethyl Mercaptan		ppbv	NA	3.32J	NA
Ethyl Methyl Sulfide		ppbv	NA	4.31J	NA
Ethylbenzene		ug/m3	2.5	NA	250000
Hydrogen Sulfide		ug/m3	NA	15.4	NA
m,p-Xylenes		ug/m3	4.3	NA	ND
Methane		ppmv	380	NA	1200
o-Xylene		ug/m3	2.8	NA	ND
tert-Butyl Mercaptan		ug/m3	NA	14.6	NA
Tetrahydrothiophene		ug/m3	NA	13.4	NA
Thiophene		ug/m3	NA	9.21	NA
Toluene		ug/m3	3	NA	11000
3-Ethyltoluene	TIC	ug/m3	ND	NA	2000
alpha-Methylstyrene	TIC	ug/m3	ND	NA	40000
C10H14 Aromatic Compounds	TIC	ug/m3	ND	NA	30000
C11H22 Compound	TIC	ug/m3	200	NA	ND
C11H24 Branched Alkane	TIC	ug/m3	200	NA	ND
C11H24 Branched Alkane + Unidentified Compound	TIC	ug/m3	200	NA	ND
C12H26 Branched Alkanes	TIC	ug/m3	600	NA	ND
C12H26 Branched Alkanes + Unidentified Compounds	TIC	ug/m3	400	NA	ND
C13H28 Branched Alkanes + Unidentified Compounds	TIC	ug/m3	400	NA	ND
C13H28 Branched Alkanes + Unidentified Cyclic Compounds	TIC	ug/m3	400	NA	ND
C9H10 Aromatic Compound	TIC	ug/m3	ND	NA	10000
Cumene	TIC	ug/m3	ND	NA	60000
Decahydromethylnaphthalene Isomers	TIC	ug/m3	600	NA	ND
Decahydronaphthalene Isomer	TIC	ug/m3	300	NA	ND

Table F.1-2

Chemical Detections from Downhole Flux Measurements in Impacted Soil
Ascon Landfill Site

Component		Units	PNL-5A-11DHF (TO-3/TO-15)	PNL-F4-15-S (ASTM D5504-98)	PNL-F4-15-T (TO-3/TO-15)
Isobutylbenzene	TIC	ug/m3	ND	NA	4000
n-Propylbenzene	TIC	ug/m3	ND	NA	4000
sec-Butylbenzene	TIC	ug/m3	ND	NA	20000

TIC: Tentatively Identified Compound. Results are estimated.
ug/m3: micrograms per cubic meter
ppbv: parts per billion by volume
ND: not detected above reporting limit
NA: no analysis

Table F.1-3

Chemical Detections in Downhole Flux Measurements in Drilling Mud Stream
Ascon Landfill Site

Component		units	PNL-1-15-DHF (TO-3/TO-15)	PNL-12-15DHF (TO-3/TO-15)	PNL-12-15RDHF (TO-3/TO-15)	PNL-13-12DHF (TO-3/TO-15)	PNL-2-15DHF (TO-3/TO-15)	PNL-3-21DHF (TO-3/TO-15)	PNL-9-15-DHF (TO-3/TO-15)
2-Butanone (MEK)		ug/m3	ND	9.2	6.2	ND	10	ND	64
Acetone		ug/m3	ND	ND	ND	ND	45	ND	ND
Benzene		ug/m3	21000	57	22	580	ND	12000	210
C2 as Ethane		ppmv	30	ND	ND	ND	ND	41	ND
C3 as Propane		ppmv	93	ND	ND	ND	ND	390	ND
C4 as n-Butane		ppmv	160	ND	ND	3.3	ND	800	ND
C5 as n-Pentane		ppmv	140	ND	ND	4.8	ND	530	9.3
C6 as n-Hexane		ppmv	110	ND	ND	5.4	ND	280	6.2
C6+ as n-Hexane		ppmv	1700	23	12	100	2	1400	50
Carbon Disulfide		ug/m3	ND	ND	ND	ND	4.8	ND	ND
Carbonyl Sulfide		ppbv	NA	NA	NA	NA	NA	NA	NA
Dichloromethane (Methylene Chloride)		ug/m3	ND	ND	ND	ND	ND	ND	38
Ethylbenzene		ug/m3	11000	230	120	940	ND	5600	360
m,p-Xylenes		ug/m3	25000	98	51	2200	ND	16000	750
Methane		ppmv	21000	750	140	1200	600	240000	6600
o-Xylene		ug/m3	12000	30	16	1400	ND	6100	120
Toluene		ug/m3	33000	15	7.2	1300	ND	4800	51
2,2-Dimethylbutane	TIC	ug/m3	ND	ND	ND	ND	80	ND	ND
2,3-Dimethylbutane	TIC	ug/m3	ND	ND	ND	ND	400	ND	ND
2,3-Dimethylpentane	TIC	ug/m3	ND	ND	ND	ND	300	ND	ND
2,4-Dimethylpentane	TIC	ug/m3	ND	ND	ND	ND	200	ND	ND
2-Methylpentane	TIC	ug/m3	60000	ND	ND	ND	ND	100000	3000
3-Methylpentane	TIC	ug/m3	ND	ND	ND	ND	ND	100000	3000
C10H20 Compound	TIC	ug/m3	ND	ND	ND	4000	200	ND	ND
C10H20 Substituted Cyclohexane Isomer	TIC	ug/m3	ND	700	400	ND	ND	ND	ND
C10H22 Branched Alkane	TIC	ug/m3	ND	ND	ND	5000	ND	ND	ND
C10H22 Branched Alkane + Unidentifed Compound	TIC	ug/m3	ND	ND	ND	5000	ND	ND	ND
C9H16 Compound	TIC	ug/m3	ND	900	500	ND	ND	ND	ND
C9H18 Compound	TIC	ug/m3	ND	700	300	ND	ND	ND	ND
C9H18 Substituted Cyclopentane Isomer	TIC	ug/m3	ND	700	300	ND	ND	ND	ND
Cyclohexane	TIC	ug/m3	60000	ND	ND	ND	ND	ND	2000

