PHASE III ENVIRONMENTAL SITE ASSESSMENT
1655-18th STREET
BRANDON, MANITOBA

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

PHASE III ENVIRONMENTAL SITE ASSESSMENT
1655-18th STREET
BRANDON, MANITOBA

SUBMITTED TO:

Canadian Tire Corporation Limited
c/o Nejmark Architects
2-54 Adelaide Street
Winnipeg, Manitoba
R3A 0V7

SUBMITTED BY:

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WX-04612.3

February 19, 1999

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

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APPENDICES

1.0 INTRODUCTION

As requested by Mr. Tat-Liang Cheam of Nejmark Architects on behalf of the Canadian Tire Corporation Limited, AGRA Earth & Environmental Limited (AEE) conducted a Phase III Environmental Site Assessment (ESA) of the property with the street address 1655-18th Street in Brandon, Manitoba. The legal description of the property is outlined in Manitoba Certificate of Title #146264 (Appendix F).

1.1 PROJECT BACKGROUND

The source of contamination at the site is a former petroleum refinery that was located on the site and to the north. Geokwan Environmental Limited performed a Phase II ESA at the site in 1990 and subsequently installed a Vapour Extraction System at the site in 1991. AEE then performed a Phase II ESA at the site in September 1998 with the purpose of determining the extent of contamination at the subject property, in the vicinity of the proposed locations of various expansion/construction options and recommending a preferred building location, and possible remediation and/or site management requirements associated with the building options.

Further to the information supplied by the Phase II ESA, Nejmark Architects requested an additional investigation (Phase III ESA) to meet the following objectives:

- Determine the degree of contamination in two areas of the site where present information is lacking, and determine how future development of those areas would be affected by any contamination (particularly remediation cost).
- Clarify the extent of contamination within the building footprint of Option 3D.

1.2 SCOPE OF WORK

The scope of work with respect to the field investigation was proposed as follows:

- Drill 15 test holes (TH), five in each of the areas of concern.
- Install 5 monitoring wells, 2 within each of the north-central and south central areas and 1 in the building footprint of Option 3D.
- Submit seven soil samples for laboratory analysis of the hydrocarbon parameters benzene, toluene, ethylbenzene and xylenes (BTEX), total volatile hydrocarbons (TVH) and total semi-volatile hydrocarbons (TSH).
- Submit a report which summarizes the findings of the subsurface investigation.

1.3 SITE DESCRIPTION

The site was located on the east side of 18th Street, south of Richmond Avenue in Brandon, Manitoba. The site is bounded by industrial and commercial buildings to the north and east, a cemetery to the south, and a commercial strip mall to the west across 18th Street. The site was approximately 6.8 hectares in size with the west half of the site consisting of a retail store (approximately 4600m^2) and a gas bar, an asphalt paved parking lot (surrounding the store and gas bar and extending south of the store approximately 75m) and an undeveloped field (vegetated with prairie grass) extending south of the parking lot to the south property line. The east half of the site was partly vegetated with deciduous trees (mainly around the east and west perimeter) and bulrushes (in the area of the old lagoon) and surficial fill material throughout the remainder of the area. The east half of the site drained through catch basins located throughout the parking lot and in 18th Street. The west half of the site drained towards the lagoon in the southeast section of the site and south into ditches on agricultural land to the south, eventually running into a feeder stream of the Assiniboine River.

Based on geological maps, the subsurface stratigraphy in this area of the city normally consists of topsoil and fill materials underlain by alluvial deposits of sand, silt, gravel and clay, to about 3 to 5m below grade. A zone of clayey till is expected to occur between the clay and bedrock. The approximate depth of bedrock is 12 to 15 m below grade. The bedrock is in the Ashville Formation and consists of carbonaceous shale. Based on the Phase II field work, the subsurface soils investigated at the site are generally consistent with those described above.

The electrical (Manitoba Hydro), telephone (MTS) and cable service lines ran underground from the east side of the retail store to a transformer and switch boxes located approximately 50m east. The cables then ran north to the north side of the back lane and then east towards 14th Street. The natural gas and water lines ran underground from the north side of the retail store directly north to the north side of the back lane and then east towards 14th Street. The sewer line ran from the west end to the east corner of the front (south side) of the retail store and then north to the north side of the backlane and east towards 14th Street.

The site, adjacent properties and location of the underground utilities are shown on Figure A1, Appendix A.

2.0 ASSESSMENT METHODOLOGY

2.1 SOIL SAMPLING METHODS

Soil sampling was carried out from January 27 to January 28, 1999 with the aid of a truck mounted drill rig (CT250) fitted with a 150 mm, solid stem auger and a track rig (RM30) fitted with a 125mm, solid stem auger. The drill rigs were supplied and operated by Paddock Drilling of Brandon, Manitoba. At regular intervals, duplicate soil samples were removed either from the auger flights by hand (with clean latex gloves) or with a split spoon and sealed in clear plastic bags. The Ambient Temperature Headspace (ATH) vapour concentration was

determined for one bagged soil sample at each sampling interval using a hexane calibrated GasTech Tracetector set on the no methane response mode and visually examined for signs of hydrocarbon contamination such as staining and odours. The duplicate soil sample was placed in a Teflon sealed glass jar for possible chemical analysis if visible signs of contamination were observed (staining) and/or high ATH readings were measured. Headspace in the glass jar was minimized to reduce analyte volatization before laboratory analysis. All sample containers were labeled with the project number, date of sampling, name of sampler and sample depth. All jarred samples were immediately placed into an ice packed cooler. The jarred samples were retained in the ice packed cooler while in the field and during shipping to AEE Test Laboratory in Edmonton, Alberta. A chain of custody/analytical request form was completed and sent with the soil samples. Jarred samples not required for analysis were held in cold storage at the laboratory for 30 days and then disposed of unless further analysis was requested.
The test hole locations are illustrated in Appendix A, Figure A2 and the test hole logs, as recorded at the time of drilling, are included in Appendix B.

The test holes were plugged at the bottom with granular bentonite and backfilled with auger cuttings.

2.2 LABORATORY ANALYSIS

2.2.1 Soil

Samples submitted for laboratory analysis and the laboratory methods utilized are presented in Table 1. The Certificates of Analysis are included in Appendix C.

TABLE 1: LABORATORY ANALYSIS METHODOLOGY

Sample ID	Media	Analysis Requested	Laboratory Method Used
30-5 at 3.1 m	Soil	BTEX, TVH, TSH	BTEX and TVH (C_5-C_8) -EPA Method 5021/8000
32-11 at 1.4 m	Soil	BTEX, TVH, TSH	TSH (C_{10}-C_{32})- EPA Method 3550/8000
37-2 at 0.9 m	Soil	BTEX, TVH, TSH	
38-5 at 3.1 m	Soil	BTEX, TVH, TSH	
40-4 at 2.1 m	Soil	BTEX, TVH, TSH	
40-5 at 3.1 m	Soil	BTEX, TVH, TSH	
42-4 at 2.1 m	Soil	BTEX, TVH, TSH	

Notes:
BTEX Benzene, toluene, ethylbenzene, xylenes
TVH Total volatile hydrocarbons (purgeable)
TSH Total semi-volatile hydrocarbons (extractable)
EPA U.S. Environmental Protection Agency, 1986. Test Methods for Evaluation of Solid Waste, 3rd ed. Office of Solid Waste Emergency Response, U.S. Enviro. Protection Agency, Washington, D.C.

2.3 Quality Assurance/Quality Control

Analytical quality control is provided by the laboratory through analysis in duplicate of selected samples submitted for laboratory analysis and by analysis of the recovery of a surrogate analyte. Duplicate analysis and surrogate recovery were performed on the samples submitted, and both were within acceptable limits, except where accurate recovery was unavailable due to interference from the high hydrocarbon content in the sample. Field quality assurance was provided by adherence to AEE soil sampling protocols as stated in Section 2.1.

3.0 RESULTS

3.1 Subsurface Conditions

Although highly variable in the upper 4 to 6 m, the soil profile within the property generally consists of the following, as noted in descending order from the ground surface:

- Asphalt, Fill Materials or Organic Soils
- Variable low plastic silt, clay and/or silty sand
- Low to medium plastic silty clay
- Medium Plastic clay till, with interbedded deposits of sand and gravel

A perched groundwater zone was typically present within 1.5 to 2.5 m of grade, although at some locations seepage did not occur immediately on completion of drilling. Groundwater was also present within the clay till, generally occurring within interbedded sand or gravel layers. Test hole logs are included in Appendix D.

The geotechnical report for the site investigation provides additional detail on the soil and groundwater conditions within the three areas investigated.

After the completion of drilling, monitoring wells were installed to a depth of 4.6 m with a slotted section of 3.7m in each of TH31, 32, 22, and 23. The construction details of the monitoring wells are shown on the test hole logs. The groundwater monitoring wells were monitored by AEE personnel on February 15, 1999. The results of the monitoring are summarized in Table 3.

3.1.2 Soil Combustible Vapour Levels

Soil vapour levels measured during the drilling program are summarized below in Table 2. The vapour concentrations were determined for each soil sample recovered from the test holes during drilling and are shown on the test hole logs (Appendix B). Elevated vapour concentrations (>500ppm) were encountered in TH30, TH32, TH33, TH37, TH38, TH39, TH40, TH41 and TH42.

TABLE 2: SUMMARY OF SOIL COMBUSTIBLE VAPOUR LEVELS

Location	Test Hole Depth (m)	Hydrocarbon Staining Zone (m)	Soil Vapour Levels > 200 ppm (m)	Maximum Soil Vapour Level	
				Level (ppm)	Depth (m)
TH29	4.0	1.7 to 2.4	none	300	0.3
TH30	4.6	2.3 to 4.1	2.2 to 2.4	700	2.3
TH31	4.6	none	none	80	0.9
TH32	9.5	1.3 to 1.7	1.4 to 1.5	4400	1.4
		2.3 to 2.7	none	75	2.4
TH33	4.6	0.8 to 2.7	1.3 to 1.6	700	1.5
TH34	4.6	1.8 to 2.9	none	18	1.5
TH35	4.6	none (odour)	none	94	0.3
TH36	4.6	none	none	18	2.1
TH37	4.6	0.6 to 1.4	0.6 to 1.7	3200	0.6
TH38	4.6	2.0 to 3.6	2.0 to 3.6	2000	3.1
TH39	4.6	1.5 to 3.6	2.9 to 3.2	740	3.1
TH40	9.1	1.2 to 5.3	1.2 to 5.3	7600	2.1
TH41	7.6	1.7 to 2.0	3.5 to 3.8	1200	3.7
TH42	9.1	1.7 to 2.6	2.0 to 2.3	3000	2.1
		3.5 to 4.7	3.5 to 4.7	3600	3.7
TH43	4.6	none (odour)	none	200	2.1

Notes: ▸ ppm -parts per million

3.1.3 Monitoring Well Data

The existing wells which were installed by AEE in September 1998 (TH8A-TH27) and the wells installed on January 27 to 28, 1999 (TH31-TH40) were monitored by AEE on February 15, 1999. On October 6, 1998 wells (TH8A-TH27) were monitored and elevated subsurface combustible vapour concentrations were recorded in TH8A and TH14. On February 15, 1999 subsurface combustible vapour concentrations in excess of 500 ppm were measured in TH8A, TH14 and TH40.

The groundwater levels were measured from grade and are recorded in Table 3 below. During the February 15, 1999 monitoring, a thick reddish and yellow substance was observed in TH8A and may have been caused by product separation resulting from freezing. Water samples from TH14, TH26 and TH36 exhibited a slight yellow tinge throughout the sample and emitted a noticeable hydrocarbon odour. A water sample from TH40 exhibited a slight yellow tinge in the top 20mm of the sample and emitted a noticeable hydrocarbon odour. Water levels fell approximately 0.2m to 0.9m since the last reading in October, 1998, with the exception of TH14 which rose approximately 0.3m.

TABLE 3: GROUNDWATER AND VAPOR MONITORING RESULTS

Monitoring Well	Subsurface Vapour Concentration (PPM)		Groundwater Level (m below grade)		Comments	
	98-10-06	99-02-15	98-10-06	99-02-15	98-10-06	99-02-15
8A	11000	1000	1.25	1.65	sheen on top	reddish & yellow product
14	770	630	2.08	1.80	n/a	slight yellow tinge, odour
19	110	430	2.62	2.80	n/a	n/a
22	0	48	1.66	2.55	n/a	sand in sample
26	0	25	1.50	1.55	n/a	slight yellow tinge, odour
27	0	85	0.70	0.65	n/a	n/a
31	-	84	-	1.81	-	slight odour
32	-	5	-	2.75	-	n/a
35	-	140	-	1.70	-	n/a
36	-	70	-	2.00	-	v. slight yellow tinge, odour
40	-	2000	-	2.85	-	yellow on top 2cm, odour

3.2 SITE CLASSIFICATION

A discussion of the applicable environment legislation, regulations and guidelines can be found in Appendix D.

A site sensitivity analysis was completed by AEE as described in the Manitoba Environment Guidelines (1993 and 1998). This procedure is used to aid in the determination of the appropriate remediation guidelines and is not intended to be a comprehensive risk assessment of the site. The tables in Appendix D highlight the information used for the sensitivity analysis. The tables also summarize the ingestion and inhalation potentials via the various human exposure pathways, and indicate the pathway used in the selection of remediation guidelines for TVH and TSH.

The site sensitivity ranking for the inhalation of vapours from soil was moderate and from groundwater low. Based on the present commercial land use and the sensitivity analysis, the CCME SQG for a commercial site are considered to be the applicable guidelines for BTEX concentrations. Since CCME has not established a guideline for total semi-volatile hydrocarbons (TSH) and total volatile hydrocarbons (TVH), the Manitoba Environment (1993) Level I guideline has been used for the applicable criteria. Based on the future intended residential land use, the Canadian Council of Ministers of the Environment (CCME) *Recommended Canadian Soil Quality Guidelines* (SQG) for a residential site are the applicable Tier I criteria for BTEX parameters.

Note that since groundwater at the site is not used as a potable water source, the guideline for the toluene soil concentration was selected to be 25 μg/g instead of 0.8 μg/g.

3.3 LABORATORY ANALYSIS RESULTS

3.3.1 Soil

The results of the laboratory analyses conducted on selected soil samples are summarized in Table 4. Copies of the detailed chemical analyses are provided in Appendix C.

TABLE 4: SOIL ANALYTICAL RESULTS

Location	Soil Vapour Level (ppm)	Benzene	Toluene	Ethylbenzene	Xylenes	TVH	TSH
30-5 at 3.1 m	180	0.044	0.011	0.46	0.73	27	160
32-11 at 1.4 m	4400	<0.010	0.22	**37**	**180**	**1200**	**5900**
37-2 at 0.9 m	3200	3.6	<0.010	1.1	3.4	55	**5400**
38-5 at 3.1 m	2000	<0.010	<0.010	6.1	8.6	**370**	210
40-4 at 2.1 m	7600	**14**	**58**	**47**	**220**	**2900**	1500
40-5 at 3.1 m	3800	**6.6**	1.1	8.4	**19**	**190**	43
42-4 at 2.1 m	3000	**5**	0.38	6.1	11	**180**	130
ME Criteria *Level II*						150	2000
CCME SQG Criteria Commercial		5	25*	20	17	NG	NG

Notes:
- all concentrations in micrograms per dry gram (µg/g) unless otherwise indicated
- ME criteria - A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba (1993)
- CCME SQG Criteria - Canadian Council of Ministers of the Environment Recommended Canadian Soil Quality Guidelines (1997) for the site assuming nonpotable groundwater conditions.
- NG No guideline available from this source
- Bold underlined indicates concentration in excess of guidelines for the site.
- * Groundwater Ingestion Pathway not applicable

Exceedances of the applicable CCME SQG criteria for a commercial site were measured in samples submitted for laboratory analysis.

Review of the gas chromatograph scans for the samples analyzed indicated that light hydrocarbons such as gasoline as well as heavier hydrocarbons such as diesel are present in the soil at the site.

