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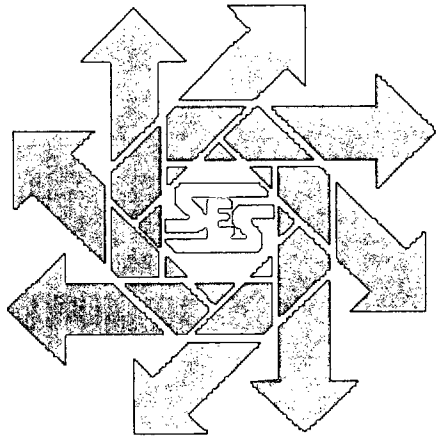
REPORTS

DATE:

2001

Chevron USA
Schubert Site Investigation
Lea County, New Mexico

March 9, 2001



Prepared for:

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I. Background

In December 2000 Safety & Environmental Solutions, Inc. (SESI) was engaged by Chevron USA, West Permian Basin Unit, to perform a site investigation at a location where oil and gas production had occurred in the past. The investigation was conducted voluntarily by Chevron at the request of the landowner, Mr. Gary Schubert, and not in response to regulatory directives. The subject area is identified as the Schubert property and is located in Unit M of Section 21, Township 18 S, Range 38 E in Lea County, New Mexico. The area is north and east of the intersection of Bender Blvd. and French Dr. The site is approximately one mile west of the Lovington Highway (NM 18) in Hobbs (Figure 1). The property is currently being cultivated and is irrigated with water from nearby wells.

Previously the subject area contained a production tank battery and an associated pit. The pit was located about 1,300 ft. north and east of the Bender-French intersection. It was relatively large (size approximately 200 x 300 ft. sq.) and was in use for an unknown period prior to 1978. Available aerial photographs clearly show the pit in 1964 but only a barely discernible outline is seen on the 1978 photograph. The pit shows two cells, but in the 1964 photograph it appears dry. The production battery is about 800 ft north and east of the intersection. Four tanks appear on the 1964 photograph; although the 1978 photo is unclear, it appears that at most only one tank remains.

The purpose of the investigation was two-fold. First, the investigation was performed to delineate the horizontal and vertical extent of any remaining hydrocarbon and/or salt materials at the pit and battery. Secondly, analytical data collected from the sampling effort was to be used as inputs to the American Petroleum Institute's (API) VADSAT model to assess the potential effects on groundwater quality from subsurface petroleum hydrocarbon releases.

VADSAT is an interactive program to simulate the movement of conservative inorganic or reactive organic species present in land-disposed waste. Program output is used to assess effects of land disposal practices on groundwater quality. Compounds considered include organic species that dissolve from oily wastes, and inorganic salts that migrate by convection and dispersion in the aqueous phase. Adsorption, biodecay and volatilization at the ground surface are considered for organic species, while salts are considered non-reactive. Release scenarios that may be modeled include both surface and subsurface releases. The latter are distinguished by the presence of overlying soil cover, which acts to impede evaporation losses of volatile compounds. The program can also model effectiveness of clay and synthetic liners.

VADSAT is based on coupled analytical solutions of the unsaturated and saturated zone flow and transport equations, which can be solved with minimal computational effort. It is well suited for conducting uncertainty analyses to assess effects of variable soil and waste characteristics on the risk of groundwater contamination at land-disposal sites. Environmental Systems and Technologies, Inc., of Blacksburg, Virginia, developed the VADSAT model in 1995 under contract from the API, and use of the model by SESI is by license from the API.

II. Work Performed

Soil Boring and Sampling

It was necessary to use the services of a land surveyor to locate the old pit and battery area because the surface has been leveled for agricultural use. Figure 2 is a copy of site survey produced by John West Engineering to locate the site of the production pit and the tank battery. Borehole locations were staked at 75 ft. north-south intervals and 50 ft. east-west intervals at Area 1 (the production pit area), and at 50 ft. intervals at Area 2 (the tank battery location).

Drilling began on February 4, 2001, using SESI personnel from Hobbs. Drilling was completed on February 16. A Giddings trailer-mounted drill, Model 25-SCT was used to bore test holes with a 4-in. hollow-stem auger. Samples from the test holes generally were collected in thin-walled sampling tubes using SOPs found in Environmental Protection Agency, 1984, Characterization of Hazardous Waste Site - A Methods Manual: Vol. II. Initially, soil samples were collected at 0-2 ft. and 2-5 ft. intervals. Due to the presence of cemented caliche at 3 ft., some sample boreholes at Area 1 did not penetrate below that depth. However, sufficient boreholes were drilled in the center of pit to provide confidence in the results. At Area 2, all holes were drilled to five feet. Locations of the boreholes at Areas 1 and 2 are shown in Figures 3 and 4, respectively. A table showing borehole lithologies is presented in Appendix A. At the completion of drilling, the boreholes were backfilled with drill cuttings.

Field-testing for Total Petroleum Hydrocarbons (TPH) was performed on most soil samples (EPA Method 418.1) using a GAC Mega Total Petroleum Hydrocarbon analyzer. The samples were preserved on ice and delivered along with Chain of Custody to Cardinal Laboratories for testing. Laboratory samples were analyzed for Total Petroleum Hydrocarbons (EPA Method SW 846 418.1), BTEX (EPA Method SW-846-8260) and Chlorides (EPA Method 600/4-79-020 325.3). Copies of the analytical results are found in Appendix B.

III. Results of Soil Testing

Soil Sampling Results – Area 1, Production Pit

Soil sampling results for TPH, BTEX and chlorides from the 17 boreholes at Area 1 are tabulated in Table 1.

Laboratory TPH concentrations ranged from less than 10 mg/Kg in six boreholes to 9,440 mg/Kg in BH 5-1 at a depth of 0-2 ft. The average TPH, calculated for all Area 1 samples, was 1,504 mg/Kg. The highest TPH concentrations are in boreholes BH 3, 4, 5, 6, and 8, which are within the center of the Area 1 investigation grid (Figure 3).

Table 1. Borehole Soil Sampling Results, Area 1 (Production Pit) Schubert Site Investigation, Lea County, New Mexico

Location, Borehole, and Sample #	Depth (ft.)	Sample Date	Concentration (mg/Kg)					
			TPH	Benzene	Toluene	E-benzene	Total Xylenes	Cl
Area 1, BH 1-1	2-5	02/04/01	<10	<0.005	0.007	<0.005	0.018	128
Area 1, BH 2-1	3-5	02/04/01	<10	<0.005	<0.005	<0.005	<0.015	192
Area 1, BH 3-1	0-2	02/05/01	3,540	<0.005	0.008	<0.005	<0.015	145
Area 1, BH 3-2	2-5	02/05/01	165	<0.005	0.010	<0.005	0.017	162
Area 1, BH 4-1	0-2	02/06/01	1,400	<0.005	0.006	<0.005	0.016	129
Area 1, BH 4-2	2-5	02/06/01	15.8	<0.005	<0.005	<0.005	<0.015	145
Area 1, BH 5-1	0-2	02/06/01	9,440	<0.005	<0.005	<0.005	<0.015	291
Area 1, BH 5-2	2-5	02/06/01	220	<0.005	<0.005	<0.005	<0.015	129
Area 1, BH 6-1	0-2	02/06/01	3,550	<0.005	<0.005	<0.005	<0.015	113
Area 1, BH 6-2	2-5	02/06/01	388	<0.005	<0.005	<0.005	<0.015	162
Area 1, BH 7	0-2	02/06/01	119	<0.005	<0.005	<0.005	<0.015	242
Area 1, BH 8	0-2	02/06/01	1,490	<0.005	<0.005	<0.005	<0.015	129
Area 1, BH 9	0-2	02/06/01	154	<0.005	<0.005	<0.005	<0.015	129
Area 1, BH 10	0-3	02/06/01	60.2	<0.005	<0.005	<0.005	<0.015	113
Area 1, BH 11	0-3	02/06/01	491	<0.005	<0.005	<0.005	<0.015	210
Area 1, BH 12	0-3	02/06/01	18.5	<0.005	<0.005	<0.005	<0.015	145
Area 1, BH 13	0-2	02/06/01	<10	<0.005	<0.005	<0.005	<0.015	81
Area 1, BH 14	0-1.5	02/06/01	<10	<0.005	<0.005	<0.005	<0.015	356
Area 1, BH 15	0-1.5	02/06/01	<10	<0.005	<0.005	<0.005	<0.015	129
Area 1, BH 16	0-2	02/06/01	<10	<0.005	<0.005	<0.005	<0.015	1,617
Area 1, BH 17	0-2	02/06/01	<10	<0.005	<0.005	<0.005	<0.015	129
		All Samples:				All Samples:		
	Area 1 TPH Mean:		1,504			Area 1 Chloride Mean:		232
	Area 1 TPH Geometric Mean:		357			Area 1 Chloride Geometric Mean:		171
	Area 1 TPH Max:		9,440			Area 1 Chloride Max:		1,617
	Area 1 TPH Min:		<10			Area 1 Chloride Min:		81
	"Shallow" Samples (≤3 ft.):					"Shallow" Samples (≤3 ft.):		
	Area 1 Shallow Samples TPH Mean:		2,026			Area 1 Shallow Samples Cl Mean:		264
	Area 1 Shallow Samples TPH Geometric Mean:		549			Area 1 Shallow Samples Cl Geom. Mean:		180
	Area 1 Shallow Samples TPH Max:		9,440			Area 1 Shallow Samples Cl Max:		1,617
	Area 1 Shallow Samples TPH Min:		<10			Area 1 Shallow Samples Cl Min:		81
	"Deep" Samples (>3 ft.):					"Deep" Samples (>3 ft.):		
	Area 1 Deep Samples TPH Mean:		197			Area 1 Deep Samples Cl Mean:		153
	Area 1 Deep Samples TPH Geometric Mean:		122			Area 1 Deep Samples Cl Geometric Mean:		151
	Area 1 Deep Samples TPH Max:		388			Area 1 Deep Samples Cl Max:		192
	Area 1 Deep Samples TPH Min:		<10			Area 1 Deep Samples Cl Min:		128

To further assist in interpretation, average TPH values were recalculated based on whether the sample was a "shallow" (0-3 ft.) or "deep" sample (>3 ft.). The mean TPH for the shallow samples was 2,026 mg/Kg, while the mean for the deep samples was only 197 mg/Kg. Lithologically, all the shallow samples except one were a brown or gray cohesive clay (BH 12 had a mixture of pink sand and brown clay). However, this type of clay is not characteristically present in the area, which may indicate that the old pit was clay-lined. Further, the soil TPH values were not excessively elevated compared to those found in other abandoned production pits in the Hobbs area.