Table F.1-3
Chemical Detections in Downhole Flux Measurements in Drilling Mud Stream
Ascon Landfill Site

Component		units	PNL-1-15-DHF (TO-3/TO-15)	PNL-12-15DHF (TO-3/TO-15)	PNL-12-15RDHF (TO-3/TO-15)	PNL-13-12DHF (TO-3/TO-15)	PNL-2-15DHF (TO-3/TO-15)	PNL-3-21DHF (TO-3/TO-15)	PNL-9-15-DHF (TO-3/TO-15)
Cyclopentane	TIC	ug/m3	ND	ND	ND	ND	ND	90000	2000
Dimethylcyclohexane	TIC	ug/m3	ND	1700	1000	ND	ND	ND	ND
Dimethylcyclohexane Isomer	TIC	ug/m3	60000	ND	ND	1100	ND	ND	ND
Dimethylcyclopentane Isomers	TIC	ug/m3	220000	1700	800	2200	ND	300000	9000
Isobutane	TIC	ug/m3	ND	ND	ND	ND	400	100000	ND
Isopentane	TIC	ug/m3	70000	ND	ND	6000	100	200000	4000
Methyl Ethyl Cyclopentane Isomer	TIC	ug/m3	ND	700	300	ND	ND	ND	ND
Methylcyclohexane	TIC	ug/m3	80000	900	400	9000	ND	100000	3000
Methylcyclopentane	TIC	ug/m3	80000	ND	ND	9000	ND	100000	4000
n-Butane	TIC	ug/m3	70000	ND	ND	ND	70	100000	2000
n-Hexane	TIC	ug/m3	80000	ND	ND	ND	ND	200000	3000
n-Pentane	TIC	ug/m3	70000	ND	ND	5000	ND	100000	2000
Propane + Carbonyl Sulfide	TIC	ug/m3	ND	ND	ND	ND	70	ND	ND
Tetramethylcyclopentane Isomers	TIC	ug/m3	ND	ND	ND	ND	600	ND	ND
Trimethylcyclohexane	TIC	ug/m3	ND	1000	300	ND	ND	ND	ND
Trimethylcyclohexane Isomer	TIC	ug/m3	70000	700	400	10000	ND	80000	2000
Trimethylcyclopentane Isomers	TIC	ug/m3	140000	2700	1400	15000	800	100000	3000
Unidentified	TIC	ug/m3	ND	ND	ND	ND	200	ND	ND

TIC: Tentatively Identified Compound. Results are estimated.
ug/m3: micrograms per cubic meter
ppbv: parts per billion by volume
ND: not detected above reporting limit
NA: no analysis

Table F.1-4

Chemical Detections in Downhole Flux Measurements in Drilling Mud with High Liquid