The soil analytical results summarized in Table 3 indicated exceedances of the relevant criteria in various samples for benzene, toluene, ethylbenzene, xylenes, TSH and TVH. A toluene guideline level of 25 µg/g was selected for the soil remediation criteria since groundwater on site is not used for drinking.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Discussion

Option 3D (TH38-TH42)

Laboratory analysis of soil samples and field measured ATH vapor concentrations indicate that residual hydrocarbon impacts are present in the soil within the footprint of building option 3D. Exceedances of the CCME SQG criteria were noted in samples from TH38, TH40 and TH42. Elevated combustible vapor concentrations and visual evidence of hydrocarbon impacts were noted in all testholes. Groundwater monitoring in TH40 indicated elevated combustible vapour concentrations. The vertical extent of the impacts appear to be concentrated in the 1.5m to 5m depth range in TH40 and TH42 and in the 2.0m to 3.5m range in TH38, TH39 and TH41. Figure A2 illustrates the estimated horizontal extent of hydrocarbon impacts above CCME Commercial Guideline Levels, based on available site data. The geotechnical data is reviewed under separate cover.

North-Central (TH29-TH33)

Laboratory analysis of soil samples and field measured ATH vapor concentrations indicate that residual hydrocarbon impacts are present in the soil within the area investigated. Exceedances of the CCME SQG criteria were noted in the sample from TH32. Elevated combustible vapor concentrations and visual evidence of hydrocarbon impacts were noted in TH30, TH32 and TH33. Groundwater monitoring in this area (TH31 and TH32) indicated that no elevated combustible vapour concentrations or free product was present in either monitoring well, but the water sample from TH31 emitted a slight odour. The vertical extent of the impacts appears to be concentrated in the 1.2 to 2.7 m depth range, except in TH30, where staining extended to a depth of 4.1m. Figure A2 illustrates the estimated horizontal extent of hydrocarbon impacts above CCME Commercial Guideline Levels, based on available site data. The geotechnical data is reviewed under separate cover.

South-Central (TH34-TH37 & TH43)

Laboratory analysis of soil samples and field measured ATH vapor concentrations indicate that residual hydrocarbon impacts are present in the soil within the area investigated, but only in TH37. Elevated combustible vapour concentrations, visual evidence of hydrocarbon impacts and exceedances of CCME SQG criteria were noted in sample TH37. Groundwater monitoring in this area (TH35 and TH36) indicated that no elevated combustible vapour concentrations were present in either well, but the water sample from TH36 exhibited a slight yellow tinge and emitted a faint hydrocarbon odour. The vertical extent of impacts appears to be concentrated in the 0.6m to 1.7m depth range. Figure A2 illustrates the estimated horizontal extent of hydrocarbon impacts above CCME Commercial Guideline Levels, based on available site data. The geotechnical data is reviewed under separate cover.

4.2 Recommendations

In view of the elevated combustible vapours and hydrocarbon parameter concentrations detected within the building footprint of Option 3D in TH40 and TH42, it is recommended that a hydrocarbon resistant geosynthetic membrane be placed beneath the floor slab to prevent the migration of vapours to the interior of the proposed building. The liner should be placed under the western portion of the building including the garden center as indicated in Figure A2. The liner should cover the interior garden center and the western 30m of the store in the east-west direction and should extent over the entire north-south dimension of the store. The estimated cost of a liner to cover the area indicated in Figure A2 is approximately $45,000 (including supply, delivery, installation and engineering).

5.0 CLOSURE

The American Society for Testing and Materials Standard of Practice notes that no environmental site assessment can wholly eliminate uncertainty regarding the potential for recognized environmental conditions in connection with a property. Performance of a standardized environmental site assessment protocol is intended to reduce, but not eliminate, uncertainty regarding the potential for recognized environmental conditions in connection with the property, given reasonable limits of time and cost. The findings of this investigation are based on the interpretation of data from a limited number of boreholes and analytical results pertaining to specific samples. The evaluation and interpretations do not preclude the existence of chemical substances other than those identified herein, or the possibility that contamination levels can vary between the areas of investigation.

This report has been prepared for the exclusive use of the Canadian Tire Corporation Limited and their agents for specific application to the property defined in this report. The environmental assessment was conducted in accordance with generally accepted assessment practices. No other warranty, expressed or implied, is made. The limitations of this report are specified in Appendix E.

We trust that this report meets your present requirements. If you have any questions or if we can be of further assistance, please contact our office.

Respectfully submitted,
AGRA Earth & Environmental Limited

David Bynski, B.Sc.C.E.

Reviewed by:

Kimber Osiowy, M.Sc., P.Eng.
Group Leader, Environmental Assessment

6.0 REFERENCES

Baracos, A., Shields, D. and Kjartanson, B. 1983. Geological Engineering Maps & Report for Urban Development of Winnipeg. The University of Manitoba, Department of Geological Engineering. Winnipeg, MB.

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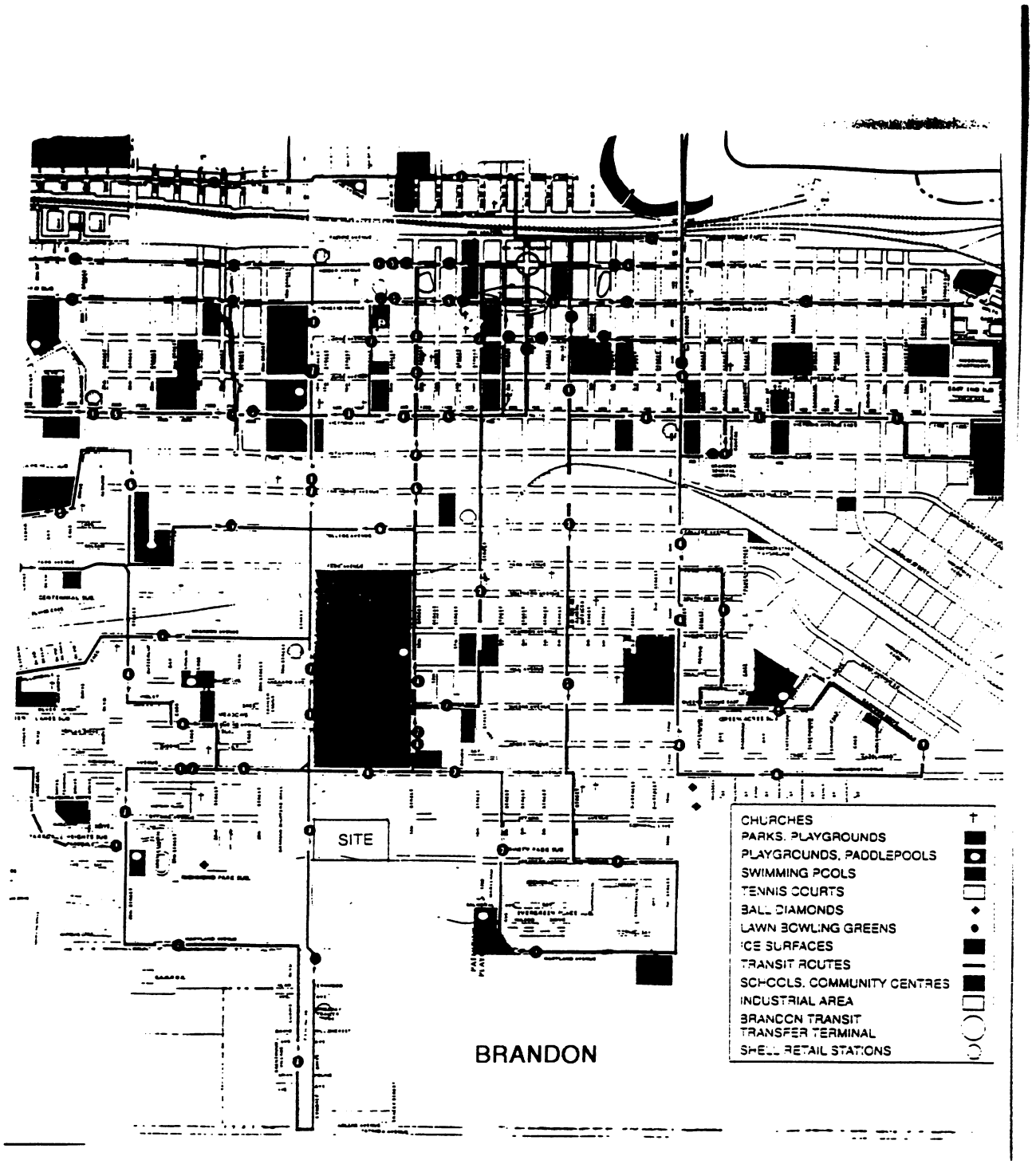
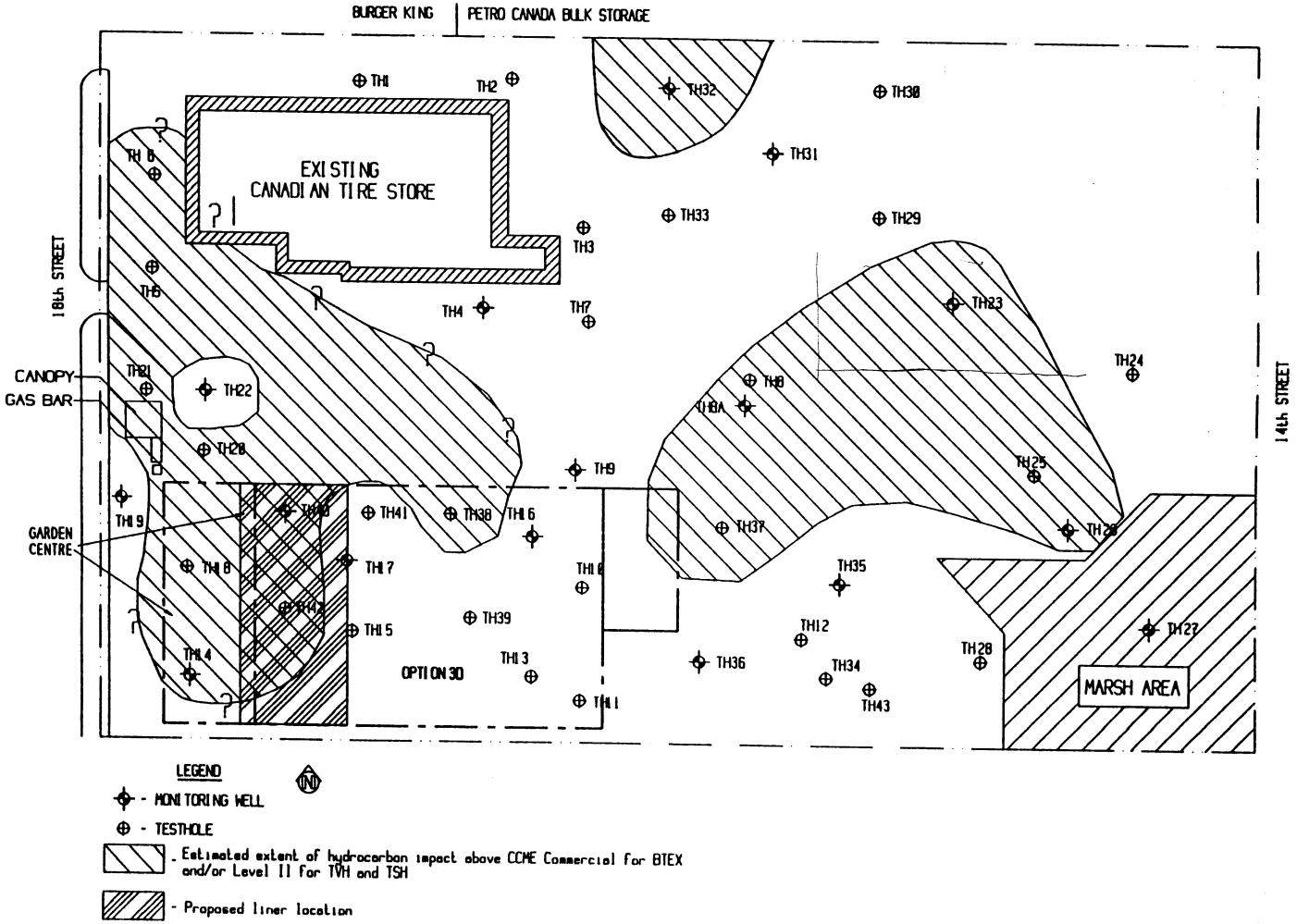
APPENDIX A

FIGURES



AGRA *Earth & Environmental Limited*		**SITE MAP** **PHASE III ENVIRONMENTAL SITE ASSESSMENT** **1655-18th STREET** **BRANDON, MANITOBA**		
CANADIAN TIRE CORPORATION LIMITED				
Drawn: DB	Scale: AS SHOWN	Date: FEB/99	Project No.:WX-04612.3	Figure: A1



AGRA *Earth & Environmental Limited*	**SITE PLAN** **PHASE III ENVIRONMENTAL SITE ASSESSMENT** **1655-18th STREET** **BRANDON, MANITOBA**			
CANADIAN TIRE CORPORATION LIMITED				
Drawn: DS	Scale: ~1:1750	Date: FEB/99	Project No.:WX-04612.3	Figure:A2

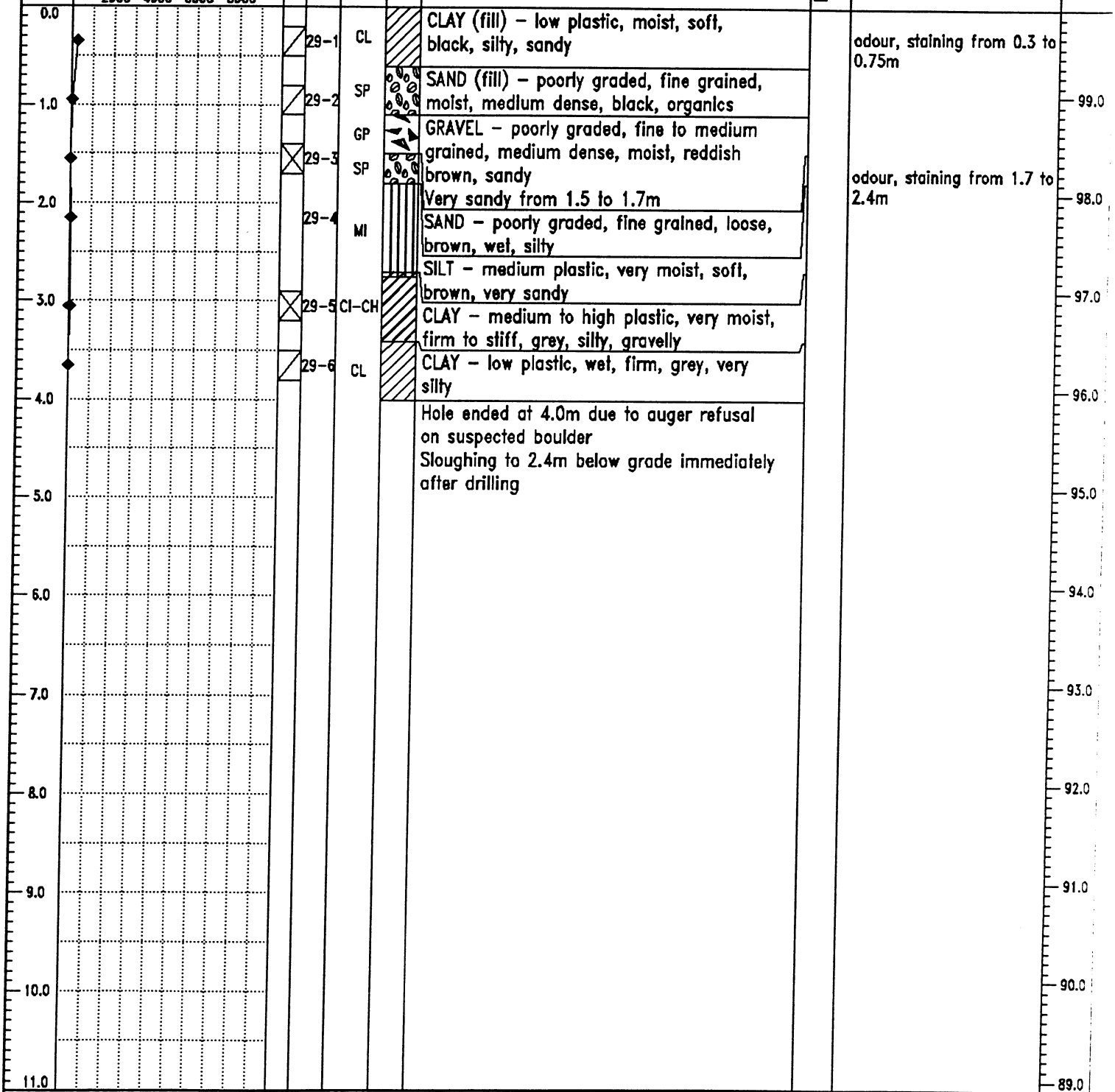
APPENDIX B

TEST HOLE LOGS

PHASE III ESA – C.T. BRANDON	CONTRACTOR: PADDOCK DRILLING LTD.	TEST HOLE NO: 29
CANADIAN TIRE CORP. LTD.	DRILL RIG: RM30 TRACK	PROJECT NO: WX04612.3
	AUGER: 125MM SS	ELEVATION: 99.9 m