BTEX constituent sampling showed essentially no volatile hydrocarbons present in the shallow or deep samples at very low detection limits (usually 0.005 mg/Kg). No benzene was detected in any Area 1 sample.

Chloride levels ranged from 81 mg/Kg in BH 13 to a maximum of 1,617 mg/Kg in BH 16. The latter was the only sample that exceeded 1,000 mg/Kg; the next highest sample was 356 mg/Kg in BH 14. There was only a relatively small decrease in chloride levels in the "deep" samples from levels in the upper 3 ft.; the average of the shallow samples was 264 mg/Kg while the deeper samples had a chloride mean of 153 mg/Kg. Again, the soil chloride concentrations were not excessively elevated compared to those commonly found in abandoned pits in the region. Also, except for the value of 1,617 mg/Kg in BH 16 (which is likely production related), the other chloride values may well be due to irrigation leaching of the surface since the area is currently under cultivation.

The lack of significant residual hydrocarbon or highly elevated produced water constituents in the soil samples indicates that either the pit was not in continuous use for placement of production wastes, or that it was cleaned before closure. Based on the presence of relatively clean and continuous clay at all but one borehole, and the lack of significant TPH concentrations in the underlying caliche, it is likely that the pit was not extensively used for disposal purposes. Supporting evidence for this hypothesis is the 1964 aerial photograph, which shows an apparent dry pond.

Soil Sampling Results – Area 2, Tank Battery Area

Soil sampling results for TPH, BTEX and chlorides from the 11 boreholes at Area 2 are tabulated in Table 2.

Laboratory TPH concentrations ranged from less than 10 mg/Kg in four boreholes to 1,890 mg/Kg in BH 1-1 at a depth of 0-3 ft. The average TPH, calculated for all Area 2 samples, was 445 mg/Kg. The highest TPH concentrations are in boreholes BH 1, 2, and 6, which are generally within the center of the Area 2 investigation grid (Figure 4).

As at Area 1, the TPH values were recalculated based on whether the sample was a "shallow" (0-3 ft.) or "deep" sample (>3 ft.). The mean TPH for the shallow samples was 731 mg/Kg, while the mean for the deep samples was only 112 mg/Kg. Lithologically, the shallow samples were a mixture of topsoil, clay and sandy clay. Again, the soil TPH values were not excessively elevated compared to those found in other abandoned production sites in the Hobbs area.

Table 2. Borehole Soil Sampling Results, Area 2 (Tank Battery) Schubert Site Investigation, Lea County, New Mexico

Location, Borehole, and Sample #	Depth (ft.)	Sample Date	Concentration (mg/Kg)					
			TPH	Benzene	Toluene	E-benzene	Total Xylenes	Cl
Area 2, BH 1-1	0-3	02/07/01	1,890	<0.005	0.058	0.034	0.171	81
Area 2, BH 1-2	5-5.5	02/08/01	167	<0.005	<0.005	<0.005	<0.015	113
Area 2, BH 2-1	0-2	02/08/01	911	<0.005	<0.005	<0.005	<0.015	81
Area 2, BH 2-2	3-3.5	02/08/01	18.4	<0.005	<0.005	<0.005	<0.015	65
Area 2, BH 3-1	0-3.25	02/08/01	86.6	<0.005	0.006	0.007	<0.015	178
Area 2, BH 3-2	5-5.5	02/08/01	110	<0.005	<0.005	<0.005	<0.015	162
Area 2, BH 4-1	0-2.5	02/08/01	117	<0.005	0.005	<0.005	<0.015	97
Area 2, BH 4-2	5-5.5	02/08/01	47.4	<0.005	<0.005	<0.005	<0.015	81
Area 2, BH 5-1	0-2.5	02/08/01	372	<0.005	<0.005	<0.005	<0.015	113
Area 2, BH 5-2	5-5.5	02/08/01	107	<0.005	<0.005	<0.005	<0.015	97
Area 2, BH 6-1	0-2.5	02/08/01	1,650	<0.005	<0.005	<0.005	<0.015	65
Area 2, BH 6-2	5-6	02/08/01	221	<0.005	<0.005	<0.005	<0.015	145
Area 2, BH 7-1	2-3	02/16/01	<10	<0.002	0.002	<0.002	<0.006	63
Area 2, BH 7-2	4-5	02/16/01	<10	<0.002	<0.002	<0.002	<0.006	63
Area 2, BH 8-1	0-3	02/09/01	<10	<0.005	<0.005	<0.005	<0.015	226
Area 2, BH 8-2	3-5	02/09/01	<10	<0.005	<0.005	<0.005	<0.015	178
Area 2, BH 9-1	2-3	02/16/01	92.9	<0.002	0.01	0.004	0.01	110
Area 2, BH 9-2	4-5	02/16/01	<10	<0.002	<0.002	<0.002	<0.006	94
Area 2, BH 10-1	2-3	02/16/01	<10	0.003	<0.002	<0.002	<0.006	173
Area 2, BH 10-2	4-5	02/16/01	<10	<0.002	<0.002	<0.002	<0.006	204
Area 2, BH 11-1	2-3	02/16/01	<10	<0.002	<0.002	<0.002	<0.006	141
Area 2, BH 11-2	4-5	02/16/01	<10	<0.002	<0.002	<0.002	<0.006	220
		All Samples:					All Samples:	
		Area 2 TPH Mean:	445				Area 2 Chloride Mean:	125
		Area 2 TPH Geometric Mean:	188				Area 2 Chloride Geometric Mean:	115
		Area 2 TPH Max:	1,890				Area 2 Chloride Max:	226
		Area 2 TPH Min:	<10				Area 2 Chloride Min:	63
		"Shallow" Samples (≤3 ft.):					"Shallow" Samples (≤3 ft.):	
		Area 2 Shallow Samples TPH Mean:	731				Area 2 Shallow Samples Cl Mean:	121
		Area 2 Shallow Samples TPH Geometric Mean:	372				Area 2 Shallow Samples Cl Geom. Mean:	111
		Area 2 Shallow Samples TPH Max:	1,890				Area 2 Shallow Samples Cl Max:	226
		Area 2 Shallow Samples TPH Min:	<10				Area 2 Shallow Samples Cl Min:	63
		"Deep" Samples (>3 ft.):					"Deep" Samples (>3 ft.):	
		Area 2 Deep Samples TPH Mean:	112				Area 2 Deep Samples Cl Mean:	129
		Area 2 Deep Samples TPH Geometric Mean:	85				Area 2 Deep Samples Cl Geometric Mean:	118
		Area 2 Deep Samples TPH Max:	221				Area 2 Deep Samples Cl Max:	220
		Area 2 Deep Samples TPH Min:	<10				Area 2 Deep Samples Cl Min:	63
Background								
H.P. (oily hardpan)	(Area 2)	02/09/01	48,600	<0.005	0.007	<0.005	<0.015	48
W. Bender 1 (south)	0.5-0.8	03/06/01	--	--	--	--	--	50
W. Bender 2 (south)	2-2.4	03/06/01	--	--	--	--	--	112

BTEX constituent sampling showed only a few volatile hydrocarbons present in the shallow at very low detection limits (usually 0.005 mg/Kg). Benzene at 0.003 mg/Kg was detected in only one Area 2 sample. At that level the value is not significant, especially for any groundwater impact. The highest BTEX values were toluene at 0.058 mg/Kg, ethylbenzene at 0.034 mg/Kg, and total xylenes at 0.171 mg/Kg. All three samples were from borehole BH 1-1 located at the center of the Area 2 grid.

Chloride levels ranged from 63 mg/Kg in BH 7 to a maximum of 226 mg/Kg in BH 8. There was essentially no difference in chloride levels in the "deep" samples from levels in the upper 3 ft.; the average of the shallow samples was 121 mg/Kg while the deeper samples had a chloride mean of 129 mg/Kg. Again, the soil chloride concentrations were not excessively elevated compared to those commonly found in abandoned pits in the region.

For those constituents sampled in soil at the production battery, the location does not pose a threat to groundwater due to the lack of significant residual hydrocarbon or highly elevated produced water contaminants.

A sample of "oily hardpan" was collected at the location of the former tank battery. Although it had a TPH of 48,600 mg/Kg, BTEX was essentially absent and chloride concentration was less than 50 mg/Kg. This material does not pose a threat to groundwater.

For comparison purposes, a background soil sample was collected for chloride analysis. The sample was collected from an uncultivated open field on the south side of Bender Blvd. east of French Drive just across from the Schubert site. The shallow sample reported 50 mg/Kg chloride while the sample at 2.4 ft. (at the top of the caliche) had a concentration of 112 mg/Kg. This value probably represents background in the vicinity of the investigation area.

IV. VADSAT Modeling of Chloride Contaminant Movement

The VADSAT model was utilized to simulate contaminate transport of chloride from the vicinity of the production pit through the vadose (unsaturated) zone to the groundwater. No organics were modeled because benzene was absent, and the low levels of other volatiles detected would be attenuated before reaching groundwater. The length of time chosen for model simulation is important because the NMOCD is looking at a minimum time period of 200 years for protection of groundwater from constituents that might be leached from the pit.

Over 40 physical and chemical variables are required to be determined prior to running the VADSAT model. Many of these are site specific (e.g. constituent concentration, waste area and thickness, depth to groundwater), while others are characteristic of the pit locale (e.g. soil type, infiltration rate, hydraulic conductivity, aquifer thickness and gradient). Some variables are essentially generic to the model and generally do not need to be changed unless there is site-specific data showing a need to modify the variables (e.g. constituent physical and chemical properties for the BTEX contaminants).

Chloride Simulations

Chloride is a very conservative contaminant (i.e. does not degrade or combine with other chemicals in the subsurface to decrease its concentration). When modeling chloride, the initial concentration and net infiltration (recharge) rate are the main drivers of contamination to the water table.

At the Schubert site, the average chloride value of 232 mg/Kg at Area 1 (the production pit) was used in the model. It was not adjusted for background concentration, nor was the geometric mean used in the simulation. Hypothetical receptors were placed at a location 10 feet downgradient from the pit at depths of 1, 5 and 10 feet below the water table. An infiltration rate of 0.5 inches per year was used in the simulation; this is the rate of recharge (under natural conditions) estimated by Nickolson and Clebsch (1961). Chloride first appears at the downgradient receptors about 180 years into the simulation, but the maximum increase in concentration at the end of 200 years is about 0.1 mg/L, which is an insignificant increase (Figure 5).