Ascon Landfill Site

Component		units	PNL-14-21-DHF (TO-3/TO-15)	PNL-6-15-DHF (TO-3/TO-15)	PNL-6-15-RDHF (TO-3/TO-15)	PNL-8-18-DHF (TO-3/TO-15)
1,3-Butadiene		ug/m3	ND	140	ND	ND
1,3-Dichlorobenzene		ug/m3	ND	ND	ND	ND
2-Butanone (MEK)		ug/m3	ND	69	33	110
2-Hexanone		ug/m3	ND	ND	ND	ND
Benzene		ug/m3	8900	26	6.4	9000
C2 as Ethane		ppmv	11	3.3	ND	10
C3 as Propane		ppmv	54	ND	ND	29
C4 as n-Butane		ppmv	240	13	7.1	50
C5 as n-Pentane		ppmv	240	13	8.1	47
C6 as n-Hexane		ppmv	170	7.4	4.6	33
C6+ as n-Hexane		ppmv	1800	81	37	300
Carbon Disulfide		ug/m3	ND	36	13	ND
Chlorobenzene		ug/m3	ND	92	37	ND
Dichloromethane (Methylene Chloride)		ug/m3	ND	78	28	180
Ethylbenzene		ug/m3	8200	34	13	2600
m,p-Xylenes		ug/m3	10000	ND	ND	4300
Methane		ppmv	170000	56000	35000	47000
o-Xylene		ug/m3	2000	ND	ND	2100
Styrene		ug/m3	ND	ND	ND	280
Toluene		ug/m3	710	18	ND	5300
2,3-Dimethylbutane	TIC	ug/m3	ND	4000	2000	ND
2,3-Dimethylpentane	TIC	ug/m3	ND	4000	2000	ND
2-Methylpentane	TIC	ug/m3	90000	ND	ND	20000
3-Methylpentane	TIC	ug/m3	90000	5000	2000	20000
C9H16 Compound	TIC	ug/m3	ND	3000	ND	ND
C9H18 Compound	TIC	ug/m3	ND	3000	1000	ND
Cyclohexane	TIC	ug/m3	80000	ND	ND	ND
Cyclopentane	TIC	ug/m3	ND	ND	ND	10000
Dimethylcyclohexane Isomer	TIC	ug/m3	ND	3000	1000	ND
Dimethylcyclopentane Isomer + C7H16 Compound	TIC	ug/m3	ND	ND	1000	ND
Dimethylcyclopentane Isomers	TIC	ug/m3	300000	4000	1000	60000
Isopentane	TIC	ug/m3	100000	6000	2000	20000

Table F.1-4

Chemical Detections in Downhole Flux Measurements in Drilling Mud with High Liquid
Ascon Landfill Site

Component		units	PNL-14-21-DHF (TO-3/TO-15)	PNL-6-15-DHF (TO-3/TO-15)	PNL-6-15-RDHF (TO-3/TO-15)	PNL-8-18-DHF (TO-3/TO-15)
Methylcyclohexane	TIC	ug/m3	100000	ND	ND	20000
Methylcyclopentane	TIC	ug/m3	100000	ND	ND	20000
n-Butane	TIC	ug/m3	100000	5000	2000	20000
n-Hexane	TIC	ug/m3	ND	ND	ND	20000
n-Pentane	TIC	ug/m3	100000	ND	ND	20000
Tetramethylcyclopentane Isomer	TIC	ug/m3	ND	4000	1000	ND
Trimethylcyclohexane Isomers	TIC	ug/m3	90000	5000	3000	20000
Trimethylcyclopentane Isomers	TIC	ug/m3	180000	12000	4000	20000
Isobutane	TIC	ug/m3	70000	5000	2000	20000

TIC: Tentatively Identified Compound. Results are estimated.
ug/m3: micrograms per cubic meter
ppbv: parts per billion by volume
ND: not detected above reporting limit
NA: no analysis

Table F.1-5
Chemical Detections from Downhole Flux Measurements Near Pit-F
Ascon Landfill Site

			PNL-11-12 DHF	PNL-F1-13-S	PNL-F1-13-SR	PNL-F1-13-T	PNL-F1-13-TR
Component		units	(TO-3/TO-15)	(ASTM D5504-98)	(ASTM D5504-98)	(TO-3/TO-15)	(TO-3/TO-15)
2-Butanone (MEK)		ug/m3	12	NA	NA	ND	ND
3-Methylthiophene		ppbv	ND	ND	ND	ND	ND
Acetone		ug/m3	1600	NA	NA	ND	ND
Benzene		ug/m3	220	NA	NA	35000	13000
C6+ as n-Hexane		ppmv	7.75	NA	NA	86	41
Carbon Disulfide		ppbv	ND	144	130	ND	ND
Carbonyl Sulfide		ug/m3	NA	139	122	NA	NA
Diethyl Sulfide		ppbv	NA	202	175	NA	NA
Dimethyl Sulfide		ppbv	NA	9.32	8.42	NA	NA
Ethylbenzene		ug/m3	4900	NA	NA	91000	45000
Hydrogen Sulfide		ppbv	NA	6.86	10.2	NA	NA
m,p-Xylenes		ug/m3	ND	NA	NA	ND	ND
Methane		ppmv	5.95	NA	NA	21	7.8
o-Xylene		ug/m3	11	NA	NA	ND	ND
Styrene		ug/m3	1100	NA	NA	ND	ND
tert-Butyl Mercaptan		ppbv	NA	11.7	8.88	NA	NA
Tetrahydrothiophene		ppbv	NA	75.8	68.5	NA	NA
Thiophene		ppbv	NA	12.4	10.4	NA	NA
Toluene		ug/m3	160	NA	NA	9900	4000
Vinyl Acetate		ug/m3	25	NA	NA	ND	ND
3-Ethyltoluene	TIC	ug/m3	100	NA	NA	1000	ND
4-Ethyltoluene	TIC	ug/m3	ND	NA	NA	600	ND
Acetophenone	TIC	ug/m3	100	NA	NA	ND	ND
alpha-Methylstyrene	TIC	ug/m3	3000	NA	NA	10000	6000
Benzothiophene Isomer	TIC	ug/m3	100	NA	NA	ND	ND
C10H12 Aromatic Compound	TIC	ug/m3	ND	NA	NA	3000	2000
C10H12 Compound	TIC	ug/m3	300	NA	NA	ND	ND
C10H14 Aromatic Compounds	TIC	ug/m3	1000	NA	NA	32000	17000
C10H14 Compound	TIC	ug/m3	200	NA	NA	ND	ND
C9H10 Aromatic Compound	TIC	ug/m3	ND	NA	NA	20000	10000
Cumene	TIC	ug/m3	2000	NA	NA	6000	4000
Diethylbenzene Isomers	TIC	ug/m3	2200	NA	NA	ND	ND
Indane	TIC	ug/m3	100	NA	NA	ND	ND
Isobutylbenzene	TIC	ug/m3	ND	NA	NA	3000	ND
Methylstyrene Isomer	TIC	ug/m3	1000	NA	NA	ND	ND

