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report.V00353______.1999-11-17.REMEDIAL______.pdf
INVESTIGATION/FEASIBILITY STUDY

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Municipal Brownfields - b
Superfund - hw
Spills - sp
ERP - e
VCP - v
BCP - c

non-releasable - put .nf.pdf
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XCG CONSULTANTS LTD.

ENVIRONMENTAL ENGINEERING SPECIALISTS

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EXCELLENCE IN ENVIRONMENTAL CONSULTING SERVICES

XCG File #5-997-02-01

November 12, 1999

REMEDIAL INVESTIGATION/ FEASIBILITY STUDY WORK PLAN 3241 WALDEN AVENUE DEPEW, NEW YORK

FORMER, NL INDUSTRIES

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TABLE OF CONTENTS

FIGURES

APPENDICES

1. INTRODUCTION

1.1 General

In September 1999, Norampac, Inc. (Norampac) retained XCG Consultants Ltd. (XCG) to carry out a Remedial Investigation and Feasibility Study (RI/FS) of the property located at 3241 Walden Avenue in Depew, New York. XCG has previously conducted a number of investigations at the subject property, including a Limited Phase 1 Environmental Site Assessment (ESA) and several Phase 2 ESAs. These studies were initiated in 1998 at the request of the New York State Department of Environmental Conservation (NYSDEC). The NYSDEC's concerns were related to historical environmental impacts located in the area of a former on-site lagoon and marsh, located at the south end of the central portion of the property. Specific contaminants of concern include metals (e.g. lead, copper, and zinc) and several polycyclic aromatic hydrocarbons (PAHs).

XCG conducted the subsurface investigations in a phased approach, and as such, the extent and types of contamination have been well characterized. This RI/FS work plan presents a summary of the existing site information, and additional investigations that may be required to address any data gaps, in order to complete the RI/FS.

1.2 Objectives of the RI/FS

Based on general United States Environmental Protection Agency (US EPA) and NYSDEC guidance requirements, the objectives of the RI are as follows:

- Delineate the lateral and vertical extent of contaminants of concern in the soil and groundwater, and their relative concentrations throughout the property. and any off-site extensions.
- Characterize the site geology and hydrogeology to assist in assessing the fate and migration of the contaminants of concern.

The FS will be carried out after completion of the RI to evaluate various site management alternatives.

The RI/FS will follow the guidance outlined in EPA's "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final," dated October 1998. In addition, the selection of remedial actions will be in accordance with the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4030 "Selection of Remedial Actions at Inactive Hazardous Waste Sites," dated May 15, 1990.