Since the area is under cultivation, a further simulation was made with a net infiltration rate of 5 inches per year, a chloride concentration of 120 mg/Kg (adjusted for background), and taking into consideration the clay beneath the site that would act as a "leaky" liner. With this scenario, chloride appears at the receptors about 110 years into the simulation. The maximum chloride concentration increase is 50 mg/L at 1 ft. depth and about 7 mg/L at 10 ft. depth (Figure 6). Although this scenario appears to pose groundwater problems, large-scale irrigated agriculture in the area is unlikely to continue past 40 years due to dropping of water levels in the Ogallala Formation below where pumping for agriculture is economical. Further, the subject property may be sold and taken out of agricultural production within the next two to three years.

Although the WQCC Regulations do not directly apply to the groundwater contamination at the site, the NMOCD is applying the methodology of the WQCC regulations in evaluating the future risk to groundwater. The regulations allow degradation of the groundwater up to the listed standard, but once reached no further degradation is allowed. At the Schubert site, the chloride concentration in the groundwater is unknown, but it is unlikely that it exceeds the New Mexico groundwater standard of 250 mg/L. Therefore it is likely that some small chloride increase would be allowed due to leaching from irrigation recharge at the production pit location. Due to the uncertainties of future use of the property for agriculture and/or the availability of irrigation water, and the lack of a current background water quality sample, further modeling efforts at the site would not be productive at this time.

V. Conclusions and Recommendations

Results of the soil sampling program show no risk to groundwater from any hydrocarbon material remaining at the site of the production pit and the tank battery. Although several samples have elevated TPH concentrations, measurable BTEX is missing from virtually all samples. Because of this, BTEX modeling was not performed at either of these sites.

Chloride modeling shows negligible increases in chloride groundwater concentrations for a modeling scenario that utilizes natural recharge as the mechanism for moving chloride

to the groundwater. However, a maximum increase of 50 mg/L in chloride in the groundwater is predicted if the area were irrigated for the next 100 years or longer and net recharge increased to 5 inches per year. The latter scenario is unlikely given the constraints expected to occur as water for irrigated agriculture becomes prohibitively expensive as water levels drop and it is diverted to beneficial uses that are more economically valuable.

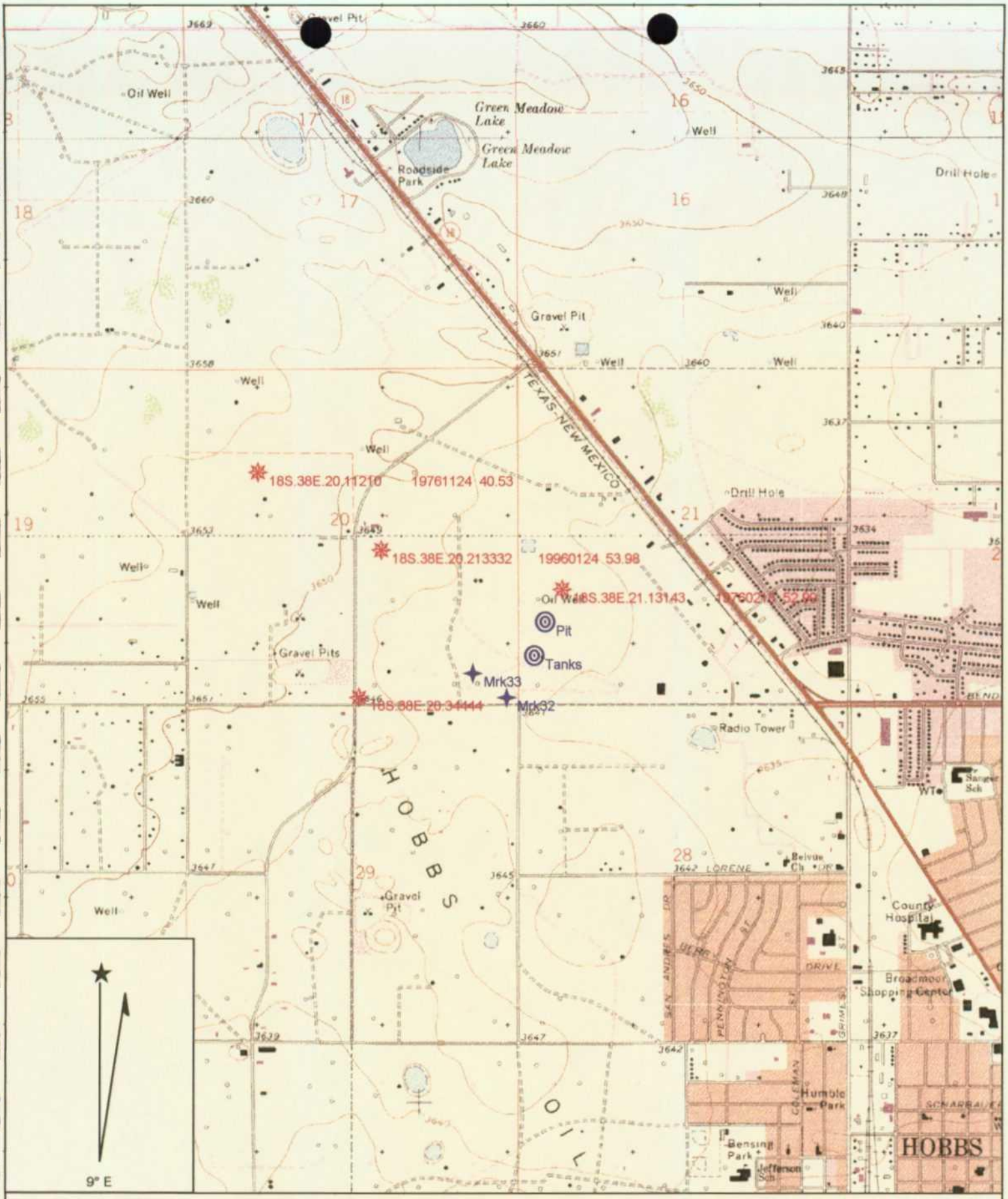
Based on evaluation of the soil sampling results and simulation of contaminant movement in the subsurface, SESI believes that no further investigation or remedial action is necessary or needed at either of the two sites (production pit and tank battery) investigated at the Schubert property.

VI. References

Nicholson, A. N., Jr., and Clebsch, A., Jr., 1961. *Geology and Ground-water Conditions in Southern Lea County, New Mexico.* Ground-Water Report 6, New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico, 120 p.

VII. Report Figures

Figure 1.
Vicinity Map



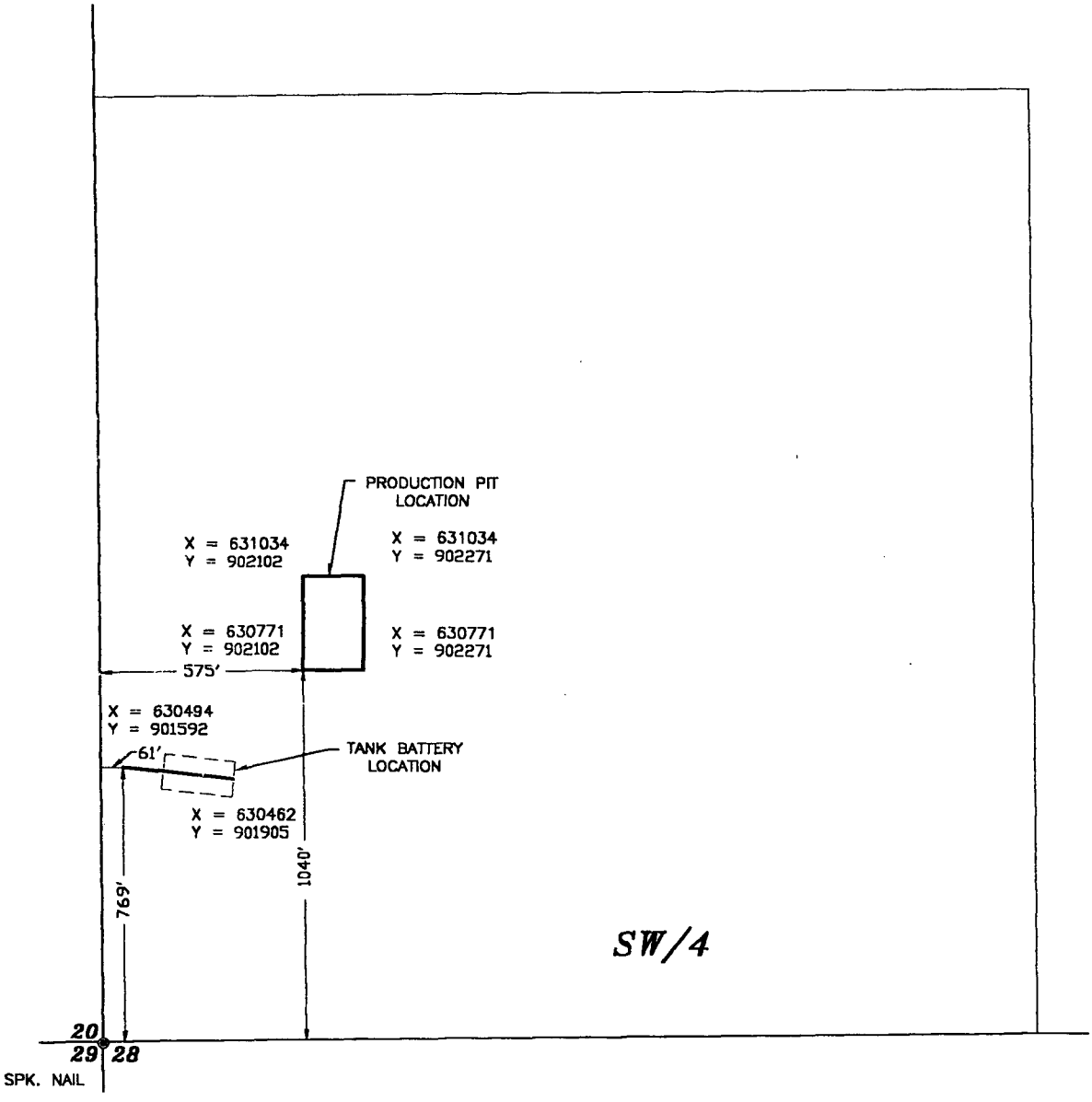
Name: HOBBS WEST
Date: 3/13/2001
Scale: 1 inch equals 2000 feet

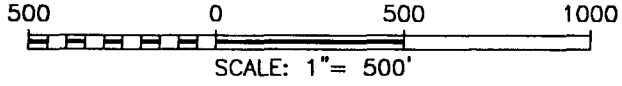
Location: 032° 43' 48.4" N 103° 09' 44.3" W
Caption: Figure 1. Vicinity Map
Schubert Site Investigation
Chevron USA

Figure 2.
Site Survey

SW/4 OF SECTION 21, TOWNSHIP 18 SOUTH, RANGE 38 EAST, N.M.P.M.,

LEA COUNTY, NEW MEXICO.