Table F.1-5
Chemical Detections from Downhole Flux Measurements Near Pit-F
Ascon Landfill Site

Component		units	PNL-11-12 DHF (TO-3/TO-15)	PNL-F1-13-S (ASTM D5504-98)	PNL-F1-13-SR (ASTM D5504-98)	PNL-F1-13-T (TO-3/TO-15)	PNL-F1-13-TR (TO-3/TO-15)
Naphthalene	TIC	ug/m3	500	NA	NA	800	ND
n-Heptane	TIC	ug/m3	ND	NA	NA	900	ND
n-Propylbenzene	TIC	ug/m3	ND	NA	NA	2000	800
Propylbenzene	TIC	ug/m3	200	NA	NA	ND	ND
sec-Butylbenzene	TIC	ug/m3	ND	NA	NA	10000	4000

TIC: Tentatively Identified Compound. Results are estimated.
ug/m3: micrograms per cubic meter
ppbv: parts per billion by volume
ND: not detected above reporting limit
NA: no analysis

Table F.1-6

Chemical Detections from Downhole Flux Measurements in Native Soils

Ascon Landfill Site

Component		units	PNL-7-21-DHF (TO-3/TO-15)	PNL-9-21-BDHF (TO-3/TO-15)	PNL-F19-10-S (ASTM D5504-98)	PNL-F19-10-T (TO-3/TO-15)	PNL-F5-13.5-S (ASTM D5504-98)	PNL-F5-13.5-T (TO-3/TO-15)
2-Butanone (MEK)		ug/m3	ND	4.9	NA	ND	NA	ND
Benzene		ug/m3	3700	ND	NA	ND	NA	ND
C2 as Ethane		ppmv	7.65	ND	NA	ND	NA	ND
C3 as Propane		ppmv	9.15	ND	NA	ND	NA	ND
C4 as n-Butane		ppmv	100	ND	NA	ND	NA	ND
C5 as n-Pentane		ppmv	140	ND	NA	ND	NA	ND
C6 as n-Hexane		ppmv	98.5	ND	NA	ND	NA	ND
C6+ as n-Hexane		ppmv	1350	ND	NA	38.5	NA	23
Carbon Disulfide		ppbv	ND	ND	8.78	ND	4.62	ND
Carbonyl Sulfide		ppbv	NA	NA	31.1	NA	33.4	NA
Ethylbenzene		ug/m3	2400	ND	NA	3300	NA	ND
Hydrogen Sulfide		ug/m3	NA	NA	3.6J	NA	7.18	ND
m,p-Xylenes		ug/m3	2900	ND	NA	ND	NA	ND
Methane		ppmv	175000	0.9	NA	150	NA	59
o-Xylene		ug/m3	1300	ND	NA	ND	NA	ND
Toluene		ug/m3	430	ND	NA	ND	NA	ND
2,3-Dimethylbutane	TIC	ug/m3	30000	ND	NA	ND	NA	ND
2,3-Dimethylpentane	TIC	ug/m3	30000	ND	NA	ND	NA	ND
2-Ethyltoluene	TIC	ug/m3	NA	NA	NA	200	NA	ND
2-Methylpentane	TIC	ug/m3	30000	ND	NA	ND	NA	ND
3-Methylpentane	TIC	ug/m3	30000	ND	NA	ND	NA	ND
C10H12 Aromatic Compound	TIC	ug/m3	ND	ND	NA	900	NA	ND
C10H14 Aromatic Compounds	TIC	ug/m3	ND	ND	NA	17000	NA	ND
C10H20 Compound + C11H22 Compound	TIC	ug/m3	ND	ND	NA	ND	NA	1000
C10H20 Compounds	TIC	ug/m3	ND	ND	NA	ND	NA	6000
C9H10 Aromatic Compounds	TIC	ug/m3	ND	ND	NA	4500	NA	ND
C9H12 Aromatic Compound	TIC	ug/m3	ND	ND	NA	500	NA	ND
C9H16 Compound	TIC	ug/m3	ND	ND	NA	ND	NA	2000
C9H18 Compound + C10H20 Compound	TIC	ug/m3	ND	ND	NA	ND	NA	1000
C9H18 Compounds	TIC	ug/m3	ND	ND	NA	ND	NA	4000
C9H20 Compound	TIC	ug/m3	ND	ND	NA	ND	NA	1000
Cumene	TIC	ug/m3	ND	ND	NA	40000	NA	ND
Dimethylcyclopentane Isomers	TIC	ug/m3	120000	ND	NA	ND	NA	2000