SAMPLE TYPE: SHELBY TUBE | CUTTINGS | SPT | CORE | NO RECOVERY | CONT. SAMPLE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



SOIL DESCRIPTION

Depth (m)	Description	Comments
0.0 – 0.3	CLAY (fill) – low plastic, moist, soft, black, silty, sandy	odour, staining from 0.3 to 0.75m
0.3 – 1.0	SAND (fill) – poorly graded, fine grained, moist, medium dense, black, organics	
1.0 – 1.5	GRAVEL – poorly graded, fine to medium grained, medium dense, moist, reddish brown, sandy	
1.5 – 1.7	Very sandy from 1.5 to 1.7m	odour, staining from 1.7 to 2.4m
1.7 – 2.4	SAND – poorly graded, fine grained, loose, brown, wet, silty	
2.4 – 3.0	SILT – medium plastic, very moist, soft, brown, very sandy	
3.0 – 3.7	CLAY – medium to high plastic, very moist, firm to stiff, grey, silty, gravelly	
3.7 – 4.0	CLAY – low plastic, wet, firm, grey, very silty	
4.0	Hole ended at 4.0m due to auger refusal on suspected boulder Sloughing to 2.4m below grade immediately after drilling	

INSTRUMENTATION DATA

ELEVATION(m): 99.0, 98.0, 97.0, 96.0, 95.0, 94.0, 93.0, 92.0, 91.0, 90.0, 89.0

AGRA Earth & Environmental Limited
Winnipeg, Manitoba

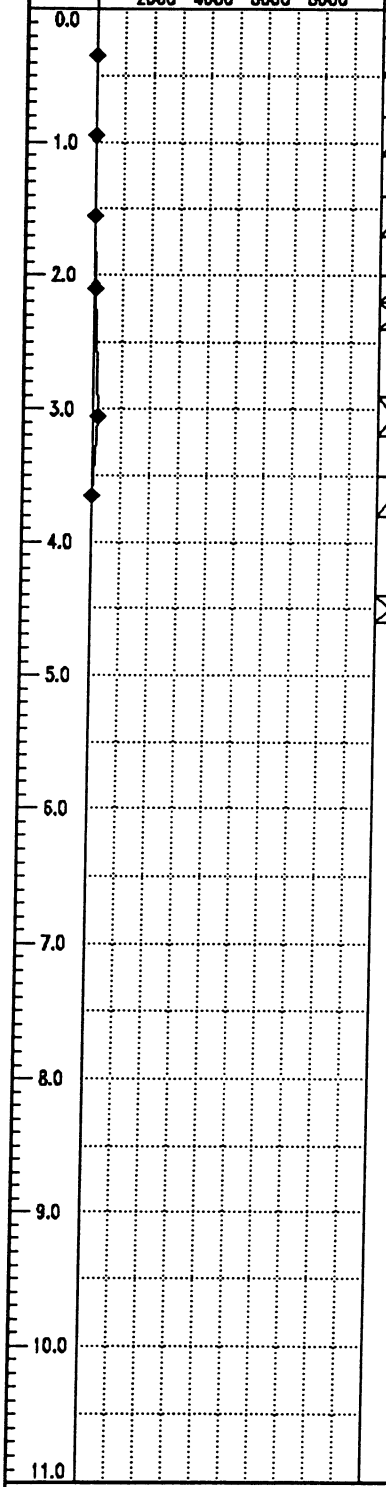
LOGGED BY: DB	COMPLETION DEPTH: 4 m
REVIEWED BY: KBO	COMPLETE: 01/27/99
Fig. No: B1	Page 1 of 1

99/02/19 02:08PM (GEO_LV10)

PHASE III ESA – C.T. BRANDON	CONTRACTOR: PADDOCK DRILLING LTD.	TEST HOLE NO: 30
CANADIAN TIRE CORP. LTD.	DRILL RIG: CT250	PROJECT NO: WX04612.3
	AUGER: 125MM SS	ELEVATION: 99.2 m

SAMPLE TYPE: SHELBY TUBE | CUTTINGS | SPT | CORE | NO RECOVERY | CONT. SAMPLE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	INSTRUMENTATION DATA	COMMENTS	ELEVATION(m)
							99.0
							98.0
							97.0
							96.0
							95.0
							94.0
							93.0
							92.0
							91.0
							90.0
							89.0
	30-1	GP		GRAVEL (pavement & fill) – poorly graded, fine to medium grained, damp, medium dense, brown, sandy Sandy, silty from 0.7 to 1.8m			
	30-2						
	30-3						
	30-4	SM		SAND – poorly graded, fine to medium grained, moist, medium dense, brown,		odour, black staining from 2.3 to 2.5m	
	30-8	GP		organics, trace gravel GRAVEL – poorly graded, fine to medium grained, wet, loose, grey			
	30-5	ML		SILT – low plastic, very moist, stiff, brown			
	30-6	CH		CLAY – high plastic, moist, firm to stiff, brown		pockets with staining from 3.5 to 4.1mw	
	30-7			CLAY (TILL) – high plastic, moist, soft, light brown, gravel			
				Hole ended at 4.6m Hole sloughed to 2.0m below grade immediately after drilling			

AGRA Earth & Environmental Limited
Winnipeg, Manitoba

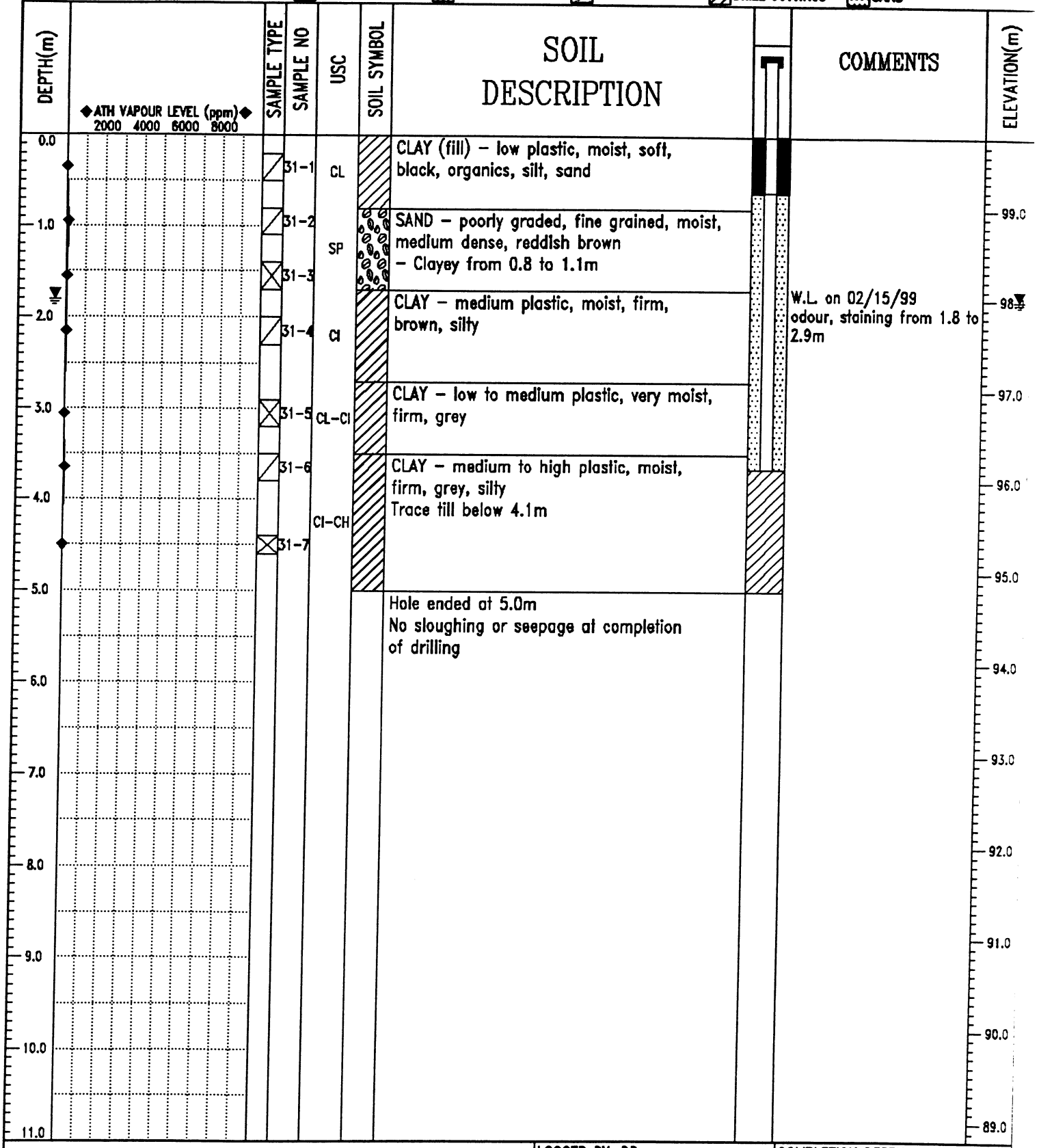
LOGGED BY: DB	COMPLETION DEPTH: 4.6 m
REVIEWED BY: KBO	COMPLETE: 01/28/99
Fig. No: B2	Page 1 of 1

99/02/19 02:08PM (GEO_LV10)

PHASE III ESA – C.T. BRANDON	CONTRACTOR: PADDOCK DRILLING LTD.	TEST HOLE NO: 31
CANADIAN TIRE CORP. LTD.	DRILL RIG: RM30 TRACK	PROJECT NO: WX04612.3
	AUGER: 125MM SS	ELEVATION: 99.8 m

SAMPLE TYPE: SHELBY TUBE | CUTTINGS | SPT | CORE | NO RECOVERY | CONT. SAMPLE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



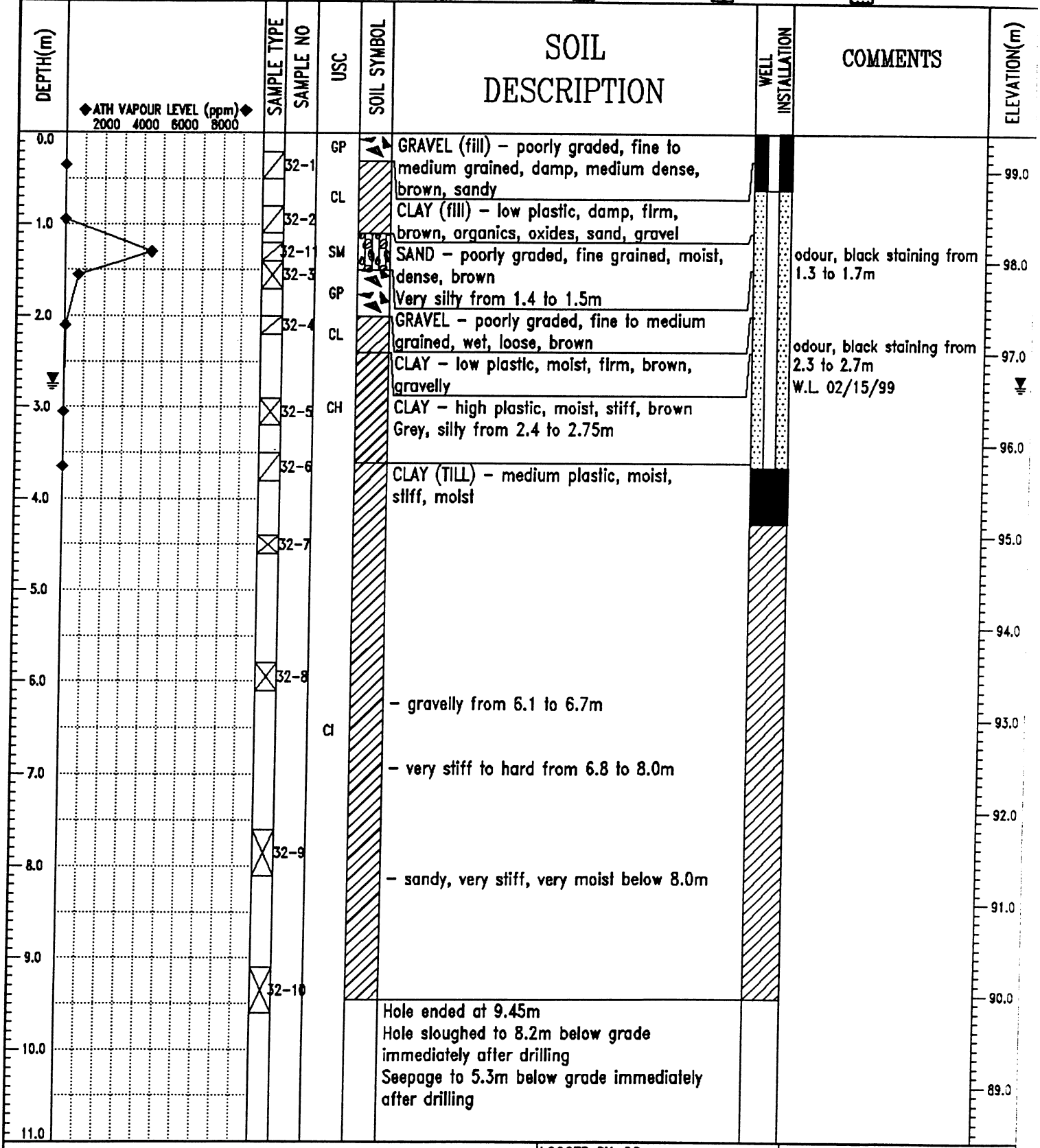
AGRA Earth & Environmental Limited Winnipeg, Manitoba	LOGGED BY: DB	COMPLETION DEPTH: 5 m
	REVIEWED BY: KBO	COMPLETE: 01/27/99
	Fig. No: B3	Page 1 of 1

99/02/19 02:09PM (GEO_LV10)

PHASE III ESA – C.T. BRANDON	CONTRACTOR: PADDOCK DRILLING LTD.	TEST HOLE NO: 32
CANADIAN TIRE CORP. LTD.	DRILL RIG: CT250	PROJECT NO: WX04612.3
	AUGER: 125MM SS	ELEVATION: 99.4 m

SAMPLE TYPE: SHELBY TUBE | CUTTINGS | SPT | CORE | NO RECOVERY | CONT. SAMPLE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