I HEREBY CERTIFY THAT I DIRECTED AND AM RESPONSIBLE FOR THIS SURVEY, THAT THIS SURVEY IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND THAT THIS SURVEY AND PLAT MEET THE MINIMUM STANDARDS FOR SURVEYING IN NEW MEXICO.

03/13/01

RONALD J. EIDSON, N.M. P.S. No. 3239
GARY G. EIDSON, N.M. P.S. No. 12641

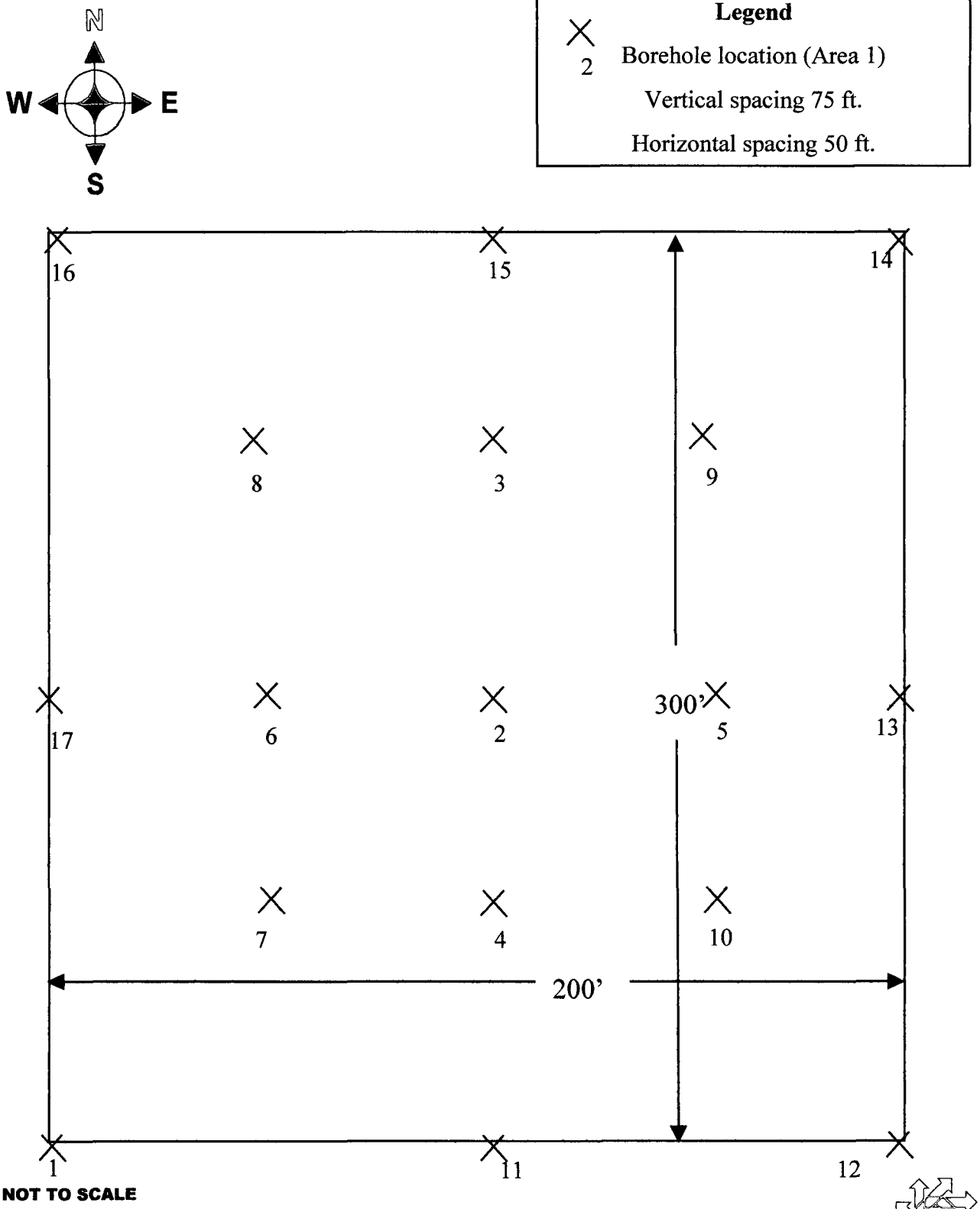
JOHN WEST SURVEYING COMPANY
412 N. DAL PASO – HOBBS, NEW MEXICO – 505-393-3117

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

A SURVEY TO LOCATE POINTS FOR BOUNDARIES ON PROPOSED SAMPLING LOCATIONS IN THE SOUTHWEST QUARTER IN SECTION 21, TOWNSHIP 18 SOUTH, RANGE 38 EAST, LEA COUNTY, NEW MEXICO

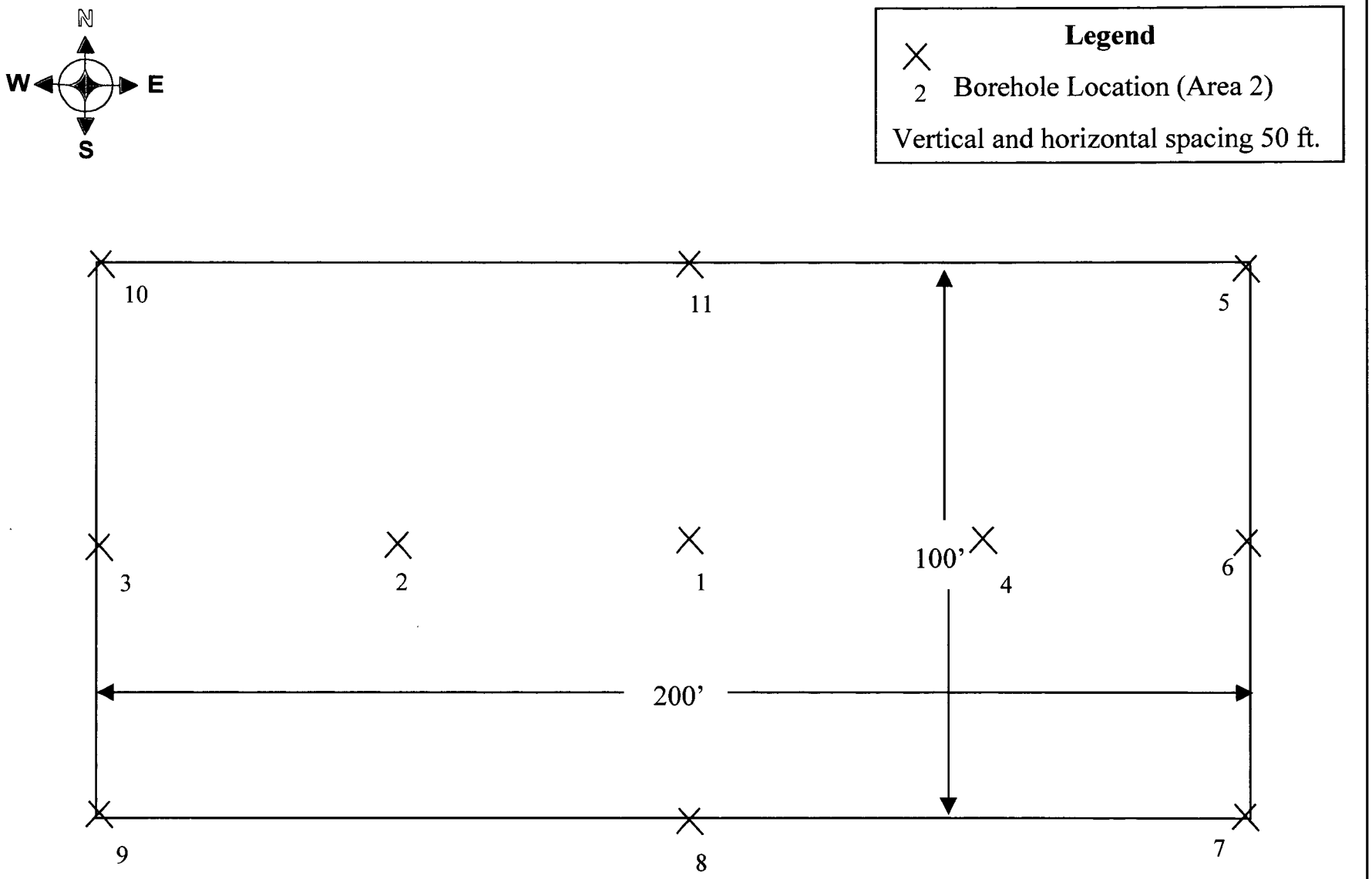
Survey Date: 0/0/01		Sheet 1 of 1 Sheets	
W.O. Number: 00-11-0192		Drawn By: LMP	
Date:03/13/01	DISK: CD#4	SAFE0192	Scale:1"=500'

Figure 3.
Borehole Locations, Production Pit (Area 1)



Chevron USA	**Figure 3** **Schubert Site Investigation** **Production Pit Area** **February 2001**	***Safety & Environmental Solutions, Inc.***

Figure 4.
Borehole Locations, Tank Battery (Area 2)



Chevron USA	**Figure 4** **Schubert Site Investigation, Battery Area** **February 2001**	***Safety & Environmental Solutions, Inc.***