Table F.1-6
Chemical Detections from Downhole Flux Measurements in Native Soils
Ascon Landfill Site

			PNL-7-21-DHF	PNL-9-21-BDHF	PNL-F19-10-S	PNL-F19-10-T	PNL-F5-13.5-S	PNL-F5-13.5-T
Component		units	(TO-3/TO-15)	(TO-3/TO-15)	(ASTM D5504-98)	(TO-3/TO-15)	(ASTM D5504-98)	(TO-3/TO-15)
Isobutylbenzene	TIC	ug/m3	ND	ND	NA	2000	NA	ND
Isopentane	TIC	ug/m3	40000	30	NA	ND	NA	ND
Methylcyclohexane	TIC	ug/m3	40000	ND	NA	ND	NA	ND
Methylcyclopentane	TIC	ug/m3	40000	ND	NA	ND	NA	ND
n-Propylbenzene	TIC	ug/m3	ND	ND	NA	800	NA	ND
sec-Butylbenzene	TIC	ug/m3	ND	ND	NA	4000	NA	ND
Tetramethylcyclopentane Isomer	TIC	ug/m3	30000	ND	NA	ND	NA	2000
Trimethylcyclohexane Isomers	TIC	ug/m3	30000	ND	NA	ND	NA	4000
Trimethylcyclopentane Isomers	TIC	ug/m3	100000	ND	NA	ND	NA	4000

TIC: Tentatively Identified Compound. Results are estimated.
ug/m3: micrograms per cubic meter
ppbv: parts per billion by volume
ND: not detected above reporting limit
NA: no analysis

Table F.3-1
Summary of Annual Average (Long term) Exposure Concentrations
Exceedances Above Threshold Values
Scenario 1 - 2,500 ft^2 Excavation Area
Ascon Landfill Site

Chemicals	Source Values			Estimated Percent Threshold Exceedance							
	Waste Type	Flux (ug/m2-min)		100 feet		300 feet		600 feet		1,000 feet	
		Avg	Max	avg	max	avg	max	avg	max	avg	max
Benzene	DM	1514	6573	85%	**702%**		57%				
Benzene	DMHL	1403	2817	71%	**244%**						
Benzene	NATIVE**	2927	4695	**257%**	**473%**		12%				
Benzene	STYRENE	3774	10955	**361%**	**1237%**		**161%**				

**Note: Native Clay Sample results may be affected by overlying drilling muds with high volatile content (See PNL-7-21 DHF results).
Does not included detected Sulfur Compounds

Table F.3-2

Summary of Hourly Average (Short Term) Exposure Concentrations
Exceedances Above Threshold Values
Scenario 1 - 2,500 ft^2 Excavation Area
Ascon Landfill Site

Chemicals	**Source Values**			**Estimated Percent Threshold Exceedance**							
	Waste Type	**Flux (ug/m2-min)**		**100 feet**		**300 feet**		**600 feet**		**1,000 feet**	
		Avg	**Max**	**avg**	**max**	**avg**	**max**	**avg**	**max**	**avg**	**max**
Benzene	DM	1514	6573	**137%**	**926%**	57%	**581%**		**305%**		**165%**
Benzene	DMHL	1403	2817	**119%**	**340%**	45%	**192%**		74%		14%
Benzene	NATIVE**	2927	4695	**357%**	**633%**	**203%**	**386%**	80%	**189%**	18%	89%
Ethylbenzene	NATIVE**	39501	78250	**127%**	**351%**	51%	**199%**		78%		16%
Benzene	STYRENE	3774	10955	**489%**	**1611%**	**291%**	**1034%**	**133%**	**575%**	52%	**342%**
Ethylbenzene	STYRENE	11284	28483		64%		9%				

**Note: Native Clay Sample results may be affected by overlying drilling muds with high volatile content (See PNL-7-21 DHF results).
Does not included detected Sulfur Compounds

Table F.3-3

Summary of Annual Average (Long Term) Exposure Concentrations
Exceedances Above Threshold Values
Scenario 2 - 5,000 ft^2 Excavation Area
Ascon Landfill Site