2. SITE BACKGROUND

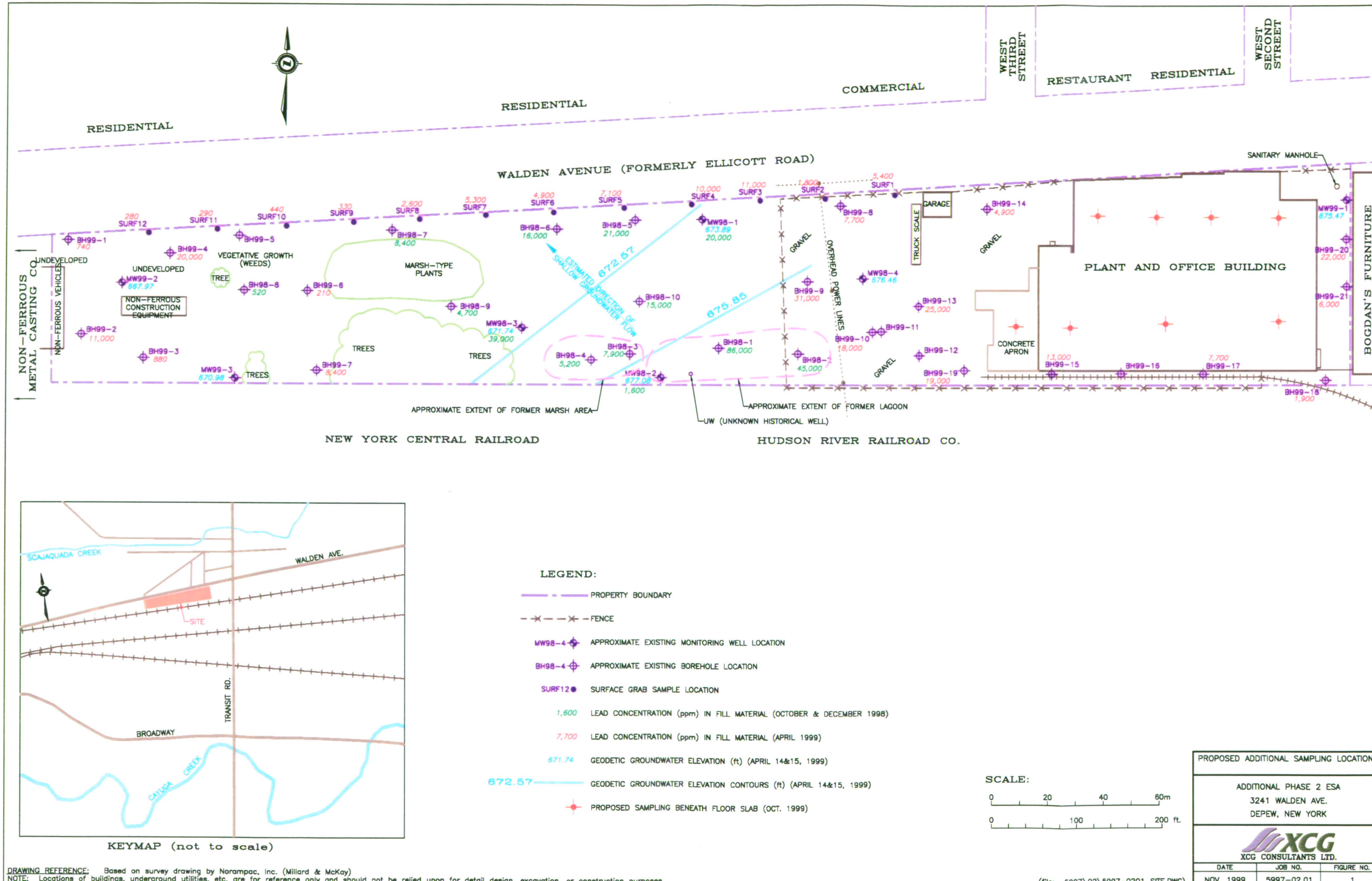
2.1 Site Location and Description

The subject property is located at 3241 Walden Avenue in Depew, New York. The property is situated on the south side of Walden Avenue, approximately 178.1 metres (584.42 feet) west of the centre line of Transit Road. The property is legally described as Part of Lot 68, Township 11, Range 7 of the Holland Land Company's Survey in the Village of Depew, Town of Cheektowaga, County of Erie.

The subject property is approximately 3.04 hectares (7.5 acres) in size. The site is located in a mixed commercial/industrial and residential area. Commercial/ industrial properties adjoin the east and west sides of the subject site. The properties located across the street, on the north side of Walden Avenue, are a mixture of residential and some commercial sites. The south side of the property is bordered by railway tracks. The topography of the subject property and immediate surrounding area has a generally flat grade. The property location and layout is shown on Figure 1. The property is currently used to operate paper fibre recycling activities, and XCG understands that it will continue to be used for industrial purposes.

The site has one main building located at the east side of the property. The building is estimated to occupy an area of approximately 5,890 m^2 (63,400 ft^2). The east side of the property is paved with asphalt for employee parking. A truck loading/unloading and trailer parking area is located west of the building. The trucking area is surfaced with gravel and is surrounded by a chain-link fence. In November 1999, the trucking area was re-surfaced with new gravel. Norampac indicated that approximately 400 tonnes of gravel was imported to the site to provide a minimum cover of approximately 0.08 metres (3 inches).