Figure 5.
Chloride Simulation, Production Pit (Area 1), 0.5 in./yr. Recharge

Figure 5. Chloride Concentration vs. Time

Chevron Schubert Site Investigation

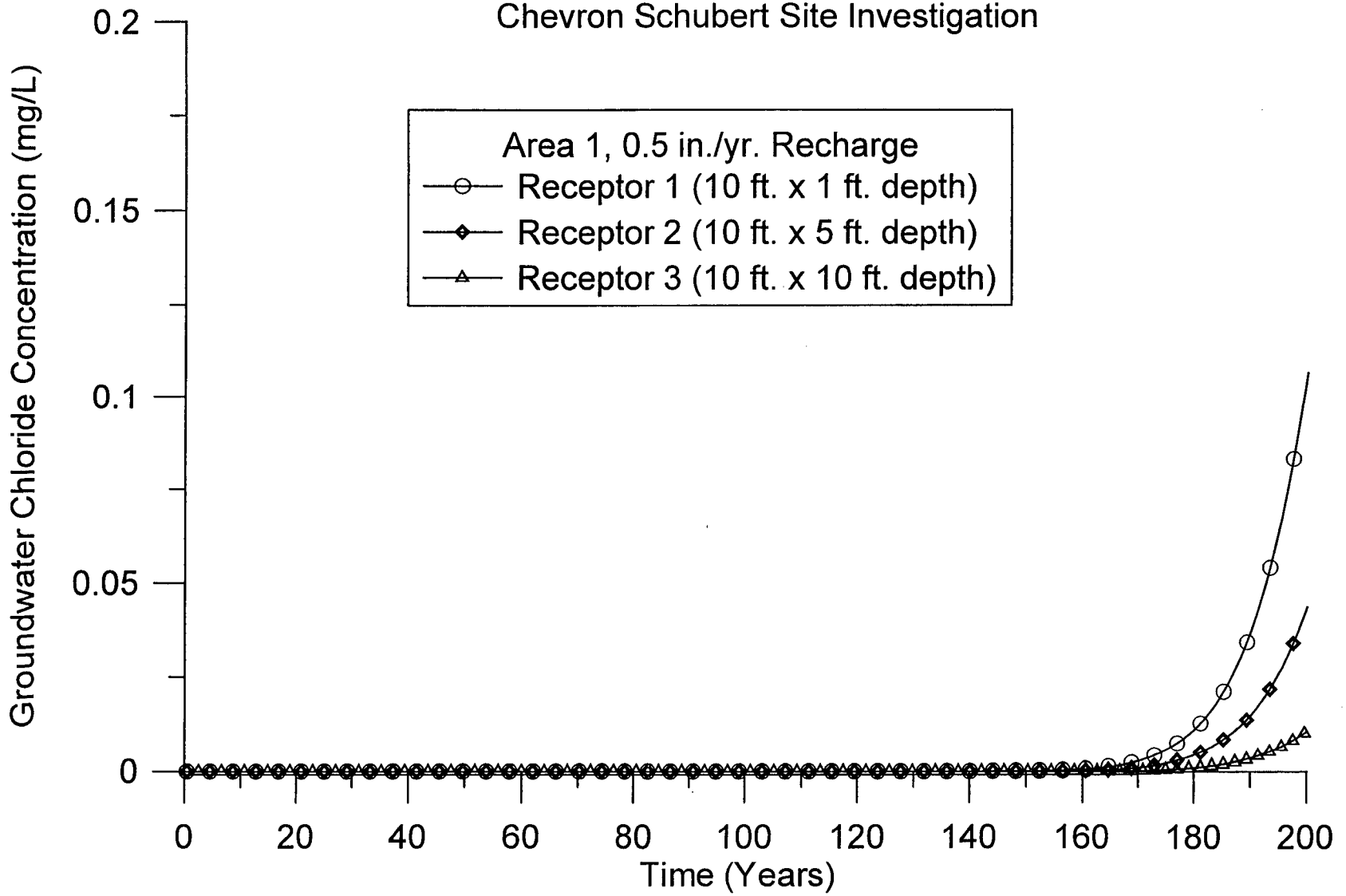
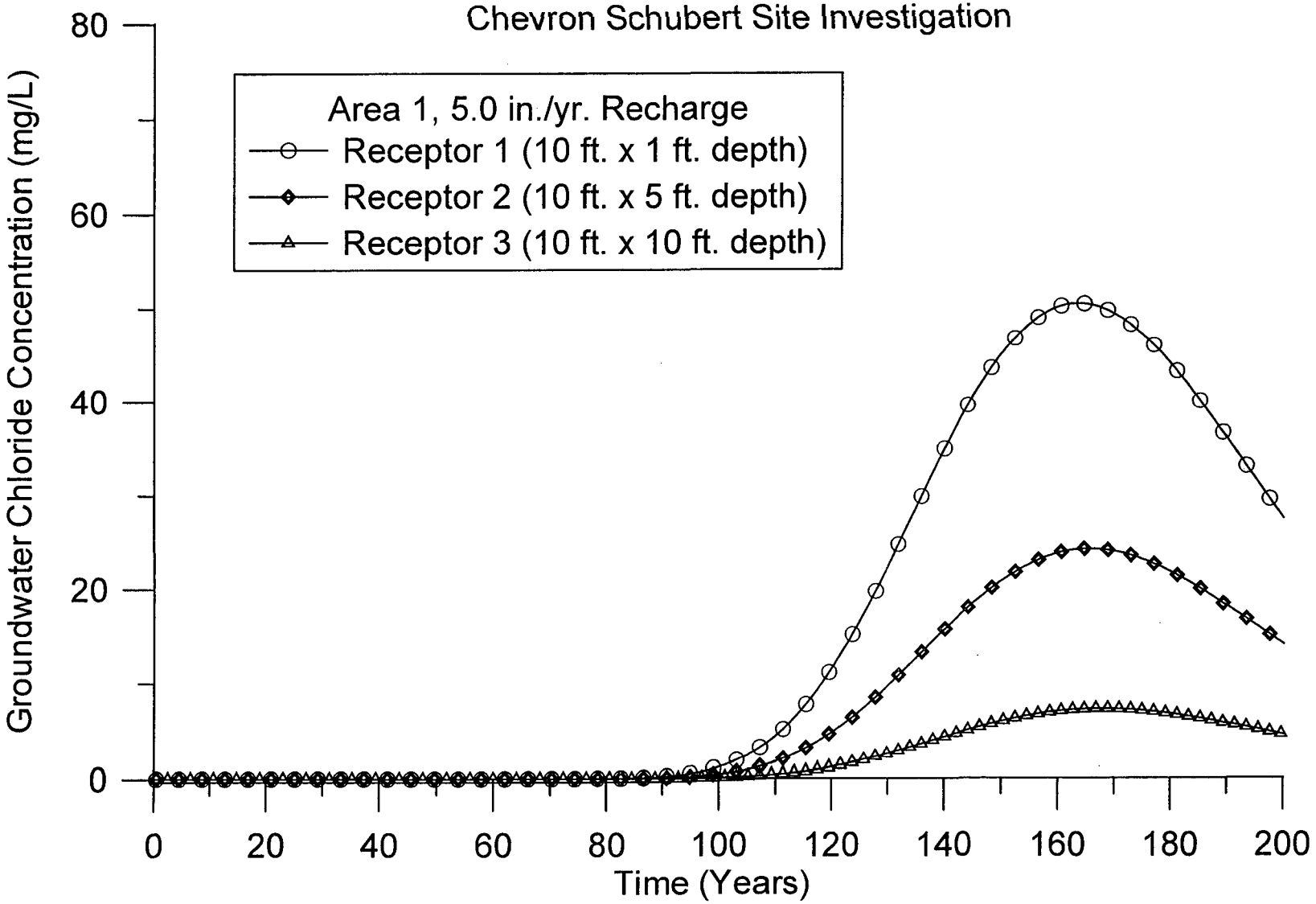


Figure 6.
Chloride Simulation, Production Pit (Area 1), 5.0 in./yr. Recharge

Figure 6. Chloride Concentration vs. Time

Chevron Schubert Site Investigation



VIII. Report Appendices

Appendix A. Borehole Lithologies

Appendix B. Laboratory Analytical Reports

Appendix C. VADSAT Model Simulation Results

Appendix A
Borehole Lithologies

Appendix A. Borehole Lithologies

Location, Borehole, and Sample #	Depth (ft.)	Description
Area 1, BH 1	0-2	Clay, brown-gray
	2-5	Caliche, indurated
Area 1, BH 2	0-2	Clay, brown-gray
	2-5	Caliche, indurated
Area 1, BH 3	0-2	Clay, brown-gray
	2-5	Caliche, indurated
Area 1, BH 4	0-2	Clay, brown
	2-5	Caliche
Area 1, BH 5	0-2	Clay, brown
	2-5	Caliche
Area 1, BH 6	0-2	Clay, brown
	2-5	Caliche, soft
Area 1, BH 7	0-2	Clay, brown
Area 1, BH 8	0-2	Clay, brown
Area 1, BH 9	0-2	Clay, brown
Area 1, BH 10	0-3	Clay, gray
Area 1, BH 11	0-3	Clay, gray
Area 1, BH 12	0-3	Sand, pink, and clay, brown
Area 1, BH 13	0-2	Clay, brown
Area 1, BH 14	0-1.5	Clay, brown
Area 1, BH 15	0-1.5	Clay, brown
Area 1, BH 16	0-2	Clay, brown
Area 1, BH 17	0-2	Clay, brown
Area 2, BH 1	0-3	Clay, sandy, gray
	4.5	Caliche, hard, white
	5-5.5	Caliche, white
Area 2, BH 2	0-2	Clay, sandy, brown
	3-3.5	Caliche, white
Area 2, BH 3	0-3.25	Clay, sandy, gray
	5-5.5	Caliche, white
Area 2, BH 4	0-1	Topsoil, sandy
	1-2.5	Clay
	5-5.5	Caliche, white
Area 2, BH 5	0-2.5	Topsoil, clay, gray
	5-5.5	Caliche, white
Area 2, BH 6	0-1	Topsoil
	1-6	Clay, tan-gray
Area 2, BH 7-1	2-3	Clay
	4-5	Clay, gray, and caliche
Area 2, BH 8-1	0-3	Clay
	3-5	Clay, gray, and caliche
Area 2, BH 9-1	2-3	Clay, gray
	4-5	Clay, gray, and caliche
Area 2, BH 10-1	2-3	Clay, brown
	4-5	Clay, brown, and caliche
Area 2, BH 11-1	2-3	- -
	4-5	- -
Background		
H.P. (oily hardpan)	- -	- -
W. Bender 1 (south)	0.5-0.8	Silt, sandy, brown with roots and some clay
W. Bender 2 (south)	2-2.4	Silt, light brown with clay and caliche fragments,
		auger refusal at 2.4 ft.

Appendix B
Laboratory Analytical Reports

CARDINAL LABORATORIES

PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
SAFETY & ENVIRONMENTAL SOLUTIONS, INC.
ATTN: BOB ALLEN
703 E. CLINTON, #103
HOBBS, NM 88240
FAX TO: (505) 393-4388

Receiving Date: 02/05/01
Reporting Date: 02/07/01
Project Owner: CHEVRON
Project Name: SCHUBART ASSESSMENT
Project Location: HOBBS, NM

Sampling Date: 02/04 & 02/05/01
Sample Type: SOIL
Sample Condition: COOL & INTACT
Sample Received By: GP
Analyzed By: BC/AH

LAB NUMBER	SAMPLE ID	TPH (mg/Kg)	Cl* (mg/Kg)	BENZENE (mg/Kg)	TOLUENE (mg/Kg)	ETHYL BENZENE (mg/Kg)	TOTAL XYLENES (mg/Kg)
ANALYSIS DATE:		02/06/01	02/05/01	02/06/01	02/06/01	02/06/01	02/06/01
H5579-1	AREA 1 BH 1-1	<10	128	<0.005	0.007	<0.005	0.018
H5579-2	AREA 1 BH 2-1	<10	192	<0.005	<0.005	<0.005	<0.015
H5579-3	AREA 1 BH 3-1	3540	145	<0.005	0.008	<0.005	<0.015
H5579-4	AREA 1 BH 3-2	165	162	<0.005	0.010	<0.005	0.017
Quality Control		230	980	0.102	0.103	0.098	0.291
True Value QC		240	1000	0.100	0.100	0.100	0.300
% Recovery		95.9	98.0	102	103	98.3	97.0
Relative Percent Difference		2.9	7.2	9.7	8.3	3.7	3.5

METHODS: TRPHC-EPA 600/4-79-020 418.1;Cl-Std. Methods 4500-Cl⁻B; BTEX-EPA SW-846 8260
*Analyses performed on 1:4 w:v aqueous extracts.