Chemicals	Source Values			Estimated Percent Threshold Exceedance							
	Waste Type	Flux (ug/m2-min)		100 feet		300 feet		600 feet		1,000 feet	
		Avg	Max	avg	max	avg	max	avg	max	avg	max
Benzene	DM	1514	6573	**181%**	**1119%**		**190%**				
Benzene	DMHL	1403	2817	**160%**	**423%**		24%				
Benzene	NATIVE**	2927	4695	**443%**	**771%**	29%	**107%**				
Benzene	STYRENE	3774	10955	**600%**	**1932%**	67%	**384%**		54%		

**Note: Native Clay Sample results may be affected by overlying drilling muds with high volatile content (See PNL-7-21 DHF results).
Does not included detected Sulfur Compounds

Table F.3-4

Summary of Hourly Average (Short Term) Exposure Concentrations
Exceedances of Threshold Values
Scenario 2 - 5,000 ft^2 Excavation Area
Ascon Landfill Site

Chemicals	Source Values			Estimated Percent Threshold Exceedance							
	Waste Type	Flux (ug/m2-min)		100 feet		300 feet		600 feet		1,000 feet	
		Avg	Max	avg	max	avg	max	avg	max	avg	max
Benzene	DM	1514	6573	**243%**	**1387%**	**173%**	**1085%**	77%	**670%**	19%	**415%**
Benzene	DMHL	1403	2817	**218%**	**537%**	**153%**	**408%**	64%	**230%**	10%	**121%**
Benzene	NATIVE**	2927	4695	**562%**	**962%**	**428%**	**747%**	**243%**	**450%**	**129%**	**268%**
Ethylbenzene	NATIVE**	39501	78250	**230%**	**553%**	**163%**	**420%**	71%	**238%**	14%	**126%**
Benzene	STYRENE	3774	10955	**754%**	**2379%**	**581%**	**1876%**	**342%**	**1183%**	**196%**	**758%**
Ethylbenzene	STYRENE	11284	28483		**138%**		89%		23%		

**Note: Native Clay Sample results may be affected by overlying drilling muds with high volatile content (See PNL-7-21 DHF results).
Does not included detected Sulfur Compounds

Table F.3-5

Summary of Annual Average (Long Term) Exposure Concentrations
Exceedance of Threshold Values
Scenario 3 - 7.500 ft^2 Excavation Area
Ascon Landfill Site

Chemicals	Source Values			Estimated Percent Threshold Exceedance							
	Waste Type	Flux (ug/m2-min)		100 feet		300 feet		600 feet		1,000 feet	
		Avg	Max	avg	max	avg	max	avg	max	avg	max
Benzene	DM	1514	6573	**267%**	**1491%**		**303%**		34%		
Benzene	DMHL	1403	2817	**240%**	**582%**		73%				
Benzene	NATIVE**	2927	4695	**608%**	**1036%**	80%	**188%**				
Ethylbenzene	NATIVE**	39501	78250		21%						
Benzene	STYRENE	3774	10955	**813%**	**2552%**	**132%**	**572%**		**123%**		

**Note: Native Clay Sample results may be affected by overlying drilling muds with high volatile content (See PNL-7-21 DHF results).
Does not included detected Sulfur Compounds

Table F.3-6

Summary of Hourly Average (Short Term) Exposure Concentrations
Exceedances of Threshold Values
Scenario 3 - 7,500 ft^2 Excavation Area
Ascon Landfill Site

Chemicals	Source Values			Estimated Percent Threshold Exceedance							
	Waste Type	Flux (ug/m2-min)		100 feet		300 feet		600 feet		1,000 feet	
		Avg	Max	avg	max	avg	max	avg	max	avg	max
Benzene	DM	1514	6573	**321%**	**1726%**	**265%**	**1483%**	**155%**	**1006%**	74%	**655%**
Ethylbenzene	DM	816	11000		13%						
Benzene	DMHL	1403	2817	**290%**	**683%**	**238%**	**578%**	**136%**	**374%**	61%	**224%**
Benzene	NATIVE**	2927	4695	**713%**	**1204%**	**605%**	**1031%**	**393%**	**690%**	**236%**	**439%**
Ethylbenzene	NATIVE**	39501	78250	**305%**	**701%**	**251%**	**595%**	**145%**	**386%**	67%	**231%**
Benzene	STYRENE	3774	10955	**948%**	**2944%**	**809%**	**2538%**	**535%**	**1744%**	**333%**	**1158%**
Ethylbenzene	STYRENE	11284	28483	16%	**192%**		**153%**		77%		21%

**Note: Native Clay Sample results may be affected by overlying drilling muds with high volatile content (See PNL-7-21 DHF results).
Does not included detected Sulfur Compounds