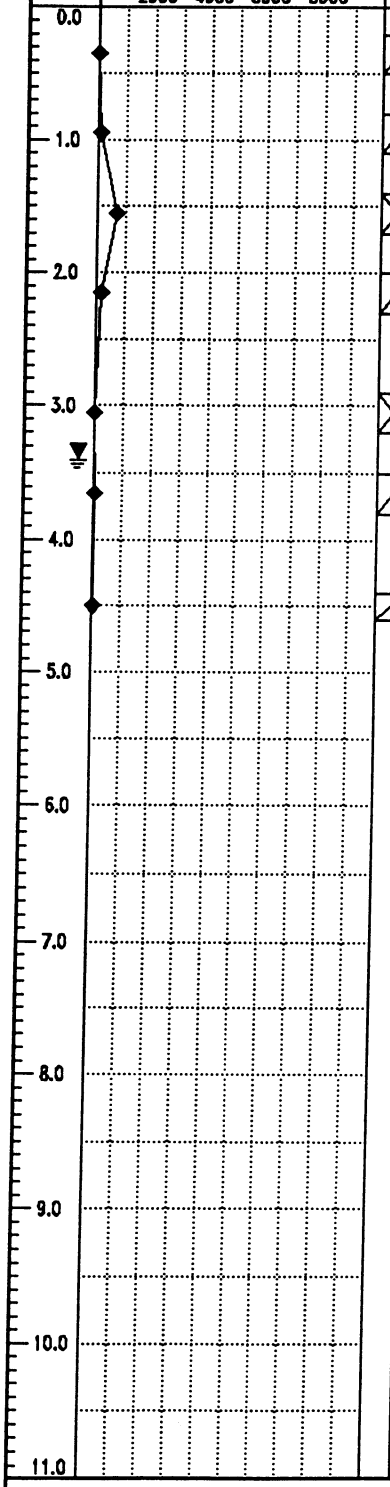


AGRA Earth & Environmental Limited Winnipeg, Manitoba	LOGGED BY: DB	COMPLETION DEPTH: 9.46 m
	REVIEWED BY: KBO	COMPLETE: 01/28/99
	Fig. No: B4	Page 1 of 1

PHASE III ESA – C.T. BRANDON	CONTRACTOR: PADDOCK DRILLING LTD.	TEST HOLE NO: 33
CANADIAN TIRE CORP. LTD.	DRILL RIG: RM30 TRACK	PROJECT NO: WX04612.3
	AUGER: 125MM SS	ELEVATION: 99.9 m

SAMPLE TYPE: SHELBY TUBE | CUTTINGS | SPT | CORE | NO RECOVERY | CONT. SAMPLE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	INSTRUMENTATION DATA	COMMENTS	ELEVATION(m)
				CLAY (fill) – low plastic, moist, soft, black, organics, sand, gravel			99.0
	33-1	CL					
	33-2	SM		SAND – poorly graded, fine to medium grained, moist, loose, black, silty, clayey		odour, staining from 0.8 to 2.75m	98.0
	33-3						
	33-4	CL		CLAY – low plastic, moist, firm, grey, very gravelly, silty			97.0
	33-5			CLAY – low to medium plastic, moist, firm, grey, silty		W.L. 01/27/99	96.0
	33-6	CL-CI					95.0
	33-7			– sand inclusions from 4.1m down			94.0
				Hole ended at 4.6m Hole sloughed to 3.7m below grade and seepage to 3.4m below grade immediately after drilling			93.0
							92.0
							91.0
							90.0
							89.0

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LOGGED BY: DB
REVIEWED BY: KBO
Fig. No: B5

COMPLETION DEPTH: 4.6 m
COMPLETE: 01/27/99

99/02/19 12:30PM (GEO_LV10)

PHASE III ESA – C.T. BRANDON	CONTRACTOR: PADDOCK DRILLING LTD.	TEST HOLE NO: 34
CANADIAN TIRE CORP. LTD.	DRILL RIG: RM30 TRACK	PROJECT NO: WX04612.3
	AUGER: 125MM SS	ELEVATION: 100.1 m

SAMPLE TYPE: SHELBY TUBE | CUTTINGS | SPT | CORE | NO RECOVERY | CONT. SAMPLE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

DEPTH(m)	ATH VAPOUR LEVEL (ppm) 2000 4000 6000 8000	SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	INSTRUMENTATION DATA	COMMENTS	ELEVATION(m)
0.0						TOPSOIL – loamy, organics, black, moist, roots, gravel, grass			100.0
			34-1	OL					
				ML		SILT – low plastic, moist, soft, brown, trace clay, trace sand, organics			
1.0			34-2			SAND – poorly graded, fine grained, moist, medium dense, brown			99.0
				SP		Silty from 0.6 to 0.9m			
			34-3			Wet from 1.3 to 1.8m			
2.0				SM		SAND – poorly graded, fine grained, moist, medium dense, brown, very clayey		odour, staining from 1.8 to 2.9m	98.0
			34-4			CLAY – medium plastic, moist, firm, brown			
						Sandy, silty from 2.1 to 2.75m			
3.0			34-5			Silty, soft to firm below 3.8m			97.0
				CI		Grey mottled, oxide inclusions below 3.8m			
			34-6					W.L. 01/27/99	
4.0						– silty, soft to firm below 3.8m			96.0
			34-7			– grey mottled, oxide inclusions below 3.8m			
						Hole ended at 4.6m			
5.0						Sloughing and seepage to 3.6m below grade at completion of drilling.			95.0
6.0									94.0
7.0									93.0
8.0									92.0
9.0									91.0
10.0									90.0
11.0									

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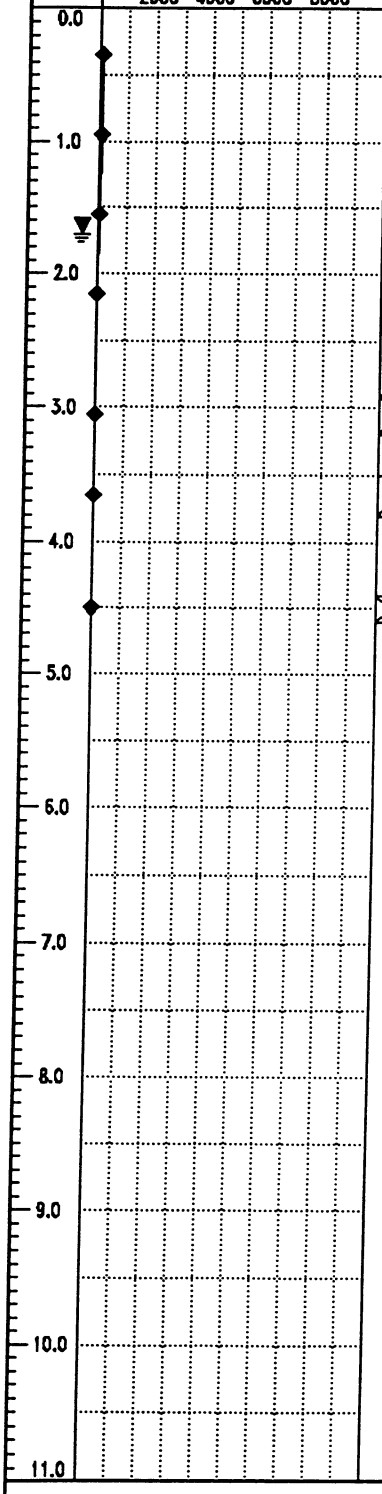
LOGGED BY: DB	COMPLETION DEPTH: 4.6 m
REVIEWED BY: KBO	COMPLETE: 01/27/99
Fig. No: B6	Page 1 of 1

98/02/19 02:09PM (GEO_LV10)

PHASE III ESA – C.T. BRANDON	CONTRACTOR: PADDOCK DRILLING LTD.	TEST HOLE NO: 35
CANADIAN TIRE CORP. LTD.	DRILL RIG: RM30 TRACK	PROJECT NO: WX04612.3
	AUGER: 125MM SS	ELEVATION: 99.65 m

SAMPLE TYPE: SHELBY TUBE | CUTTINGS | SPT | CORE | NO RECOVERY | CONT. SAMPLE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	COMMENTS	ELEVATION(m)
	35-1			CLAY (FILL) – low plastic, moist, firm, black, organics, silty, trace sand	odour, staining from 0.2 to 1.8m	99.0
	35-2	CL				
	35-3				W.L. 02/15/99	98
	35-4	SM		SAND – poorly graded, fine grained, wet, grey, loose, very silty		97.0
	35-5	SP		SAND – poorly graded, coarse grained, wet, medium dense, grey, trace gravel		96.0
	35-6	CI		CLAY – high plastic, moist, firm, grey, trace gravel		95.0
	35-7	CI		CLAY (TILL) – medium plastic, moist, firm to stiff, grey, gravelly		94.0
				Hole ended at 4.6m Sloughing to 2.4m below grade and seepage to 2.1m below grade at completion of drilling.		93.0
						92.0
						91.0
						90.0
						89.0

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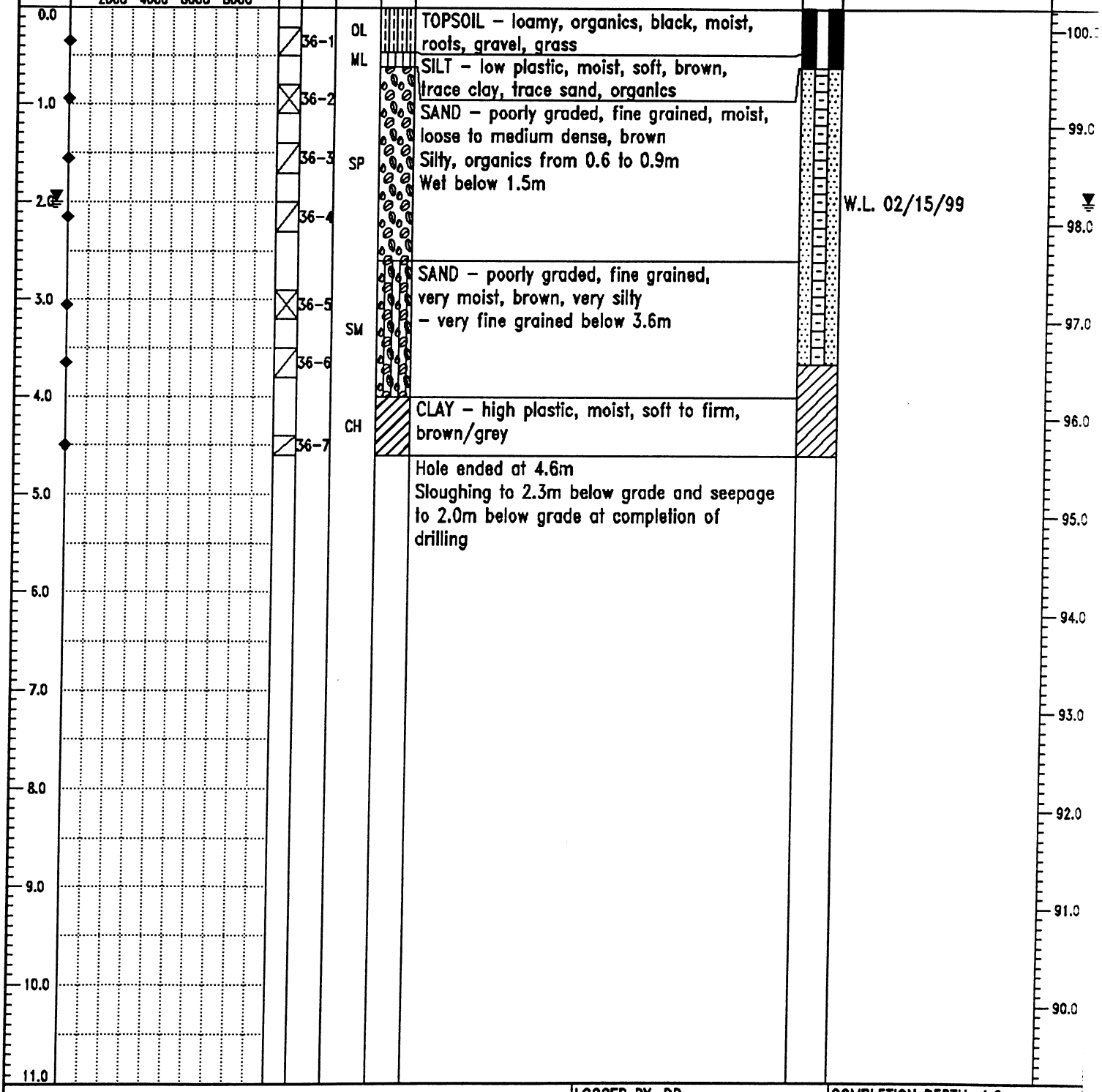
LOGGED BY: DB	COMPLETION DEPTH: 4.6 m
REVIEWED BY: KBO	COMPLETE: 01/27/99
Fig. No: B7	Page 1 of 1

99/02/19 02:10PM (GEO_EV10)

PHASE III ESA – C.T. BRANDON	CONTRACTOR: PADDOCK DRILLING LTD.	TEST HOLE NO: 36
CANADIAN TIRE CORP. LTD.	DRILL RIG: RM30 TRACK	PROJECT NO: WX04612.3
	AUGER: 125MM SS	ELEVATION: 100.22 m

SAMPLE TYPE: SHELBY TUBE | CUTTINGS | SPT | CORE | NO RECOVERY | CONT. SAMPLE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



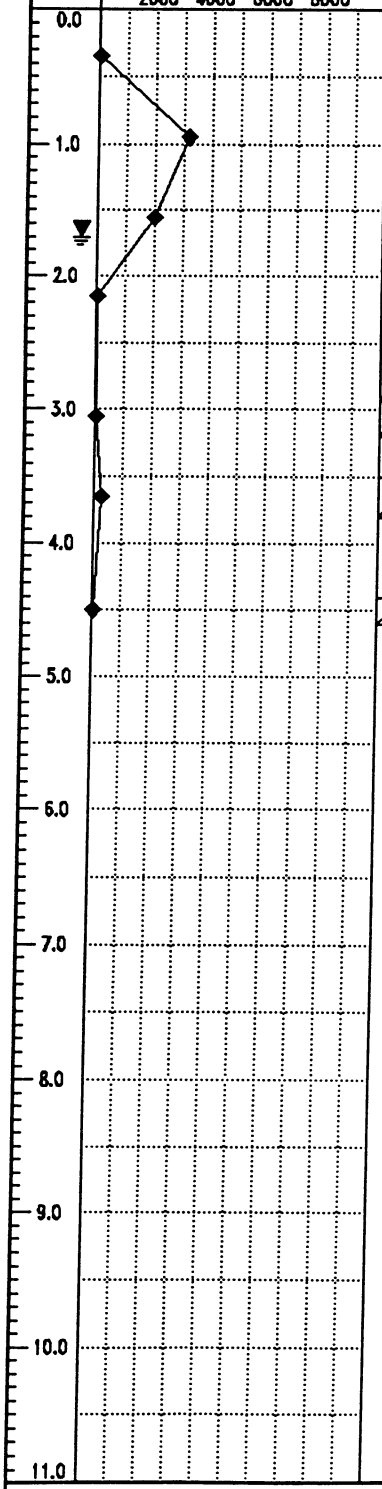
AGRA Earth & Environmental Limited Winnipeg, Manitoba	LOGGED BY: DB	COMPLETION DEPTH: 4.6 m
	REVIEWED BY: KBO	COMPLETE: 01/27/99
	Fig. No: B7	Page 1 of 1

99/02/19 02:10PM (GEO_LV10)

PHASE III ESA C.T. BRANDON	CONTRACTOR: PADDOCK DRILLING LTD	TEST HOLE NO: 37
CANADIAN TIRE CORP LTD	DRILL RIG: RM30 – TRACK	PROJECT NO: WX04612.3
	AUGER: 125MM SS	ELEVATION: 99.8 m

SAMPLE TYPE: SHELBY TUBE | CUTTINGS | SPT | CORE | NO RECOVERY | CONT. SAMPLE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	INSTRUMENTATION DATA	COMMENTS	ELEVATION(m)
	37-1	CL		CLAY (FILL) – low plastic, moist, firm, black, organics, gravel			99.0
	37-2	MI		SILT – medium plastic, moist, firm, grey Very sandy		odour, black staining from 0.6 to 1.4m	
	37-3					W.L. 01/27/99	98.0
	37-4	SM		SAND – poorly graded, fine grained, wet, loose, grey, very silty, trace gravel			97.0
	37-5	SP		SAND – poorly graded, medium to coarse grained, wet, medium dense, grey			96.0
	37-6						95.0
	37-7	CH		CLAY – high plastic, moist, firm, brown trace sand below 4.4m			94.0
				Hole ended at 4.6m Sloughing to 2.0m and seepage to 1.1m below grade immediately after drilling			93.0
							92.0
							91.0
							90.0
							89.0