Burgess J. A. Cooke, Ph. D.

2/7/01
Date

CARDINAL LABORATORIES, INC.

2111 Beechwood, Abilene, TX 79603 (915) 673-7001 Fax (915) 673-7020
101 East Marland, Hobbs, NM 88240 (505) 393-2326 Fax (505) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Company Name:	SESI	BILL TO	PO #:
Project Manager:	Alex	Company:	SAME
Address:	703 E. CLINTON, #103	Attn:	
City:	HOBBS State: NM Zip: 88240	Address:	
Phone #:	(505) 397-0510	City:	
Fax #:	(505) 393-4388	State:	Zip:
Project #:	Project Owner:	Phone #:	
Project Name:	Schubert Assessment	Fax #:	
Project Location:			

ANALYSIS REQUEST: TPH 418.1 | BTEX | Cl-

FOR LAB USE ONLY LAB I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	PRES.: ACID:	ICE / COOL	OTHER:	SAMPLING DATE	SAMPLING TIME	TPH 418.1	BTEX	Cl-
H5519-1	Area 1 BH 1-1	G	1			X					X		2-4-01	11:00	X	X	X
-2	" BH 2-1	G	1			X					X		2-4-01	2:00	X	X	X

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Terms and Conditions: Interest will be charged on all accounts more than 30 days past due at the rate of 24% per annum from the original date of invoice, and all costs of collections, including attorney's fees.

Sampler Relinquished:	Date: 2-4-01	Received By:	Phone Result: ☒ Yes ☐ No Additional Fax #:
	Time: 2:15PM		Fax Result: ☒ Yes ☐ No
Relinquished By:	Date: 2/5/01	Received By: (Lab Staff)	REMARKS: Please rush Cl ASAP & Call Rob. (Sample Taken from 5-6 FT)
	Time: 2:33		
Delivered By: (Circle One) Sampler - UPS - Bus - Other:		Sample Condition Cool: ☒ Yes ☐ No Intact: ☐ Yes ☐ No	CHECKED BY: (Initials)

† Cardinal cannot accept verbal changes. Please fax written changes to 915-673-7020.

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

CARDINAL LABORATORIES, INC.

2111 Beechwood, Abilene, TX 79603 (915) 673-7001 Fax (915) 673-7020

101 East Marland, Hobbs, NM 88240 (505) 393-2326 Fax (505) 393-2476

Page____ of____

Company Name:	SESI	**BILL TO**	
Project Manager:	Allen	P.O. #:	
Address:		Company:	
City:	State: Zip:	Attn:	
Phone #:	Fax #:	Address:	
Project #:	Project Owner: Chevron	City:	
Project Name:	Schubart Assessment	State: Zip:	
Project Location:	Hobbs	Phone #:	
Sampler Name:	Dee Hurtley	Fax #:	

ANALYSIS REQUEST

FOR LAB USE ONLY				MATRIX						PRESERV.			SAMPLING		TPH 418.1	BTEX	Chlorides										
Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	CRUDE OIL	SLUDGE	OTHER :	ACID/BASE:	ICE / COOL	OTHER :	DATE	TIME													
H5579-3	Area #1 B.H. #3-1	G	1			✓					✓		2-5-01	4:30	✓	✓	✓										
-4	Area #1 B.H. #3-2	G	1			✓					✓		2-5-01	4:30	✓	✓	✓										

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Terms and Conditions: Interest will be charged on all accounts more than 30 days past due at the rate of 24% per annum from the original date of invoice, and all costs of collections, including attorney's fees.

Sampler Relinquished:	Date: 2-5-01	Received By:	
	Time: 4:30pm		
Relinquished By:	Date:	Received By: (Lab Staff)	
	Time:		

Delivered By: (Circle One)
Sampler - UPS - Bus - Other:

Sample Condition		CHECKED BY: (Initials)
Cool	Intact	
☑ Yes ☐ No	☑ Yes ☐ No	

Phone Result: ☐ Yes ☐ No Add'l Phone #:

Fax Result: ☐ Yes ☐ No Add'l Fax #:

REMARKS:

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476.

CARDINAL LABORATORIES

PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
SAFETY & ENVIRONMENTAL SOLUTIONS, INC.
ATTN: BOB ALLEN
703 E. CLINTON
HOBBS, NM 88240
FAX TO: (505) 393-4388

Receiving Date: 02/06/01
Reporting Date: 02/09/01
Project Owner: CHEVRON
Project Name: SCHUBART ASSESSMENT
Project Location: AREA #1

Sampling Date: 02/06/01
Sample Type: SOIL
Sample Condition: COOL & INTACT
Sample Received By: BC
Analyzed By: BC/AH

LAB NUMBER	SAMPLE ID	TPH (mg/Kg)	Cl* (mg/Kg)	BENZENE (mg/Kg)	TOLUENE (mg/Kg)	ETHYL BENZENE (mg/Kg)	TOTAL XYLENES (mg/Kg)
ANALYSIS DATE:		02/07/01	02/07/01	02/07/01	02/07/01	02/07/01	02/07/01
H5585-1	AREA 1 B.H. 4-1	1400	129	<0.005	0.006	<0.005	0.016
H5585-2	AREA 1 B.H. 4-2	15.8	145	<0.005	<0.005	<0.005	<0.015
H5585-3	AREA 1 B.H. 5-1	9440	291	<0.005	<0.005	<0.005	<0.015
H5585-4	AREA 1B.H. 5-2	220	129	<0.005	<0.005	<0.005	<0.015
H5585-5	AREA 1 B.H. 6-1	3550	113	<0.005	<0.005	<0.005	<0.015
H5585-6	AREA 1 B.H. 6-2	388	162	<0.005	<0.005	<0.005	<0.015
H5585-7	AREA 1 B.H. 7	119	242	<0.005	<0.005	<0.005	<0.015
H5585-8	AREA 1 B.H. 8	1490	129	<0.005	<0.005	<0.005	<0.015
H5585-9	AREA 1 B.H. 9	154	129	<0.005	<0.005	<0.005	<0.015
H5585-10	AREA 1 B.H. 10	60.2	113	<0.005	<0.005	<0.005	<0.015
H5585-11	AREA 1 B.H. 11	491	210	<0.005	<0.005	<0.005	<0.015
H5585-12	AREA 1 B.H. 12	18.5	145	<0.005	<0.005	<0.005	<0.015
H5585-13	AREA 1 B.H. 13	<10	81	<0.005	<0.005	<0.005	<0.015
H5585-14	AREA 1 B.H. 14	<10	356	<0.005	<0.005	<0.005	<0.015
H5585-15	AREA 1 B.H. 15	<10	129	<0.005	<0.005	<0.005	<0.015
H5585-16	AREA 1 B.H. 16	<10	1617	<0.005	<0.005	<0.005	<0.015
H5585-17	AREA 1 B.H. 17	<10	129	<0.005	<0.005	<0.005	<0.015
Quality Control		240	980	0.108	0.109	0.111	0.328
True Value QC		240	1000	0.100	0.100	0.100	0.300
% Recovery		100	98.0	108	109	111	109
Relative Percent Difference		1.8	7.2	6.2	5.2	9.6	11.4

METHODS: TRPHC-EPA 600/4-79-020 418.1;Cl-Std. Methods 4500-Cl-B; BTEX-EPA SW-846 8260
*Analyses performed on 1:4 w:v aqueous extracts.

Burgess J. A. Cooke

Burgess J. A. Cooke. Ph. D.

2/9/01
Date

CARDINAL LABORATORIES, INC.

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

2111 Beechwood, Abilene, TX 79603 101 East Marland, Hobbs, NM 88240
(915) 673-7001 Fax (915) 673-7020 (505) 393-2326 Fax (505) 393-2476

Company Name:	SESI	**BILL TO**	
Project Manager:	Bob Allen	P.O. #:	
Address:		Company:	
City:	State: Zip:	Attn:	
Phone #:	Fax #:	Address:	
Project #:	Project Owner: Chevron	City:	
Project Name:	Shubart Assessment	State: Zip:	
Project Location:	Area #1	Phone #:	
Sampler Name:	Dee Wheeler	Fax #:	

FOR LAB USE ONLY				MATRIX							PRESERV.			SAMPLING		ANALYSIS REQUEST		
Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	CRUDE OIL	SLUDGE	OTHER :	ACID/BASE:	ICE / COOL	OTHER :	DATE	TIME	TPH 418.1	BTEX	Chlorides
H5585-1	Area 1 BH 4-1	G	1			✓					✓		2-6-01	4:45	✓	✓	✓
-2	" " BH 4-2		1			✓					✓						
-3	BH 5-1		1			✓					✓						
-4	BH 5-2		1			✓					✓						
-5	BH 6-1		1			✓					✓						
-6	BH 6-2		1			✓					✓						
-7	BH 7		1			✓					✓						
-8	BH 8		1			✓					✓						
-9	BH 9		1			✓					✓						
-10	BH 10		1			✓					✓						

Sampler Relinquished:	Date: 2-6-01	Received By:	Phone Result: ☐ Yes ☐ No Add'l Phone #:
	Time: 4:45pm		Fax Result: ☐ Yes ☐ No Add'l Fax #:
Relinquished By:	Date:	Received By: (Lab Staff)	REMARKS:
	Time:		

Delivered By: (Circle One)
Sampler - UPS - Bus - Other:

Sample Condition		CHECKED BY: (Initials)
Cool	Intact	
☑ Yes ☐ No	☑ Yes ☐ No	

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476.

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

CARDINAL LABORATORIES, INC.