Table F.3-7

Annual Hourly Average Odor Concentrations

Exceedances of Threshold Values

Scenario 1 - 2,500 ft^2 Excavation Area

Ascon Landfill Site

Waste Stream	Source Values		Annual Average Estimates							
			Estimated Percent Threshold Exceedance							
	Flux ((D/T)/m2-min)		100 feet		300 feet		600 feet		1,000 feet	
	Avg	Max	avg	max	avg	max	avg	max	avg	max
Drill Mud	1,210	2,602	**170%**	**481%**		13%				
Drill Mud - High Liquid	3,137	7,903	**600%**	**1664%**	37%	**244%**		6%		
Native	744	1,549	66%	**246%**						
Styrene Impacted	460	667	3%	49%						

Waste Stream	Source Values		Hourly Average Estimates							
			Estimated Percent Threshold Exceedance							
	Flux ((D/T)/m2-min)		100 feet		300 feet		600 feet		1,000 feet	
	Avg	Max	avg	max	avg	max	avg	max	avg	max
Drill Mud	1,210	2,602	**4219%**	**9188%**	**2763%**	**6058%**	**1604%**	**3565%**	**1016%**	**2299%**
Drill Mud - High Liquid	3,137	7,903	**11097%**	**28109%**	**7324%**	**18602%**	**4319%**	**11031%**	**2793%**	**7188%**
Fill	385	385	**1274%**	**1274%**	**811%**	**811%**	**442%**	**442%**	**255%**	**255%**
Native	744	1,549	**2556%**	**5429%**	**1661%**	**3566%**	**948%**	**2082%**	**586%**	**1328%**
Styrene Impacted	460	667	**1542%**	**2281%**	**989%**	**1478%**	**548%**	**839%**	**324%**	**515%**
Oil	31	89	10%	**218%**		**111%**		25%		

Table F.3-8

Annual Hourly Average Odor Concentrations

Exceedances of Threshold Values

Scenario 2 - 5,000 ft^2 Excavation Area

Ascon Landfill Site

Waste Stream	Source Values		Annual Average Estimates							
			Estimated Percent Threshold Exceedance							
	Flux ((D/T)/m2-min)		100 feet		300 feet		600 feet		1,000 feet	
	Avg	Max	avg	max	avg	max	avg	max	avg	max
Drill Mud	1,210	2,602	**310%**	**783%**		**110%**				
Drill Mud - High Liquid	3,137	7,903	**964%**	**2581%**	**153%**	**538%**		**104%**		
Fill	385	385	31%	31%						
Native	744	1,549	**152%**	**425%**		25%				
Styrene Impacted	460	667	56%	**126%**						

Waste Stream	Source Values		Hourly Average Estimates							
			Estimated Percent Threshold Exceedance							
	Flux ((D/T)/m2-min)		100 feet		300 feet		600 feet		1,000 feet	
	Avg	Max	avg	max	avg	max	avg	max	avg	max
Drill Mud	1,210	2,602	**6159%**	**13359%**	**4888%**	**10626%**	**3139%**	**6865%**	**2066%**	**4559%**
Drill Mud - High Liquid	3,137	7,903	**16127%**	**40779%**	**12832%**	**32479%**	**8297%**	**21054%**	**5517%**	**14050%**
Fill	385	385	**1891%**	**1891%**	**1487%**	**1487%**	**931%**	**931%**	**589%**	**589%**
Native	744	1,549	**3748%**	**7912%**	**2967%**	**6285%**	**1891%**	**4046%**	**1232%**	**2673%**
Styrene Impacted	460	667	**2279%**	**3350%**	**1796%**	**2650%**	**1131%**	**1685%**	**724%**	**1094%**
Oil	31	89	59%	**360%**	27%	**267%**		**138%**		59%