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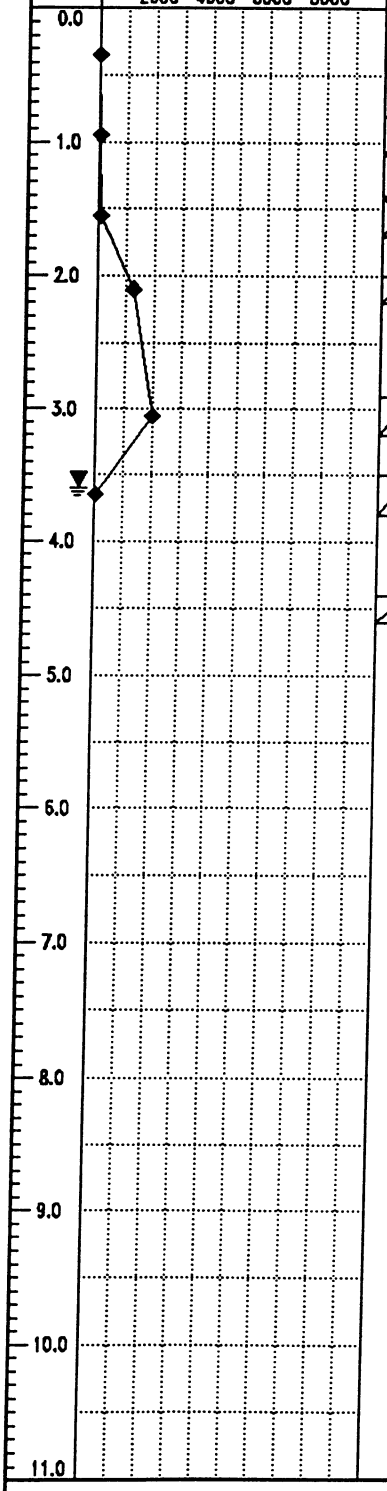
LOGGED BY: DB	COMPLETION DEPTH: 4.6 m
REVIEWED BY: KBO	COMPLETE: 01/27/99
Fig. No: B9	Page 1 of 1

99/02/19 02:10PM (GEO_LEV10)

PHASE III ESA – C.T. BRANDON	CONTRACTOR: PADDOCK DRILLING LTD.	TEST HOLE NO: 38
CANADIAN TIRE CORP. LTD.	DRILL RIG: CT250	PROJECT NO: WX04612.3
	AUGER: 125MM SS	ELEVATION: 99.6 m

SAMPLE TYPE: SHELBY TUBE | CUTTINGS | SPT | CORE | NO RECOVERY | CONT. SAMPLE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	INSTRUMENTATION DATA	COMMENTS	ELEVATION(m)
				ASPHALT (100mm)			99.0
	38-1	SP		SAND (FILL) – poorly graded, fine to medium grained, damp, medium dense, brown, gravelly			
	38-2	CL		CLAY – low plastic, moist, firm, brown, trace gravel, organics			
	38-3	ML		SILT – medium plastic, moist, soft to firm, brown, sandy			98.0
	38-4			SAND – poorly graded, fine grained, moist, loose, brown, silty Very silty below 2.0m Wet below 3.4m		odour, staining from 2.0 to 3.6m	97.0
	38-5	SM					
	38-6			– wet below 3.4m		W.L. 01/28/99	96.0
	38-7	CH		CLAY – high plastic, moist, stiff, light brown Trace gravel below 4.3m			95.0
				Hole ended at 4.6m Hole sloughed to 4.0m and seepage to 3.6m below grade immediately after drilling			94.0 93.0 92.0 91.0 90.0 89.0

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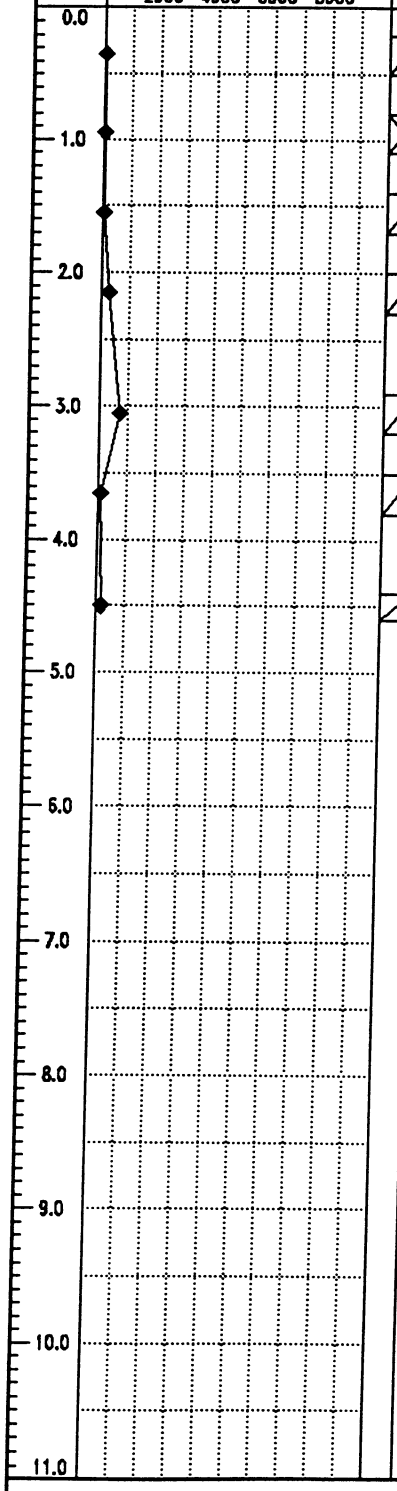
LOGGED BY: DB	COMPLETION DEPTH: 4.6 m
REVIEWED BY: KBO	COMPLETE: 01/28/99
Fig. No: B10	Page 1 of 1

99/02/19 02:11PM (GEO_LV10)

PHASE III ESA – C.T. BRANDON	CONTRACTOR: PADDOCK DRILLING LTD.	TEST HOLE NO: 39
CANADIAN TIRE CORP. LTD.	DRILL RIG: RM30 TRACK	PROJECT NO: WX04612.3
	AUGER: 125MM SS	ELEVATION: 99.7 m

SAMPLE TYPE: SHELBY TUBE | CUTTINGS | SPT | CORE | NO RECOVERY | CONT. SAMPLE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	INSTRUMENTATION DATA	COMMENTS	ELEVATION(m)
				TOPSOIL – loamy, organics, black, moist, roots, gravel, grass			99.0
	39-1	OL					
		ML		SILT – low plastic, moist, soft, brown, trace sand, organics			
	39-2	SM		SAND – poorly graded, fine grained, moist, loose to medium dense, brown, very silty – Clayey, very silty from 1.2 to 1.5m		odour, staining from 1.5 to 3.6m	98.0
	39-3						
	39-4	CL-CI		CLAY – low to medium plastic, moist, firm, brown, very silty, some fine sand, oxides			97.0
	39-5			CLAY – medium plastic, moist, firm, brown, very silty			96.0
	39-6	CI					95.0
	39-7			Hole ended at 4.6m Sloughed to 3.2m below grade at completion of drilling, no seepage.			94.0
							93.0
							92.0
							91.0
							90.0
							89.0

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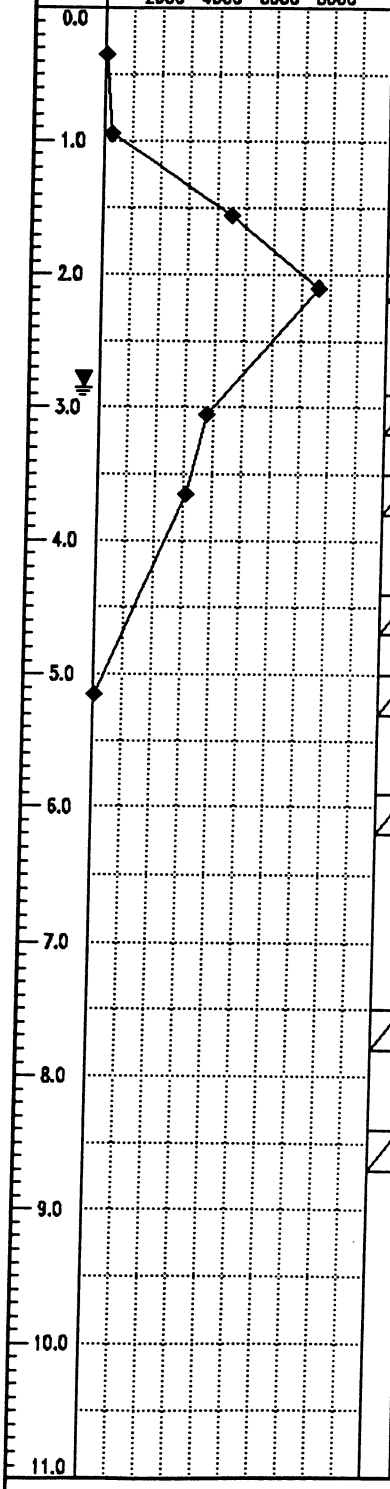
LOGGED BY: DB	COMPLETION DEPTH: 4.6 m
REVIEWED BY: KBO	COMPLETE: 01/27/99
Fig. No: B11	Page 1 of 1

98/02/19 02:11PM (GEO_EV10)

PHASE III ESA – C.T. BRANDON	CONTRACTOR: PADDOCK DRILLING LTD.	TEST HOLE NO: 40
CANADIAN TIRE CORP. LTD.	DRILL RIG: CT250	PROJECT NO: WX04612.3
	AUGER: 125MM SS	ELEVATION: 99.7 m

SAMPLE TYPE: SHELBY TUBE | CUTTINGS | SPT | CORE | NO RECOVERY | CONT. SAMPLE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



DEPTH(m)	SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL INSTALLATION	COMMENTS	ELEVATION(m)
0.0					APHALT (100mm)			99.7
		40-1	GP		GRAVEL (Fill) – poorly graded, fine to medium grained, damp, loose, brown, sandy			
1.0		40-2	CL		CLAY (FIll) – low plastic, moist, firm, brown, trace gravel, organics			98.7
		40-3	SM		SAND – poorly graded, fine grained, very moist, loose, brown/black, very silty, trace clay		odour, staining from 1.2 to 1.7m odour, black staining from 1.7 to 2.6m	
2.0		40-4						
3.0		40-5	CI		CLAY – medium plastic, moist, firm, brown, very silty		W.L. 02/15/99 odour, staining from 2.6 to 5.3m	97.0
		40-6	SM		SAND – poorly graded, fine grained, wet, loose to medium dense, brown, silty			96.0
4.0		40-7						
5.0		40-8	ML-MI		SILT – low to medium plastic, wet, soft, brown, sandy			95.0
6.0		40-9	CH		CLAY – high plastic, moist, stiff, brown Very silty from 5.8 to 7.2m			94.0
7.0								93.0
8.0		40-10						92.0
		40-11	CI		CLAY (TILL) – medium plastic, moist, very stiff, grey, sandy, gravelly			91.0
9.0					Hole ended at 9.1m Hole sloughed to 3.6m and seepage to 3.0m below grade at completion of drilling			90.0
10.0								89.0
11.0								

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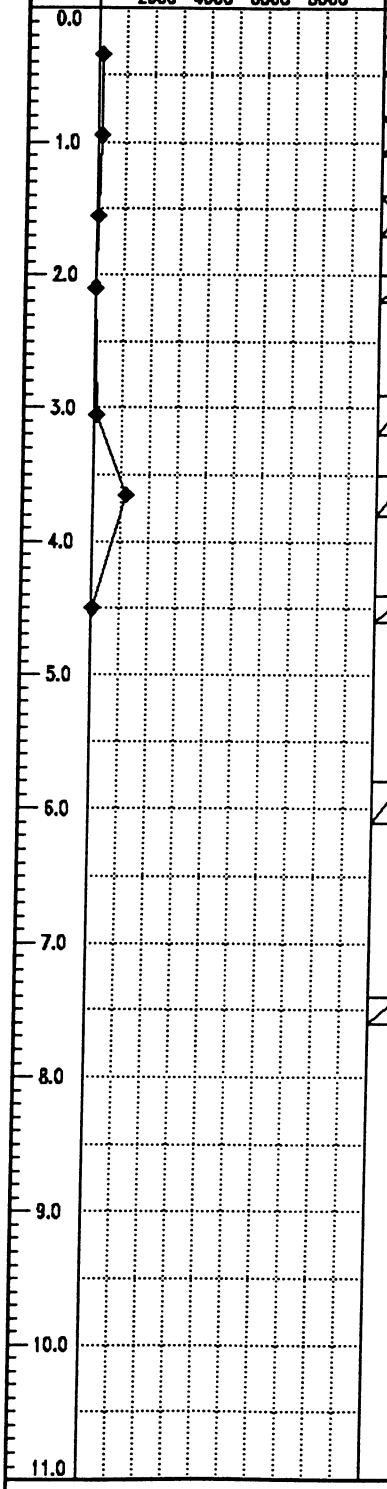
LOGGED BY: DB	COMPLETION DEPTH: 6.1 m
REVIEWED BY: KBO	COMPLETE: 01/28/99
Fig. No: B12	Page 1 of 1

99/02/19 02:11PM (GEO_LOG)

PHASE III ESA – C.T. BRANDON	CONTRACTOR: PADDOCK DRILLING LTD.	TEST HOLE NO: 41
CANADIAN TIRE CORP. LTD.	DRILL RIG: CT250	PROJECT NO: WX04612.3
	AUGER: 125MM SS	ELEVATION: 99.7 m

SAMPLE TYPE: SHELBY TUBE | CUTTINGS | SPT | CORE | NO RECOVERY | CONT. SAMPLE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	INSTRUMENTATION DATA	COMMENTS	ELEVATION(m)
							99.0
							98.0
							97.0
							96.0
							95.0
							94.0
							93.0
							92.0
							91.0
							90.0
							89.0
	41-1	GP		APHALT (100mm)			
	41-1	CL		GRAVEL (Fill) – poorly graded, fine to medium grained, damp, loose, brown, sandy			
	41-2	ML		CLAY (Fill) – low plastic, damp, firm, brown, gravel, organics			
	41-3	SM		SILT – low plastic, moist, firm, brown, sandy			
	41-4			SAND – poorly graded, fine grained, moist, loose, brown Very silty from 1.4 to 2.0m		slight odour, sparse staining from 1.7 to 2.0m	
	41-5	CL-CI		CLAY – low to medium plastic, moist, stiff, grey, oxides, silty			
	41-6			CLAY – medium plastic, moist, firm to stiff, brown Grey, silty, mottled from 3.4 to 4.1m Light brown from 4.1 to 4.9m Grey, trace gravel from 4.9 to 5.2m Grey, soft from 5.2 to 6.9m			
	41-7			– grey, trace gravel from 4.9 to 5.2m			
		CI		– grey, soft from 5.2 to 6.9m			
	41-8						
	41-9	CI		CLAY (TILL) – medium plastic, moist, stiff to very stiff, grey, some gravel			
				Hole ended at 7.6m No sloughing or seepage at completion of drilling			

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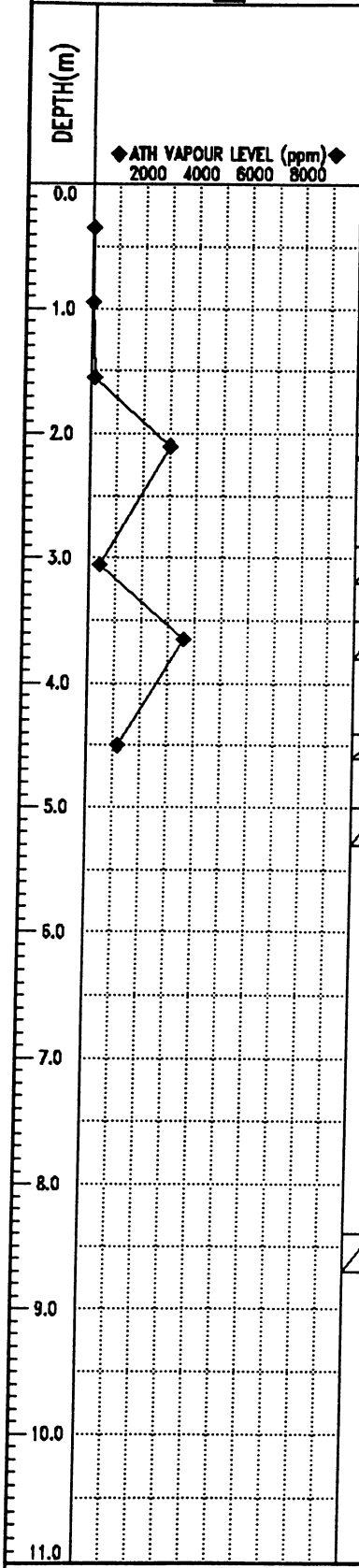
LOGGED BY: DB	COMPLETION DEPTH: 7.6 m
REVIEWED BY: KBO	COMPLETE: 01/28/99
Fig. No: B13	Page 1 of 1