2111 Beechwood, Abilene, TX 79603 (915) 673-7001 Fax (915) 673-7020

101 East Marland, Hobbs, NM 88240 (505) 393-2326 Fax (505) 393-2476

Company Name:	SEST	**BILL TO**	
Project Manager:	Allen	**P.O. #:**	
Address:		**Company:**	
City:	**State:** **Zip:**	**Attn:**	
Phone #:	**Fax #:**	**Address:**	
Project #:	**Project Owner:** Chevron	**City:**	
Project Name:	Schbert Assessment	**State:** **Zip:**	
Project Location:	Area #1	**Phone #:**	
Sampler Name:	Pat Hall	**Fax #:**	

FOR LAB USE ONLY				MATRIX							PRESERV.			SAMPLING		ANALYSIS REQUEST											
Lab I.D.	**Sample I.D.**	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	CRUDE OIL	SLUDGE	OTHER :	ACID/BASE:	ICE / COOL	OTHER :	DATE	TIME	TPH 418.1	BTEX	Chlorides										
W3585-11	Area 1 B.H. #11	G	6			✓					✓		2-6-01	4:45	✓	✓	✓										
-12	" " B.H. #12					✓					✓				✓	✓	✓										
-13	B.H. #13					✓					✓				✓	✓	✓										
-14	B.H. #14					✓					✓				✓	✓	✓										
-15	B.H. #15					✓					✓				✓	✓	✓										
-16	B.H. #16					✓					✓				✓	✓	✓										
-17	B.H. #17					✓					✓				✓	✓	✓										

Sampler Relinquished:	**Date:** 2-6-01	**Received By:**	**Phone Result:** ☐ Yes ☐ No **Add'l Phone #:**
	Time: 4:45pm		**Fax Result:** ☐ Yes ☐ No **Add'l Fax #:**
Relinquished By:	**Date:**	**Received By: (Lab Staff)**	**REMARKS:**
	Time:		
Delivered By: (Circle One)	**Sample Condition** Cool ☐ Yes ☐ No Intact ☐ Yes ☐ No	**CHECKED BY: (Initials)**	
Sampler - UPS - Bus - Other:			

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476.

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PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
SAFETY & ENVIRONMENTAL SOLUTIONS, INC.
ATTN: BOB ALLEN
703 E. CLINTON, #103
HOBBS, NM 88240
FAX TO: (505) 393-4388

Receiving Date: 02/09/01
Reporting Date: 02/13/01
Project Owner: CHEVRON
Project Name: SCHUBART ASSESSMENT
Project Location: AREA #2

Sampling Date: 02/09/01
Sample Type: SOIL
Sample Condition: COOL & INTACT
Sample Received By: BC
Analyzed By: BC/AH

LAB NUMBER	SAMPLE ID	TPH (mg/Kg)	Cl* (mg/Kg)	BENZENE (mg/Kg)	TOLUENE (mg/Kg)	ETHYL BENZENE (mg/Kg)	TOTAL XYLENES (mg/Kg)
ANALYSIS DATE:		02/12/01	02/13/01	02/12/01	02/12/01	02/12/01	02/12/01
H5596-1	AREA 2 8-1	<10	226	<0.005	<0.005	<0.005	<0.015
H5596-2	AREA 2 8-2	<10	178	<0.005	<0.005	<0.005	<0.015
H5596-3	BACKGROUND H.P.	48600	48	<0.005	0.007	<0.005	<0.015
Quality Control		229	1051	0.096	0.096	0.100	0.286
True Value QC		240	1000	0.100	0.100	0.100	0.300
% Recovery		95.6	105	96.3	96.3	99.8	95.1
Relative Percent Difference		9.8	6.8	3.4	2.9	6.3	2.1

METHODS: TRPHC-EPA 600/4-79-020 418.1;Cl-Std. Methods 4500-Cl⁻B; BTEX-EPA SW-846 8260
*Analyses performed on 1:4 w:v aqueous extracts.

Burgess J. A. Cooke. Ph. D.

2/13/01
Date

CARDINAL LABORATORIES, INC.

2111 Beechwood, Abilene, TX 79603 (915) 673-7001 Fax (915) 673-7020
101 East Marland, Hobbs, NM 88240 (505) 393-2326 Fax (505) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Page____ of____

Company Name:	SESI	BILL TO	PO #:
Project Manager:	Allen	Company:	
Address:		Attn:	
City:	State: Zip:	Address:	
Phone #:		City:	
Fax #:		State:	Zip:
Project #:	Project Owner: Chevron	Phone #:	
Project Name:	Schubart Assessment	Fax #:	
Project Location:	Area #2		

ANALYSIS REQUEST

FOR LAB USE ONLY LAB I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	PRES.: ACID:	ICE / COOL	OTHER:	SAMPLING: DATE	TIME	TPH 418.1	BTEX	Chlorides
H5596-1	Area #2 S-1	G	1			✓					✓		2-09-01	2:30pm	✓	✓	✓
-2	Area #2 S-2	G	1			✓					✓		2-09-01	2:30pm	✓	✓	✓
-3	Background H.P.	G	1			✓					✓		2-09-01	2:30pm	✓	✓	✓

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Terms and Conditions: Interest will be charged on all accounts more than 30 days past due at the rate of 24% per annum from the original date of invoice, and all costs of collections, including attorney's fees.

Sampler Relinquished:	Date: 2-09-01	Received By:	Phone Result ☐ Yes ☐ No Additional Fax #:
	Time: 2:30pm		Fax Result: ☐ Yes ☐ No
Relinquished By:	Date:	Received By: (Lab Staff)	REMARKS:
	Time:	Burgess W. Cook	
Delivered By: (Circle One)		Sample Condition: Cool ☒ Yes ☐ No; Intact ☒ Yes ☐ No	CHECKED BY: (Initials)
Sampler - UPS - Bus - Other:			

† Cardinal cannot accept verbal changes. Please fax written changes to 915-673-7020.

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PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR:
SAFETY AND ENVIRONMENTAL SOLUTIONS, INC.
ATTN: BOB ALLEN
703 E. CLINTON, SUITE 103
HOBBS, NM 88240
FAX TO: 505-393-4308

Receiving Date: 02/16/01
Reporting Date: 02/20/01
Project Number: NOT GIVEN
Project Name: SCHUBART ASSESSMENT
Project Location: AREA #2

Sampling Date: 02/16/01
Sample Type: SOIL
Sample Condition: COOL, INTACT
Sample Received By: AH
Analyzed By: JA

LAB NUMBER	SAMPLE ID	BENZENE (mg/Kg)	TOLUENE (mg/Kg)	ETHYL BENZENE (mg/Kg)	TOTAL XYLENES (mg/Kg)
ANALYSIS DATE		02/19/01	02/19/01	02/19/01	02/19/01
H5624-1	AREA #2 7-1	<0.002	0.002	<0.002	<0.006
H5624-2	AREA #2 7-2	<0.002	<0.002	<0.002	<0.006
H5624-3	AREA #2 9-1	<0.002	0.010	0.004	0.010
H5624-4	AREA #2 9-2	<0.002	<0.002	<0.002	<0.006
H5624-5	AREA #2 10-1	0.003	<0.002	<0.002	<0.006
H5624-6	AREA #2 10-2	<0.002	<0.002	<0.002	<0.006
H5624-7	AREA #2 11-1	<0.002	<0.002	<0.002	<0.006
H5624-8	AREA #2 11-2	<0.002	<0.002	<0.002	<0.006
Quality Control		0.097	0.100	0.088	0.275
True Value QC		0.100	0.100	0.100	0.300
% Accuracy		97	100	88	92
Relative Percent Difference		4.1	0.7	1.6	0.2

METHOD: EPA SW 846-8020, 5030, Gas Chromatography

Chemist

2-20-01
Date

H5624SSESIHOBBSBTEXONLY

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

CARDINAL LABORATORIES, INC.

2111 Beechwood, Abilene, TX 79603 (915) 673-7001 Fax (915) 673-7020

101 East Marland, Hobbs, NM 88240 (505) 393-2326 Fax (505) 393-2476

Page____ of____

Company Name:	SESI	**BILL TO**	
Project Manager:	Bob Allen	P.O. #:	
Address:		Company:	
City:	State: Zip:	Attn:	
Phone #:	Fax #:	Address:	
Project #:	Project Owner: Chevron	City:	
Project Name:	Schubart Assessment	State: Zip:	
Project Location:	Area #2	Phone #:	
Sampler Name:	D. Whatley	Fax #:	

ANALYSIS REQUEST

FOR LAB USE ONLY Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	CRUDE OIL	SLUDGE	OTHER:	PRESERV.: ACID/BASE:	ICE / COOL	OTHER:	SAMPLING: DATE	TIME	TPH 418.1	BTEX	Chlorides
H5624-1	Area #2 7-1	G	1			✓					✓		2-16-01	2:15	✓	✓	✓
-2	" " 7-2	G	1			✓					✓		"	"	✓	✓	✓
-3	" " 9-1	G	1			✓					✓				✓	✓	✓
-4	" " 9-2	G	1			✓					✓				✓	✓	✓
-5	" " 10-1	G	1			✓					✓				✓	✓	✓
-6	" " 10-2	G	1			✓					✓				✓	✓	✓
-7	" " 11-1	G	1			✓					✓				✓	✓	✓
-8	" " 11-2	G	1			✓					✓				✓	✓	✓

Sampler Relinquished:	Date: 2-16-01	Received By:	
	Time: 2:15pm		
Relinquished By:	Date: 2-16-01	Received By: (Lab Staff)	Amy Hill
	Time: 2:20		

Delivered By: (Circle One)

Sampler - UPS - Bus - Other:

Sample Condition: Cool ☑ Yes ☐ No; Intact ☑ Yes ☐ No

CHECKED BY: (Initials)

Phone Result: ☐ Yes ☐ No Add'l Phone #:

Fax Result: ☐ Yes ☐ No Add'l Fax #:

REMARKS:

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476.