Table F.3-9

Annual Hourly Average Odor Concentrations

Exceedances of Threshold Values

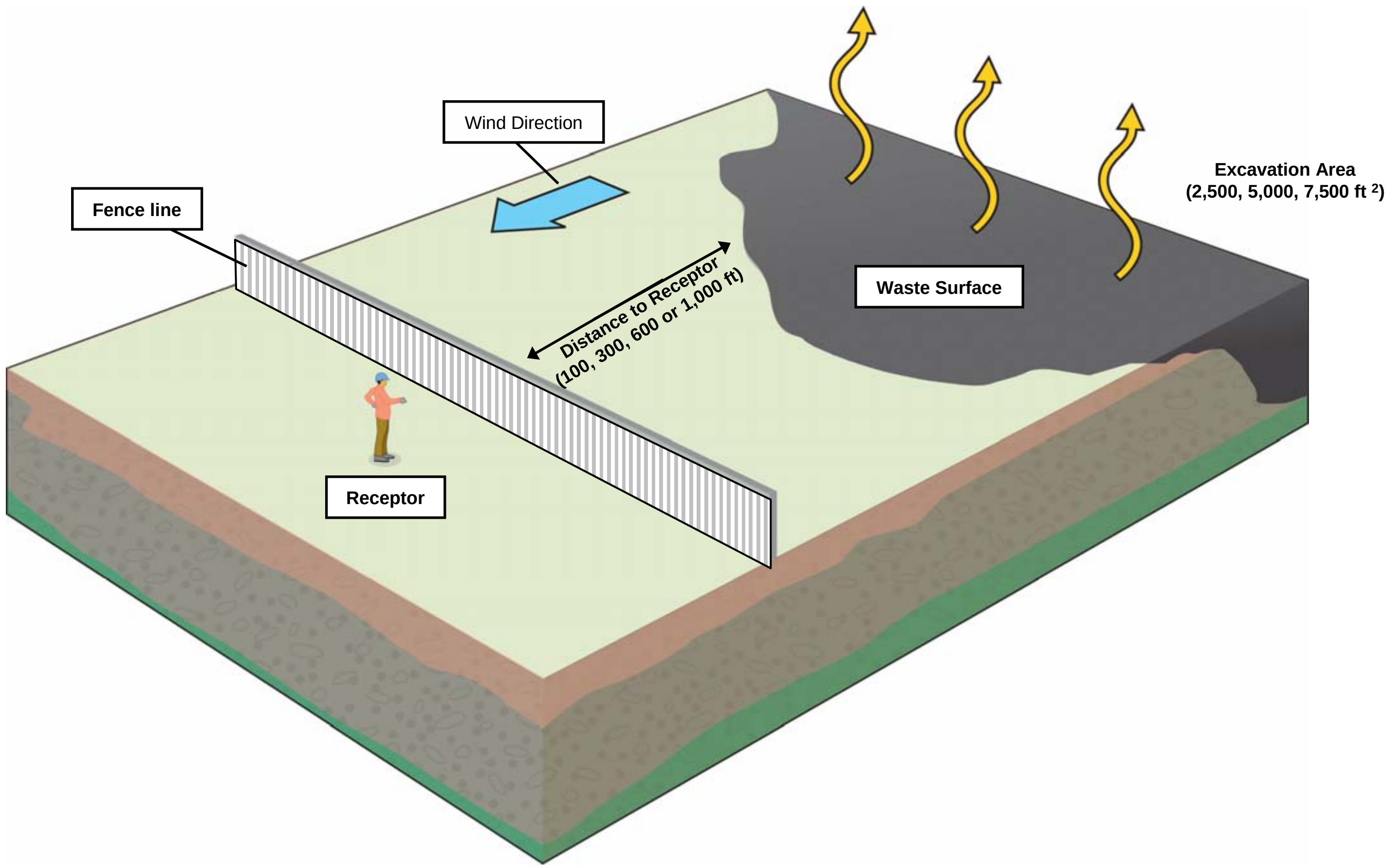
Scenario 3 - 7,500 ft^2 Excavation Area

Ascon Landfill Site

Waste Stream	Source Values		Annual Average Estimates							
			Estimated Percent Threshold Exceedance							
	Flux ((D/T)/m2-min)		100 feet		300 feet		600 feet		1,000 feet	
	Avg	Max	avg	max	avg	max	avg	max	avg	max
Drill Mud	1,210	2,602	**436%**	**1052%**	36%	**192%**				
Drill Mud - High Liquid	3,137	7,903	**1289%**	**3398%**	**252%**	**787%**	17%	**195%**		27%
Fill	385	385	70%	70%						
Native	744	1,549	**229%**	**586%**		74%				
Styrene Impacted	460	667	**104%**	**195%**						

Waste Stream	Source Values		Hourly Average Estimates							
			Estimated Percent Threshold Exceedance							
	Flux ((D/T)/m2-min)		100 feet		300 feet		600 feet		1,000 feet	
	Avg	Max	avg	max	avg	max	avg	max	avg	max
Drill Mud	1,210	2,602	**7584%**	**16424%**	**6560%**	**14223%**	**4556%**	**9912%**	**3077%**	**6731%**
Drill Mud - High Liquid	3,137	7,903	**19822%**	**50088%**	**17168%**	**43402%**	**11970%**	**30309%**	**8136%**	**20649%**
Fill	385	385	**2345%**	**2345%**	**2019%**	**2019%**	**1381%**	**1381%**	**911%**	**911%**
Impacted Soil	15	18		14%						
Native	744	1,549	**4625%**	**9737%**	**3995%**	**8427%**	**2763%**	**5860%**	**1853%**	**3967%**
Styrene Impacted	460	667	**2821%**	**4136%**	**2432%**	**3572%**	**1670%**	**2466%**	**1108%**	**1651%**
Oil	31	89	**95%**	**465%**	69%	**390%**	18%	**242%**		**134%**

Estimated Receptor Concentration (Mass/ Volume) → **Dispersion Modeling (Factor)** → **Emissions (Mass/Time)**



Technical Approach Ambient Air Emissions Evaluation		Figure F.3-1
Revised Feasibility Study Ascon Landfill Site, Huntington Beach, California	September 2007	Project Navigator, Ltd.®