PHASE III ESA – C.T. BRANDON	CONTRACTOR: PADDOCK DRILLING LTD.	TEST HOLE NO: 42
CANADIAN TIRE CORP. LTD.	DRILL RIG: CT250	PROJECT NO: WX04612.3
	AUGER: 125MM SS	ELEVATION: 99.25 m

SAMPLE TYPE: SHELBY TUBE | CUTTINGS | SPT | CORE | NO RECOVERY | CONT. SAMPLE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	INSTRUMENTATION DATA	COMMENTS	ELEVATION(m)
							99.0
	42-1	CL		CLAY (Fill) – low plastic, moist, firm, brown, gravel, organics			
	42-2			CLAY – low to medium plastic, moist, firm, brown, very silty, some gravel			98.0
	42-3	CL-CI				odour, staining from 1.7 to 2.6m	
	42-4						97.0
	42-5			CLAY – medium plastic, moist, stiff, brown, very silty			
	42-6					odour, black staining from 3.5 to 4.7m	96.0
	42-7			– grey, trace gravel below 4.7m			95.0
	42-8						94.0
		CI					93.0
							92.0
	42-9	CI		CLAY (TILL) – medium plastic, moist, firm to stiff to very stiff, grey, some gravel			91.0
				Hole ended at 9.1m Hole sloughed to 8.8m below grade immediately after drilling No seepage			90.0
							89.0

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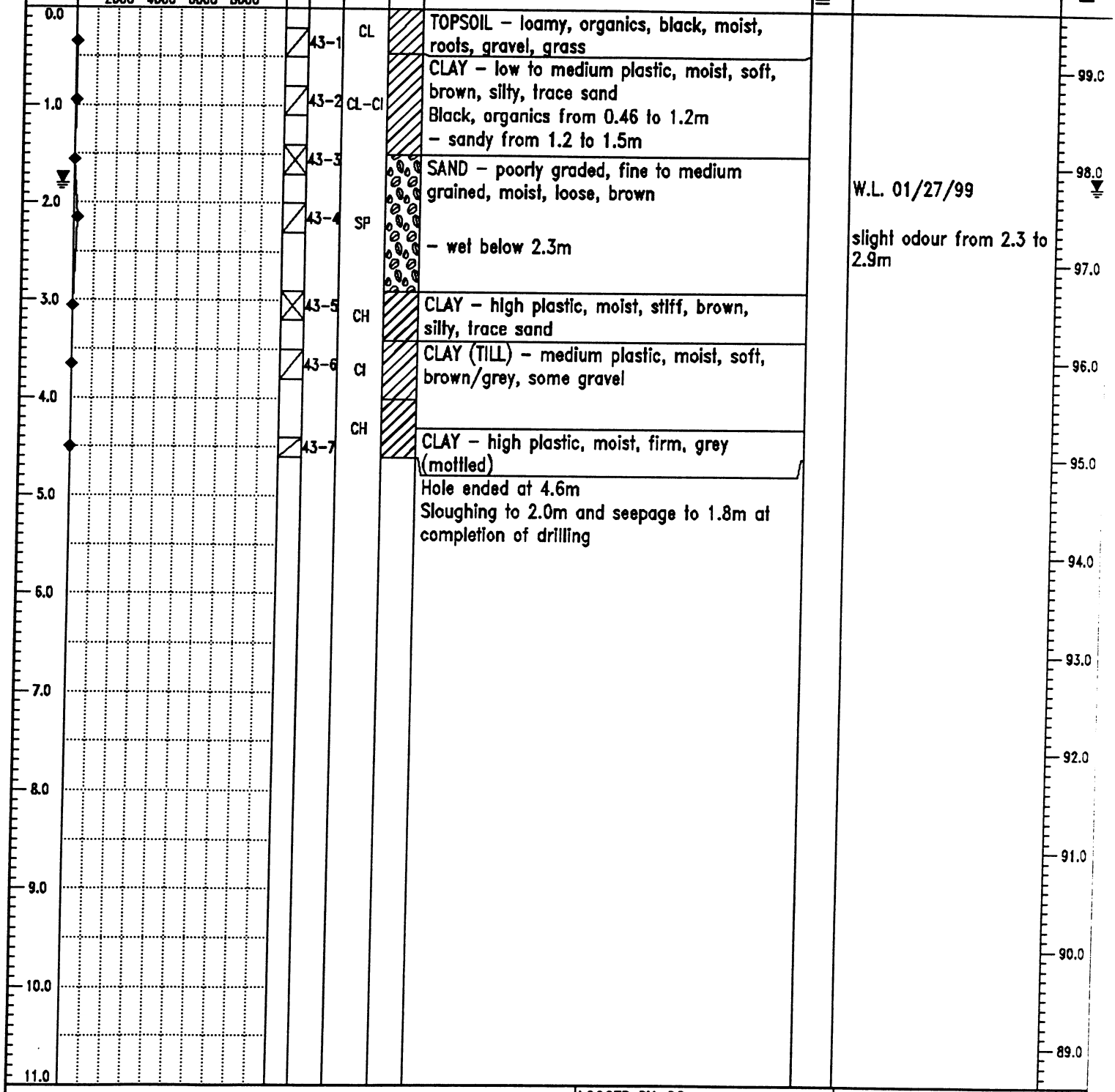
LOGGED BY: DB	COMPLETION DEPTH: 9.2 m
REVIEWED BY: KBO	COMPLETE: 01/27/99
Fig. No: B14	Page 1 of 1

PHASE III ESA – C.T. BRANDON	CONTRACTOR: PADDOCK DRILLING LTD.	TEST HOLE NO: 43
CANADIAN TIRE CORP. LTD.	DRILL RIG: RM30 TRACK	PROJECT NO: WX04612.3
	AUGER: 125MM SS	ELEVATION: 99.6 m

SAMPLE TYPE: SHELBY TUBE | CUTTINGS | SPT | CORE | NO RECOVERY | CONT. SAMPLE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



SOIL DESCRIPTION

TOPSOIL – loamy, organics, black, moist, roots, gravel, grass

CLAY – low to medium plastic, moist, soft, brown, silty, trace sand
Black, organics from 0.46 to 1.2m
– sandy from 1.2 to 1.5m

SAND – poorly graded, fine to medium grained, moist, loose, brown
– wet below 2.3m

CLAY – high plastic, moist, stiff, brown, silty, trace sand

CLAY (TILL) – medium plastic, moist, soft, brown/grey, some gravel

CLAY – high plastic, moist, firm, grey (mottled)

Hole ended at 4.6m
Sloughing to 2.0m and seepage to 1.8m at completion of drilling

INSTRUMENTATION DATA

COMMENTS

W.L. 01/27/99

slight odour from 2.3 to 2.9m

ELEVATION(m)
99.0
98.0
97.0
96.0
95.0
94.0
93.0
92.0
91.0
90.0
89.0

AGRA Earth & Environmental Limited
Winnipeg, Manitoba

LOGGED BY: DB	COMPLETION DEPTH: 4.6 m
REVIEWED BY: KBO	COMPLETE: 01/28/99
Fig. No: B15	Page 1 of 1

98/02/19 02:08PM (GEO_LV10)

APPENDIX C

CERTIFICATES OF ANALYSIS

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

4810 - 93 Street
Edmonton, Alberta
Canada T6E 5M4
Tel: (780) 436-2152
Fax: (780) 435-8425

ANALYTICAL REPORT

AGRA Earth & Environmental Limited
Winnipeg, Manitoba

Date Received: Feb 2/99
Date Sampled: Jan 27-28/99
Date of Report: Feb 10/99

SOIL ANALYSIS

Attention: Dave Bynski/Kimber Osiowy

Project No.: WX04612.3

File No.: EC26971.561

Analyst	Date of Analysis	Parameter	EPA Reference Method	Lab. No.	99-8476	99-8477	99-8478	99-8479	99-8480	99-8481	99-8482	99-8482
				Sample I.D.	30-5 @ 10'	32-11 @ 4.5'	37-2 @ 3.0'	38-5 @ 10'	40-4 @ 7'	42-4 @ 7'	40-5 @ 10'	40-5 @ 10'
				Trifluorotoluene Recovery(%)	106	99	129	*	*	*	126	121
				MDL	µg/g (ppm) dry wt							
ST	3/2/99	Benzene	5021/8000	0.010	0.044	<0.010	3.6	<0.010	14	5.0	6.6	5.3
ST	3/2/99	Toluene	5021/8000	0.010	0.011	0.22	<0.010	<0.010	56	0.38	1.1	0.81
ST	3/2/99	Ethylbenzene	5021/8000	0.010	0.46	37	1.1	6.1	47	6.1	8.4	6.6
ST	3/2/99	Xylenes	5021/8000	0.020	0.73	180	3.4	8.6	220	11	19	16
ST	3/2/99	TVH (C_5-C_9)	5021/8000	0.050	27	1200	55	370	2900	180	190	150
ST	3/2/99	TSH (C_{10}-C_{32})	3550/8000	1	160	5900	5400	210	1500	130	43	--
ST	3/2/99	TPH	TVH + TSH	--	187	7100	5455	580	4400	310	233	--
ST	3/2/99	Moisture	%		21.5	14.8	13.9	23.5	21.3	25.7	25.4	25.4

MDL - Method Detection Limit
TVH - Total Volatile Hydrocarbons (Purgeable)
TSH - Total Semi-Volatile Hydrocarbons (Extractable)
TPH - Total Petroleum Hydrocarbons (Sum of TVH+TSH)
EPA - U.S. Environmental Protection Agency. 1997. Test Methods of Evaluation of Solid Waste 3rd Ed through Update III. Office Solid Waste Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.
*Accurate recovery for Trifluorotoluene not available due to interference from high Hydrocarbon content sample.

Report reviewed:

James A. LeBlanc, B.Sc.
QA/QC Manager
Laboratory Services

Brenda Chomin
Manager
Laboratory Services

AGRA Earth & Environmental Limited has been accredited by the Canadian Association to Environmental Analytical Laboratories (CAEAL) Inc. for specific tests registered with the Association.

** All Samples Will Be Disposed After 30 Days Following Analysis. Please Contact The Lab If You Require Additional Sample Storage Time. (Samples Deemed Hazardous Will Be Returned To The Client At Their Own Expense Or Disposal Will Be Arranged) **

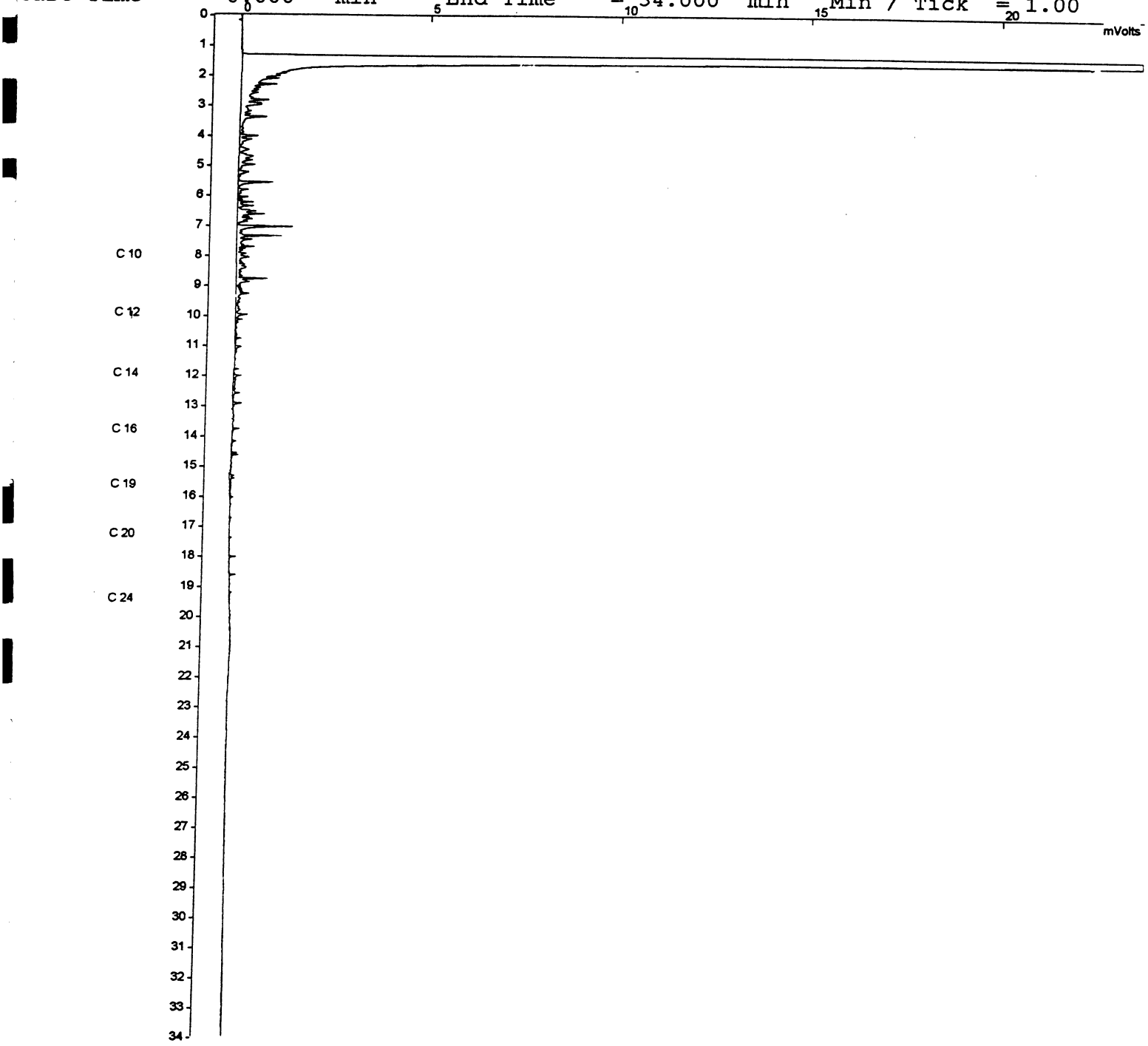
Title : TOTAL SEMI-VOLATILE HYDROCARBONS
Run File : c:\star\module16\svar396.run
Method File : C:\STAR\SEMCAL.MTH
Sample ID : 8482

Injection Date: 3-FEB-99 4:28 PM Calculation Date: 3-FEB-99 5:02 PM

Operator : S.THOMSON Detector Type: ADCB (1 Volt)
Workstation: PGMAY98C Bus Address : 16
Instrument : Varian Star #1 Sample Rate : 10.00 Hz
Channel : A = FID Run Time : 34.002 min

********** Star Chromatography Workstation ******* Version 4.51 **********

Chart Speed = 0.54 cm/min Attenuation = 100 Zero Offset = 3%
Start Time = 0.000 min End Time = 34.000 min Min / Tick = 1.00



Title : TOTAL SEMI-VOLATILE HYDROCARBONS
Run File : c:\star\module16\svar395.run
Method File : C:\STAR\SEMCAL.MTH
Sample ID : 8481