The area west of the fenced-off trucking area and east of the treed areas is described as the central portion of the property, for the purpose of this study. This area is not used for the paper fibre recycling activities. The central portion of the property, an area over 106.7 metres (350 feet) long and over 67 metres (220 feet) wide is vacant. The former lagoon and marsh area was located at the south portion of the central area. In July 1999, Norampac implemented Interim Remedial Measures (IRM) in the central portion of the property. The IRM consisted of constructing a hydroseeded-topsoil cover and erecting a chain link fence surrounding this area. These temporary measures were carried out to eliminate potential direct human exposure with the impacted fill, until a final remedial solution is developed.


RESIDENTIAL
RESIDENTIAL
COMMERCIAL
WEST THIRD STREET
RESTAURANT
RESIDENTIAL
WEST SECOND STREET
WALDEN AVENUE (FORMERLY ELLICOTT ROAD)
SANITARY MANHOLE
NON-FERROUS METAL CASTING CO.
NON-FERROUS VEHICLES
UNDEVELOPED
UNDEVELOPED
VEGETATIVE GROWTH (WEEDS)
TREE
NON-FERROUS CONSTRUCTION EQUIPMENT
MARSH-TYPE PLANTS
TREES
TREES
TREES
ESTIMATED SHALLOW GROUNDWATER DIRECTION OF FLOW
672.57
675.85
GRAVEL
OVERHEAD POWER LINES
TRUCK SCALE
GARAGE
GRAVEL
PLANT AND OFFICE BUILDING
CONCRETE APRON
GRAVEL
BOGDAN'S FURNITURE
APPROXIMATE EXTENT OF FORMER MARSH AREA
APPROXIMATE EXTENT OF FORMER LAGOON
UW (UNKNOWN HISTORICAL WELL)
NEW YORK CENTRAL RAILROAD
HUDSON RIVER RAILROAD CO.
SCAJAQUADA CREEK
WALDEN AVE.
SITE
TRANSIT RD.
BROADWAY
CAYUGA CREEK
KEYMAP (not to scale)
LEGEND:
PROPERTY BOUNDARY
FENCE
MW98-4 APPROXIMATE EXISTING MONITORING WELL LOCATION
BH98-4 APPROXIMATE EXISTING BOREHOLE LOCATION
SURF12 SURFACE GRAB SAMPLE LOCATION
1,600 LEAD CONCENTRATION (ppm) IN FILL MATERIAL (OCTOBER & DECEMBER 1998)
7,700 LEAD CONCENTRATION (ppm) IN FILL MATERIAL (APRIL 1999)
671.74 GEODETIC GROUNDWATER ELEVATION (ft) (APRIL 14&15, 1999)
672.57 GEODETIC GROUNDWATER ELEVATION CONTOURS (ft) (APRIL 14&15, 1999)
PROPOSED SAMPLING BENEATH FLOOR SLAB (OCT. 1999)
SCALE:
0 20 40 60m
0 100 200 ft.
PROPOSED ADDITIONAL SAMPLING LOCATIONS
ADDITIONAL PHASE 2 ESA
3241 WALDEN AVE.
DEPEW, NEW YORK
XCG CONSULTANTS LTD.
DATE NOV. 1999
JOB NO. 5997-02.01
FIGURE NO. 1
DRAWING REFERENCE: Based on survey drawing by Norampac, Inc. (Millard & McKay)
NOTE: Locations of buildings, underground utilities, etc. are for reference only and should not be relied upon for detail design, excavation, or construction purposes.
(file: 5997\02\5997-0201_SITE.DWG)

The area between the west edge of the trees and the west property line is defined as the west side of the property. The west side of the property is not used for on-site operations and is covered with imported fill, including construction debris (i.e. brick and large concrete fragments).