CARDINAL LABORATORIES

PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
SAFETY & ENVIRONMENTAL SOLUTIONS, INC.
ATTN: BOB ALLEN
703 E. CLINTON, #103
HOBBS, NM 88240
FAX TO: (505) 393-4388

Receiving Date: 02/08/01
Reporting Date: 02/13/01
Project Number: NOT GIVEN
Project Name: SCHUBERT
Project Location: NOT GIVEN

Sampling Date: 02/07 & 02/08/01
Sample Type: SOIL
Sample Condition: COOL & INTACT
Sample Received By: BC
Analyzed By: BC/AH

LAB NUMBER	SAMPLE ID	TPH (mg/Kg)	Cl* (mg/Kg)	BENZENE (mg/Kg)	TOLUENE (mg/Kg)	ETHYL BENZENE (mg/Kg)	TOTAL XYLENES (mg/Kg)
ANALYSIS DATE:		02/12/01	02/12/01	02/12/01	02/12/01	02/12/01	02/12/01
H5594-1	AREA 2 BH 1-1	1890	81	<0.005	0.058	0.034	0.171
H5594-2	AREA 2 BH 1-2	167	113	<0.005	<0.005	<0.005	<0.015
H5594-3	AREA 2 BH 2-1	911	81	<0.005	<0.005	<0.005	<0.015
H5594-4	AREA 2 BH 2-2	18.4	65	<0.005	<0.005	<0.005	<0.015
H5594-5	AREA 2 BH 3-1	86.6	178	<0.005	0.006	0.007	<0.015
H5594-6	AREA 2 BH 3-2	110	162	<0.005	<0.005	<0.005	<0.015
H5594-7	AREA 2 BH 4-1	117	97	<0.005	0.005	<0.005	<0.015
H5594-8	AREA 2 BH 4-2	47.4	81	<0.005	<0.005	<0.005	<0.015
H5594-9	AREA 2 BH 5-1	372	113	<0.005	<0.005	<0.005	<0.015
H5594-10	AREA 2 BH 5-2	107	97	<0.005	<0.005	<0.005	<0.015
H5594-11	AREA 2 BH 6-1	1650	65	<0.005	<0.005	<0.005	<0.015
H5594-12	AREA 2 BH 6-2	221	145	<0.005	<0.005	<0.005	<0.015
Quality Control		229	1051	0.096	0.096	0.100	0.286
True Value QC		240	1000	0.100	0.100	0.100	0.300
% Recovery		95.6	105	96.3	96.3	99.8	95.1
Relative Percent Difference		9.8	6.8	3.4	2.9	6.3	2.1

METHODS: TRPHC-EPA 600/4-79-020 418.1;Cl-Std. Methods 4500-ClB; BTEX-EPA SW-846 8260
*Analyses performed on 1:4 w:v aqueous extracts.

Burgess J.A. Cooke, Ph. D.

2/13/01
Date

CARDINAL LABORATORIES, INC.

2111 Beechwood, Abilene, TX 79603 (915) 673-7001 Fax (915) 673-7020
101 East Marland, Hobbs, NM 88240 (505) 393-2326 Fax (505) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Page 1 of 2

Company Name: SESI	BILL TO PO #:
Project Manager: Aller	Company: SAME
Address: 703 E. CLINTON, #103	Attn:
City: HOBBS State: NM Zip: 88240	Address:
Phone #: (505) 397-0510	City:
Fax #: (505) 393-4388	State: Zip:
Project #: Project Owner:	Phone #:
Project Name: Schubert	Fax #:
Project Location:	

ANALYSIS REQUEST

FOR LAB USE ONLY LAB I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	PRES.: ACID:	ICE / COOL	OTHER:	SAMPLING DATE	TIME	TPH - 418.1	BTEX	Cl⁻
H5594-1	Area 2 BH 1-1	C				X					X		2-7-01	8:00	✓	✓	✓
2	BH 1-2	C				X					X		2-8-01		✓	✓	✓
3	BH 2-1	C				X					X		"		✓	✓	✓
4	BH 2-2	C				X					X		"		✓	✓	✓
5	BH 3-1	C				X					X		"		✓	✓	✓
6	BH 3-2	C				X					X		"		✓	✓	✓
7	BH 4-1	C				X					X		"		✓	✓	✓
8	BH 4-2	C				X					X		"		✓	✓	✓
9	BH 5-1	C				X					X		"		✓	✓	✓
10	BH 5-2	C				X					X		"		✓	✓	✓

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Terms and Conditions: Interest will be charged on all accounts more than 30 days past due at the rate of 24% per annum from the original date of invoice, and all costs of collections, including attorney's fees.

Sampler Relinquished: B Aller	Date: 2-8-01 Time:	Received By:	Phone Result ☐ Yes ☐ No Additional Fax #: Fax Result: ☐ Yes ☐ No REMARKS:
Relinquished By:	Date: 2-8-01 Time: 5:05	Received By: (Lab Staff)	
Delivered By: (Circle One) Sampler - UPS - Bus - Other:		Sample Condition Cool ☐ Yes ☐ No Intact ☐ Yes ☐ No	CHECKED BY: (Initials)

† Cardinal cannot accept verbal changes. Please fax written changes to 915-673-7020.

CARDINAL LABORATORIES, INC.

2111 Beechwood, Abilene, TX 79603 101 East Marland, Hobbs, NM 88240
(915) 673-7001 Fax (915) 673-7020 (505) 393-2326 Fax (505) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Company Name: SESI	BILL TO PO #:
Project Manager: Aller	Company: SAME
Address: 703 E. CLINTON, #103	Attn:
City: HOBBS State: NM Zip: 88240	Address:
Phone #: (505) 397-0510	City:
Fax #: (505) 393-4388	State: Zip:
Project #: Project Owner:	Phone #:
Project Name: Schubert	Fax #:
Project Location:	

ANALYSIS REQUEST: TPH 418.1 / BTEX / Cl

FOR LAB USE ONLY LAB I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	PRES.: ACID:	ICE / COOL	OTHER:	SAMPLING: DATE	TIME
H5594-11	AREA2 BH6-1	C				Y					Y		2-8-01	
-12	BH6-2	C				Y					Y		"	

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Terms and Conditions: Interest will be charged on all accounts more than 30 days past due at the rate of 24% per annum from the original date of invoice, and all costs of collections, including attorney's fees.

Sampler Relinquished:	Date: 2-8-01	Received By:	Phone Result ☐ Yes ☐ No Additional Fax #:
	Time:		Fax Result: ☐ Yes ☐ No
Relinquished By:	Date: 2-8-01	Received By: (Lab Staff)	REMARKS:
	Time: 5:05		
Delivered By: (Circle One)	Sample Condition: Cool ☒ Yes ☐ No; Intact ☒ Yes ☐ No	CHECKED BY: (Initials)	
Sampler - UPS - Bus - Other:			

† Cardinal cannot accept verbal changes. Please fax written changes to 915-673-7020.

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PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
SAFETY & ENVIRONMENTAL SOLUTIONS, INC.
ATTN: BOB ALLEN
P.O. BOX 1613
HOBBS, NM 88241
FAX TO:

Receiving Date: 03/06/01
Reporting Date: 03/07/01
Project Number: NOT GIVEN
Project Name: HOBBS BACKGROUND
Project Location: W. BENDER

Analysis Date: 03/07/01
Sampling Date: 03/06/01
Sample Type: SOIL
Sample Condition: COOL & INTACT
Sample Received By: BC
Analyzed By: AH

LAB NUMBER	SAMPLE ID	Cl^- (mg/Kg)
H5679-1	W. BENDER #1, 6-10"	50
H5679-2	W. BENDER #2, 24-29"	112
Quality Control		992
True Value QC		1000
% Recovery		99.2
Relative Percent Difference		3.9

METHOD: Standard Methods	4500-ClB

NOTE: Analyses performed on 1:4 w:v aqueous extracts.

Chemist

03/07/2001
Date

H5679.XLS

CARDINAL LABORATORIES, INC.

2111 Beechwood, Abilene, TX 79603 (915) 673-7001 Fax (915) 673-7020

101 East Marland, Hobbs, NM 88240 (505) 393-2326 Fax (505) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Page____ of ____

Company Name: SESI		**BILL TO**	
Project Manager: Rob Allen		P.O. #:	
Address: P.O. Box 1613		Company: SESI	
City: Hobbs	State: Zip:	Attn:	
Phone #:	Fax #:	Address:	
Project #:	Project Owner:	City:	
Project Name: Hobbs Background		State:	Zip:
Project Location: W. Bender		Phone #:	
Sampler Name: A Royer		Fax #:	

Lab I.D. (FOR LAB USE ONLY)	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	CRUDE OIL	SLUDGE	OTHER:	PRESERV.: ACID/BASE:	ICE / COOL	OTHER:	SAMPLING: DATE (2001)	TIME	ANALYSIS REQUEST: Chlorides
H5:79-1	W. Bender #1, 6-10"		1			X							3/6	0715	✓
-2	W. Bender #2, 24-35"		1			X							3/6	0725	✓

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequental damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

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Sampler Relinquished: A Royer	Date: 3/6/01 Time: 3:30PM	Received By:	Phone Result: ☐ Yes ☐ No Add'l Phone #:
Relinquished By:	Date: Time:	Received By: (Lab Staff) Burgess J A Cooke	Fax Result: ☐ Yes ☐ No Add'l Fax #:
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	Sample Condition Cool: ☑ Yes ☐ No Intact: ☑ Yes ☐ No	CHECKED BY: (Initials)	REMARKS:

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476.

Appendix C
VADSAT Model Simulation Results

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Schubert Area 1, Chloride 232 mg/L, Run 1

SOURCE AND CHEMICAL DATA ****
DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.91440
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 5574.20020
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 1.00000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 231.99991
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 961.60999
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.02600

STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 21.33600
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.39000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.48000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.10000
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 3.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 100.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 1.90000
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.00263
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 39.31900
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.00004
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	3.0	0.0	0.3
RECEPTOR(2)	3.0	0.0	1.5
RECEPTOR(3)	3.0	0.0	3.0
RECEPTOR(4)	6.1	0.0	0.3
RECEPTOR(5)	6.1	0.0	1.5
RECEPTOR(6)	6.1	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)					
150.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
300.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
450.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
750.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
900.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1050.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1200.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1350.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1500.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1650.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1950.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2100.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2250.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2550.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2700.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2850.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3000.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3150.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3300.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3450.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3750.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3900.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Schubert Area 1, Chloride 120 mg/L, Run 8, 5"/yr, clay liner

SOURCE AND CHEMICAL DATA ****

FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day)	=	0.00009
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC.	=	0.00000
DEPTHM, MEAN THICKNESS OF WASTE ZONE (m)	=	0.91440
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE	=	0.00000
AREAM, MEAN WASTE ZONE AREA (m^2)	=	5574.20020
STDA, STD.DEV. OF WASTE ZONE AREA	=	0.00000
RLWM, MEAN L/W RATIO (-)	=	1.00000
STDRLW, STD.DEV. OF L/W RATIO	=	0.00000
CVRTHM, MEAN VALUE OF COVER THICKNESS (m)	=	0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS	=	0.00000
MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)	=	119.99888
STD OF MASS FRACTION OF SALT IN WASTE	=	0.00000
CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3)	=	497.38000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT	=	0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **

GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day)	=	0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF	=	0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.02600
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 21.33600
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.39000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.48000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.10000
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 3.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 100.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 1.90000
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.00263
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 39.31900
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.00035
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	3.0	0.0	0.3
RECEPTOR(2)	3.0	0.0	1.5
RECEPTOR(3)	3.0	0.0	3.0
RECEPTOR(4)	6.1	0.0	0.3
RECEPTOR(5)	6.1	0.0	1.5

RECEPTOR(6) 6.1 0.0 3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)					
150.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
300.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
450.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
750.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
900.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1050.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1200.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1350.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1500.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1650.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1950.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2100.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2250.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2550.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2700.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2850.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3000.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3150.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3300.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3450.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00