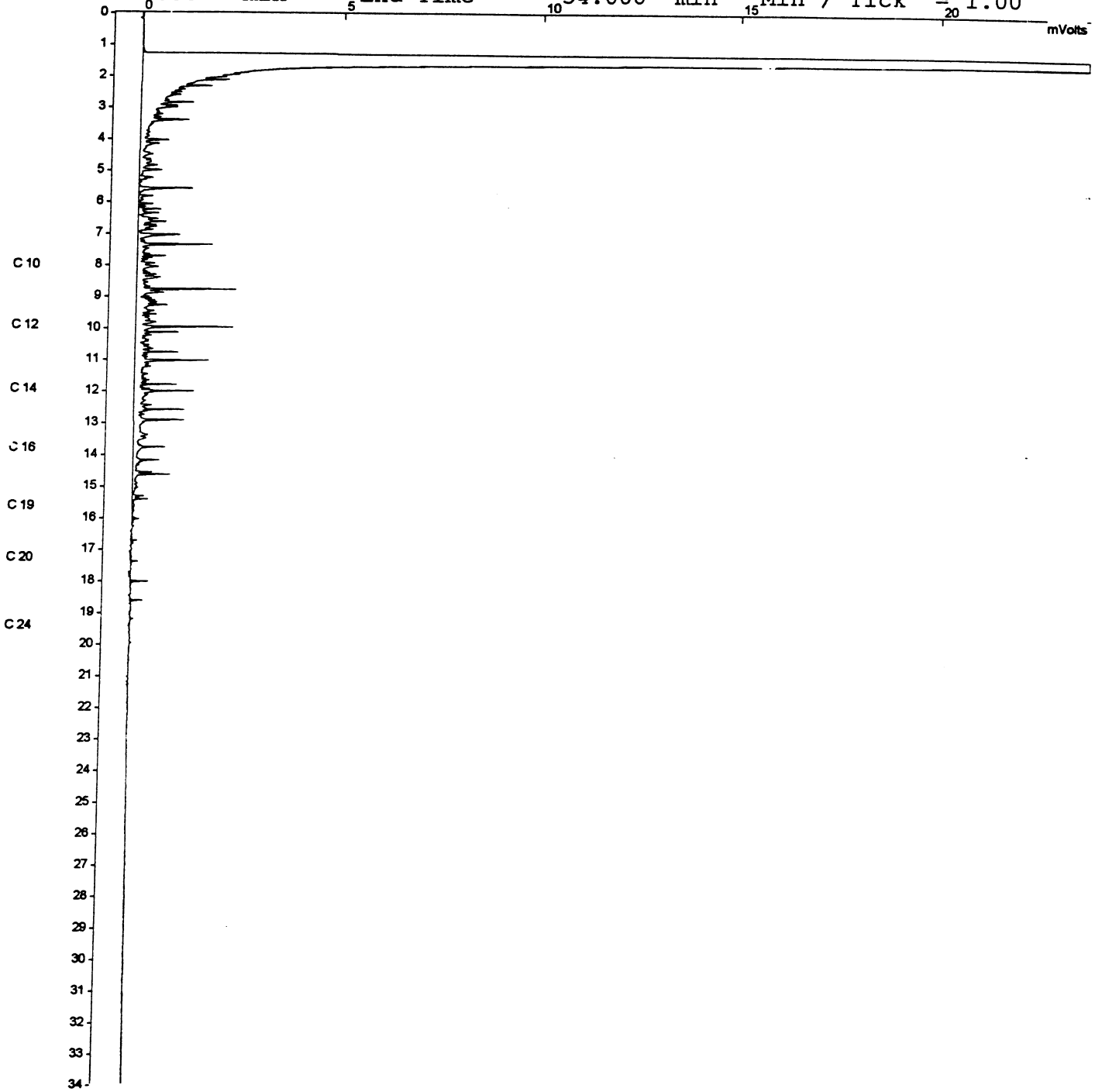
Injection Date: 3-FEB-99 3:45 PM Calculation Date: 3-FEB-99 4:20 PM

Operator : S.THOMSON
Workstation: PGMAY98C
Instrument : Varian Star #1
Channel : A = FID

Detector Type: ADCB (1 Volt)
Bus Address : 16
Sample Rate : 10.00 Hz
Run Time : 34.002 min

********** Star Chromatography Workstation ******* Version 4.51 **********

Chart Speed = 0.54 cm/min Attenuation = 100 Zero Offset = 3%
Start Time = 0.000 min End Time = 34.000 min Min / Tick = 1.00



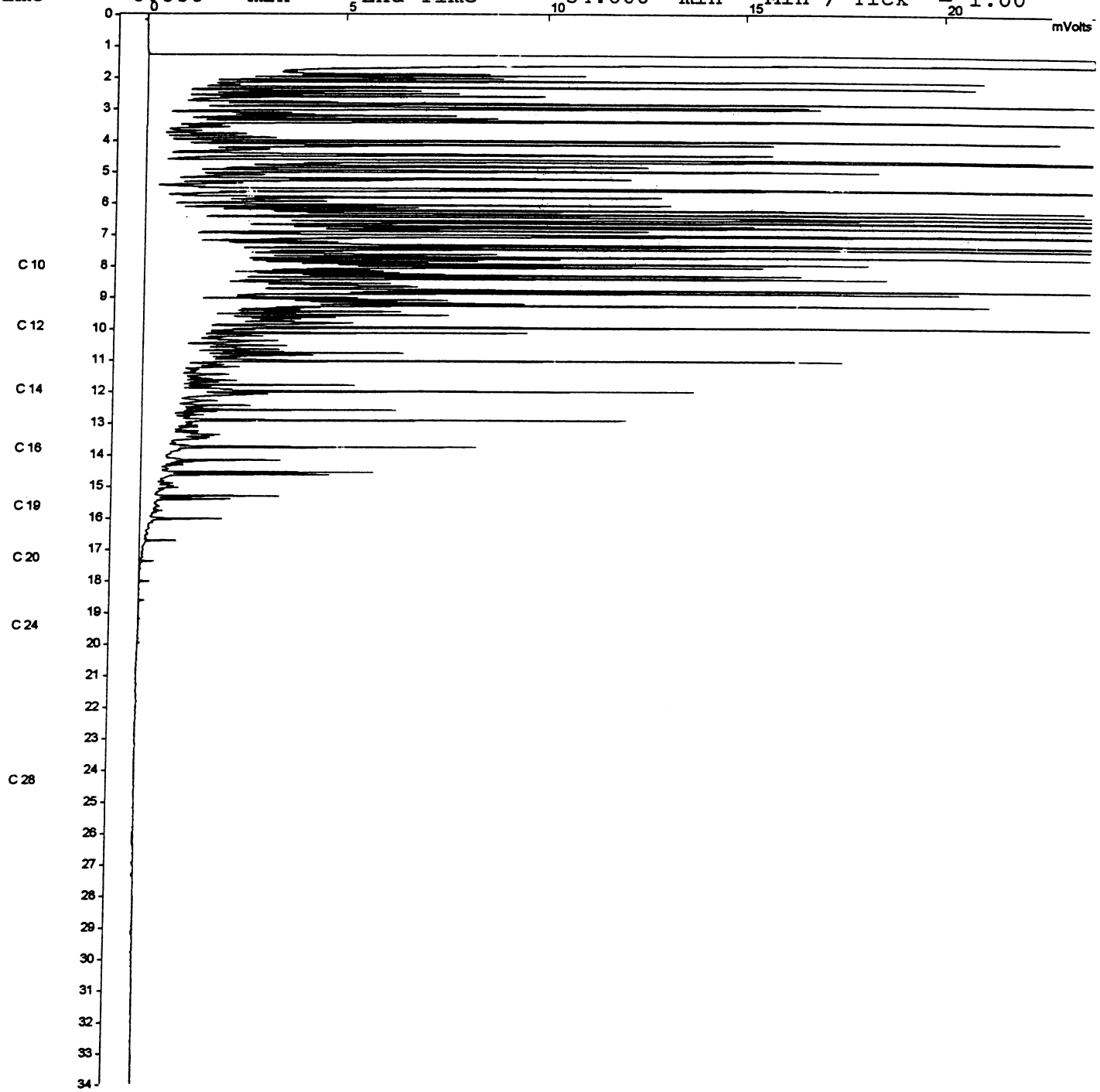
Title : TOTAL SEMI-VOLATILE HYDROCARBONS
Run File : c:\star\module16\svar393.run
Method File : C:\STAR\SEMCAL.MTH
Sample ID : 8480

Injection Date: 3-FEB-99 2:20 PM Calculation Date: 3-FEB-99 2:54 PM

Operator : S.THOMSON Detector Type: ADCB (1 Volt)
Workstation: PGMAY98C Bus Address : 16
Instrument : Varian Star #1 Sample Rate : 10.00 Hz
Channel : A = FID Run Time : 34.002 min

********** Star Chromatography Workstation ******* Version 4.51 **********

Chart Speed = 0.54 cm/min Attenuation = 100 Zero Offset = 3%
Start Time = 0.000 min End Time = 34.000 min Min / Tick = 1.00



Title : TOTAL SEMI-VOLATILE HYDROCARBONS
Run File : c:\star\module16\svar392.run
Method File : C:\STAR\SEMCAL.MTH
Sample ID : 8479

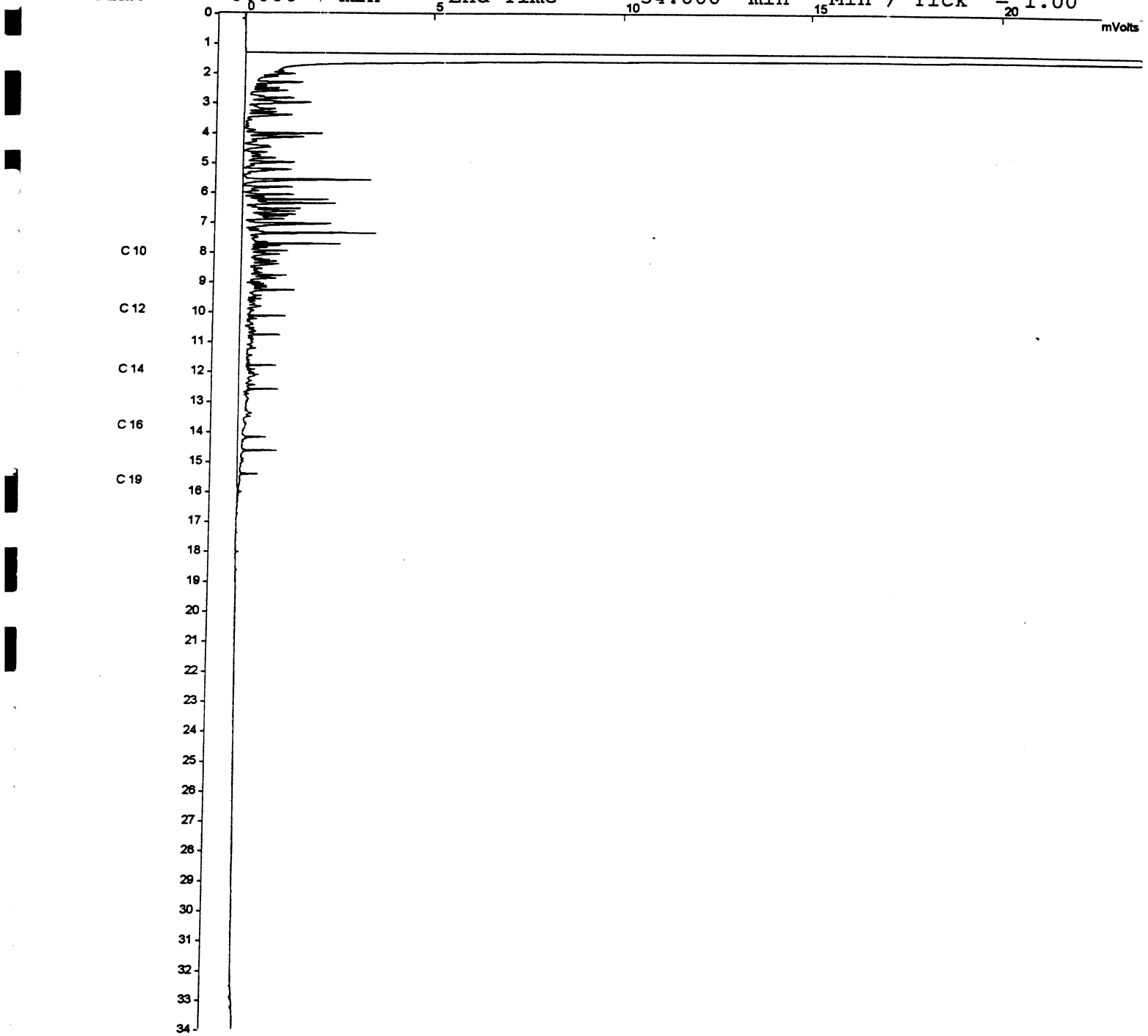
Injection Date: 3-FEB-99 1:37 PM Calculation Date: 3-FEB-99 2:11 PM

Operator : S.THOMSON
Workstation: PGMAY98C
Instrument : Varian Star #1
Channel : A = FID

Detector Type: ADCB (1 Volt)
Bus Address : 16
Sample Rate : 10.00 Hz
Run Time : 34.002 min

********** Star Chromatography Workstation ******* Version 4.51 **********

Chart Speed = 0.54 cm/min Attenuation = 100 Zero Offset = 3%
Start Time = 0.000 min End Time = 34.000 min Min / Tick = 1.00



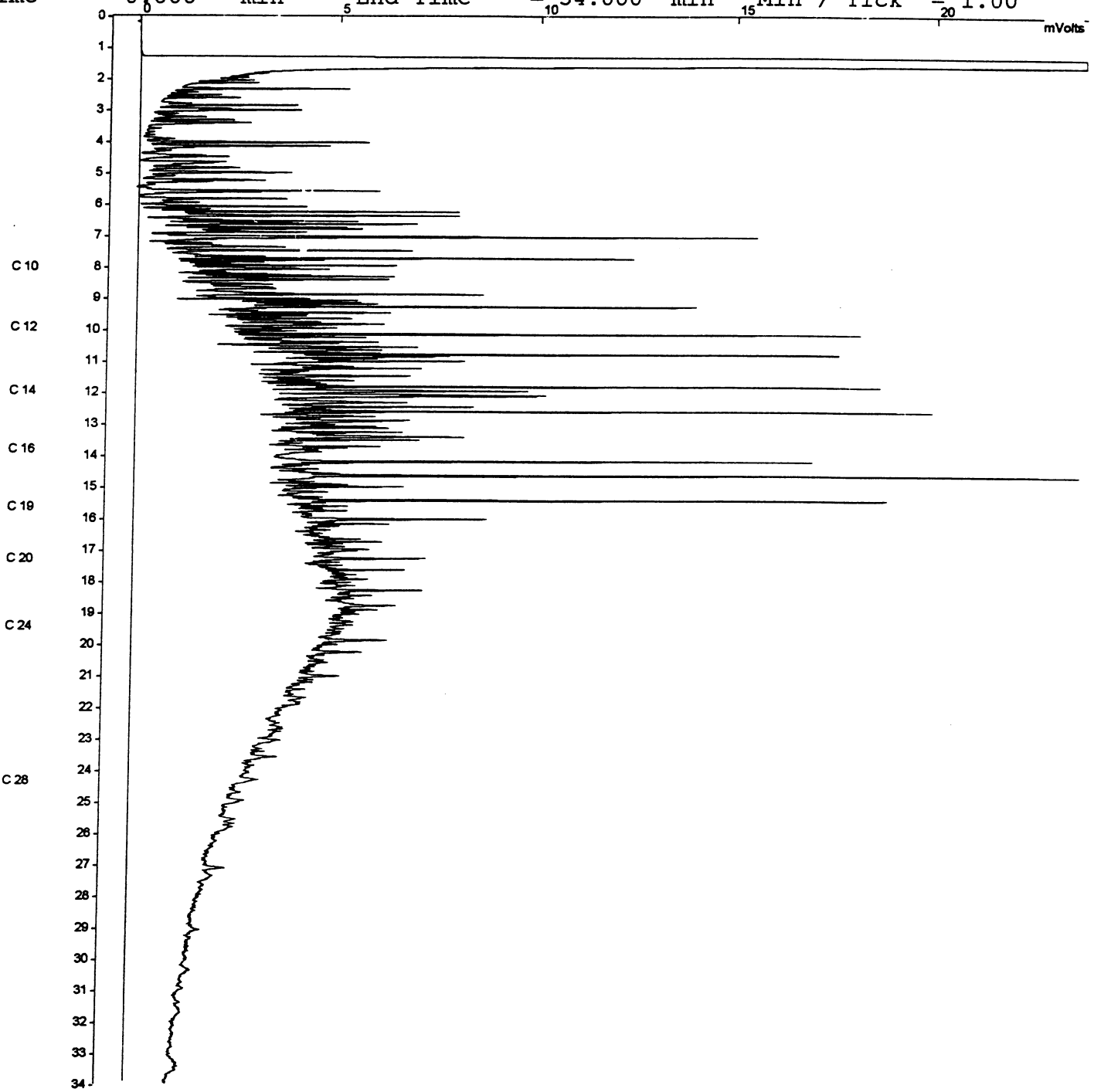
itle : TOTAL SEMI-VOLATILE HYDROCARBONS
Run File : C:\STAR\MODULE16\SVAR399.RUN
ethod File : c:\star\semcal.mth
ample ID : 8478

njection Date: 3-FEB-99 6:36 PM Calculation Date: 4-FEB-99 8:57 AM

Operator : S.THOMSON Detector Type: ADCB (1 Volt)
Workstation: PGMAY98C Bus Address : 16
nstrument : Varian Star #1 Sample Rate : 10.00 Hz
hannel : A = FID Run Time : 34.002 min

********** Star Chromatography Workstation ******* Version 4.51 **********

Chart Speed = 0.54 cm/min Attenuation = 100 Zero Offset = 3%
tart Time = 0.000 min End Time = 34.000 min Min / Tick = 1.00



Title : TOTAL SEMI-VOLATILE HYDROCARBONS
Run File : c:\star\module16\svar398.run
Method File : C:\STAR\SEMCAL.MTH
Sample ID : 8477

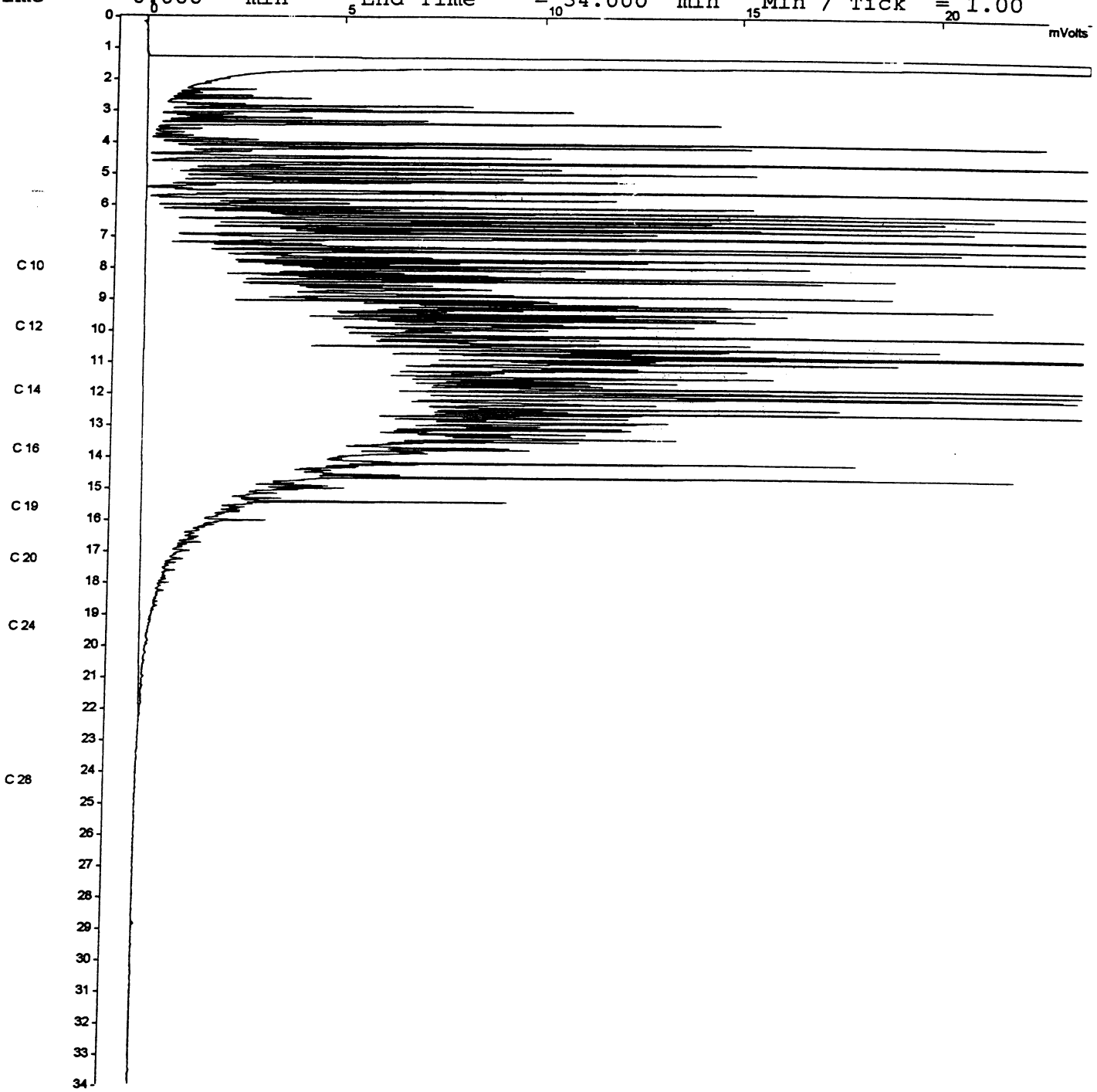
Injection Date: 3-FEB-99 5:53 PM Calculation Date: 3-FEB-99 6:27 PM

Operator : S.THOMSON
Workstation: PGMAY98C
Instrument : Varian Star #1
Channel : A = FID

Detector Type: ADCB (1 Volt)
Bus Address : 16
Sample Rate : 10.00 Hz
Run Time : 34.002 min

********** Star Chromatography Workstation ******* Version 4.51 **********

Chart Speed = 0.54 cm/min Attenuation = 100 Zero Offset = 3%
Start Time = 0.000 min End Time = 34.000 min Min / Tick = 1.00



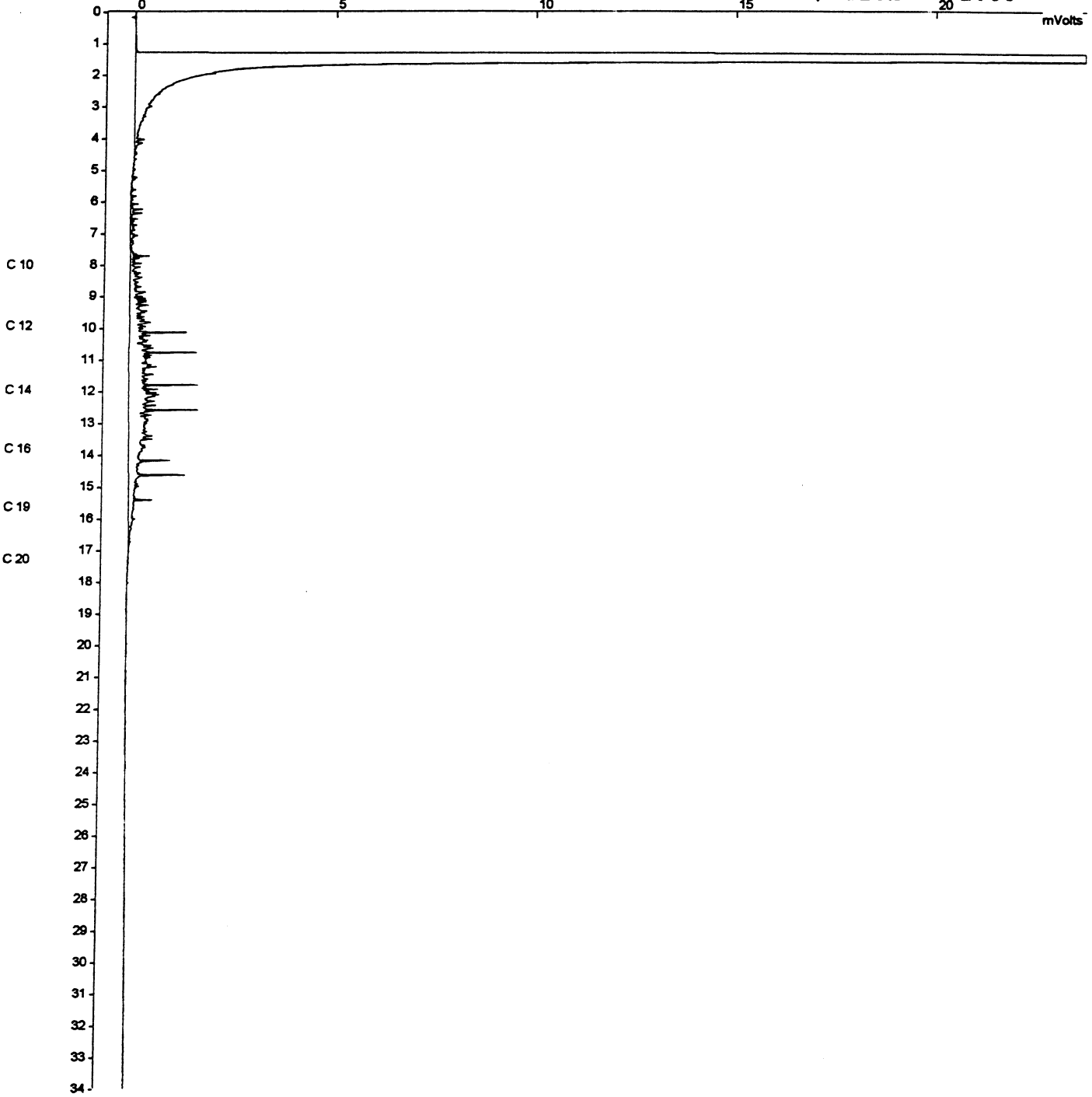
itle : TOTAL SEMI-VOLATILE HYDROCARBONS
Run File : C:\STAR\MODULE16\SVAR397.RUN
ethod File : c:\star\semcal.mth
ample ID : 8476

njection Date: 3-FEB-99 5:11 PM Calculation Date: 4-FEB-99 8:56 AM

perator : S.THOMSON Detector Type: ADCB (1 Volt)
Workstation: PGMAY98C Bus Address : 16
nstrument : Varian Star #1 Sample Rate : 10.00 Hz
nannel : A = FID Run Time : 34.002 min

********** Star Chromatography Workstation ******* Version 4.51 **********

Chart Speed = 0.54 cm/min Attenuation = 100 Zero Offset = 3%
tart Time = 0.000 min End Time = 34.000 min Min / Tick = 1.00



APPENDIX D

SITE SENSITIVITY ANALYSIS

Applicable Guidelines and Remediation Criteria

In 1991, Canadian Council of Ministers of the Environment (CCME) established interim assessment and remediation criteria for soil and groundwater contaminants in the *Interim Canadian Environmental Quality Criteria for Contaminated Sites*. The criteria were adopted from existing guidelines and criteria in use in Canada at that time. The interim criteria were to be modified as required to reflect emerging scientific data. Sites were classified as agricultural, residential/parkland, or commercial/industrial based on land use.

In 1993, Manitoba Environment (ME) published *Petroleum Storage Sites: On-site Risk Management*, in which sites were classified according to their sensitivity as determined by a site sensitivity assessment. Sites were classified as Level I, II or III for high, moderate and low sensitivity, respectively. For each level, remediation criteria for BTEX (benzene, toluene, ethyl benzene and xylenes), mineral oil and grease, lead, total semi-volatiles (TSH) and total volatile hydrocarbons (TVH) were established.

In March 1997, CCME published the *Recommended Canadian Soil Quality Guidelines* (SQG), overriding the CCME interim assessment and remediation criteria (1991) for a number of parameters. The SQG are based on the lowest value generated by the environmental and human health approaches for each of the four land uses: agricultural, residential/parkland, commercial, and industrial.

Subsequent to the publishing of the CCME SQG, ME adopted a three tiered approach for dealing with contaminated sites. The first tier consists of the direct adoption of SQG. The second tier consists of evaluation of site specific conditions and limited modification of the SQG by setting site-specific objectives. The third tier relies on the use of risk assessment procedures to establish remediation objectives at contaminated sites on a site-specific basis.

In June 1998, Manitoba Environment published a guideline entitled *Guideline for Environmental Site Investigations in Manitoba* (Guideline 98-01). The Guideline replaces the ME (1993) document and focuses not only on petroleum impacted sites, but also the requirements for the investigation of sites potentially impacted by various contaminants. The Guideline reflects the principles established by CCME for the management of sites in Canada and the requirements of the Manitoba Contaminated Sites Remediation and Consequential Amendments Act (CSRA). In Section 5.0 of the Guideline (Comparison of Investigation Results to Criteria), it describes the Tier 1, 2 and 3 Evaluation processes and declares the CCME (1997) document to be the default environmental quality guideline for Tier 1 Evaluations. Tier 2 and 3 Evaluations are to be applied where specific environmental quality guidelines are not available, or detailed site specific information should be applied, or where human health and/or environmental risks cannot be effectively quantified.

TABLE D1: SITE SENSITIVITY FACTORS	
FACTOR	**SITE CHARACTERISTICS**
Site description	Retail store and Gas Bar
Surrounding Land Uses North: West: East: South:	 Commercial Commercial Commercial & Industrial Commercial & Agricultural
Groundwater Usage	Site: no use Southeast: irrigation
Surface Water	West part of site: catch basins in parking lot and on 18th Street East part of site: lagoon at southeast corner of site and south to agr. land
Underground Structures	MTS, Hydro, Cable, Gas, Water, Sewer along north property line running east
Subsurface Stratigraphy Soil Profile	Paved sections: 1.5m of granular and clay fill followed by low plastic silt underlain by a high plastic clay followed by clay till Vegetated sections: 0.6m of topsoil and sand fill followed by low plastic silt to 2.0m underlain by high plastic clay followed by clay till
Depth to groundwater	approximately 1.5m below grade

TABLE A2 : SITE SENSITIVITY CLASSIFICATION				
Concern	**Receptor**	**Receptor Sensitivity**	**Likelihood of Impact**	**Sensitivity Ranking**
Ingestion	Groundwater: irrigation (adjacent site)	Medium	Medium	*
	Surface water: irrigation (adjacent site)	Medium	Medium	
Inhalation Soil	Surrounding agricultural land	Medium	Medium	Moderate
	Existing building on site: (commercial)	Medium	Low	
Groundwater	Surrounding agricultural land	Medium	Medium	Low
	Existing building on site (commercial)	Medium	Low	

* Water clean-up is normally not required.

Site sensitivity is **Moderate** and the soil clean-up level is **Commercial.**

STATEMENT OF LIMITATIONS

1. The work performed in this report was carried out in accordance with the standard terms of conditions made part of this contract. The conclusions presented herein are based solely upon the scope of services and time and budgetary limitations described in our contract.

2. The report has been prepared in accordance with generally accepted environmental study and/or engineering practices. No other warranties, either expressed or implied, are made as to the professional services provided under the terms of our contract and included in this report.

3. The services performed and outlined in this report were based, in part, upon visual observations of the site and attendant structures. Our opinion cannot be extended to portions of the site which were unavailable for direct observation, reasonably beyond the control of AGRA Earth & Environmental Limited.

4. The objective of this report was to assess the environmental conditions at the site, within the context of our contract and existing environmental regulations within the applicable jurisdiction. Evaluating compliance of past or future owners with applicable local, provincial and federal government laws and regulations was not included in our contract for services.

5. Our observations relating to the condition of environmental media at the site are described in this report. It should be noted that other compounds or materials other than those described could be present in the site environment.

6. The conclusions of this report are based in part, on the information provided by others. The possibility remains that unexpected environmental conditions may be encountered at the site in locations not specifically investigated. Should such an event occur, AGRA Earth & Environmental Limited must be notified in order that we may determine if modifications to our conclusions and recommendations presented herein, are necessary.