2.2 Site Geology and Hydrogeology

The site-specific geology and hydrogeology were determined in XCG's previous Phase 2 ESAs. The subsurface conditions at the various portions of the subject property are briefly summarized in this section. The overburden material encountered at the west side of the property consisted of a sand and gravel fill mixed with silty clay. Brick and concrete fragments were encountered in the fill. The depth of fill at the west side of the site was generally encountered between approximately 0.6 and 0.9 metres (2 to 3 feet) below grade, and was present to as deep as 1.2 metres (4 feet) at one of the drilling locations. The fill unit is underlain by a native silty clay stratum. Occasional pebbles and gravel are present in the silty clay. The consistency of this soil unit increased from very stiff to hard with depth, and became less hard as the depth approached the shallow water zone. Bedrock was not encountered during the previous subsurface investigations.

The overburden material at the central portion of the property consisted of varying types of fill overlying a native silty clay unit. The fill in this area generally consisted of silty sand to sandy silt with occasional gravel, and typically ranged in depth between approximately 0.6 and 0.9 metres (2 to 3 feet) below grade. The fill in the former lagoon consisted of saturated and very soft silty sand to sandy silt, and extended to depths ranging from approximately 3.0 to 3.7 metres (10 to 12 feet) below ground surface.

In the trucking area, the fill encountered during the drilling programs consisted of sand and gravel at the surface. The fill became a mixture of sand, gravel, and silty clay with depth and was saturated with perched water. The fill zone in this area generally ranged between approximately 1.2 and 1.5 metres (4 to 5 feet) below grade, and was encountered as deep as 1.8 metres (6 feet). As mentioned previously in Section 2.1, the trucking area has recently been re-surfaced with a new gravel cover, approximately 0.08 metres (3 inches) thick.

The parking area at the east side of the property is surfaced with asphalt, approximately 8 centimetres (3 inches) thick. The depth of the underlying coarse sand with gravel fill ranged between approximately 0.5 and 0.75 metres (1.5 to 2.5 feet) below grade.

A total of seven monitoring wells have been installed throughout the property. The monitoring wells were surveyed to a geodetic benchmark, which was provided by the New York State Department of Transportation. Perched water was encountered in the fill zone at various drilling locations; however, the shallow groundwater-bearing zone is situated in the native silty clay. Although the local regional area surrounding the property has a slight grade southwards, the shallow groundwater is estimated to flow northwesterly, based on groundwater measurements in the monitoring wells. Scajaquada Creek is located approximately 0.4 kilometres (0.25) miles to the north of the subject site while Cayuaga Creek is situated approximately 1.0 kilometres (0.62 miles) to the south.

2.3 Historical Review

The site history was reviewed as part of a Limited Phase 1 ESA conducted by XCG for Norampac. Details of the findings of this study are provided in XCG's report entitled "Limited Phase 1 Environmental Site Assessment, Former N.L. Industries Site, 3241 Walden Avenue, Depew, New York," dated June 11, 1999. This is briefly summarized below.

Metro Waste Paper Recovery Inc. (Metro Waste), a member of the Cascades Group, is currently operating paper fibre recycling activities at the subject property. The operations are limited to the east side of the property (i.e. as far west as the fence-off trucking area). Paper fibre recycling has been conducted on the site by various companies since 1974.

The subject property was first developed for industrial use in 1892. Past on-site activities have included brass foundry operations, which were conducted between 1892 and 1972 (i.e. 80 years), smelting operations conducted in the early part of the century, and the processing of babbitt. Brass is an alloy of copper and zinc, and babbitt is formed from an alloy of various metals including lead and copper. Waste produced by these operations, including the dredged material from the former settling lagoon, was apparently spread throughout the site. These historical activities explain the elevated levels of lead, zinc, and copper detected in the fill material.

2.4 Site Investigation History

NUS Corporation (NUS) conducted the first environmental investigation of the subject property for the US EPA. NUS completed an off-site reconnaissance of the property in early 1986 and prepared a report entitled "Potential Hazardous Waste Site Preliminary Assessment, N.L. Industries, Inc., 3241 Walden Avenue, Depew, NY, EPA Site ID Number NYD980531636." On March 31, 1987, NUS conducted a site inspection, on behalf of the US EPA, and collected 3 sediment and 4 soil samples for laboratory analyses. Elevated concentrations of several PAHs and metals (e.g. lead, copper, and zinc) were detected in the surficial soils. The results of this investigation are summarized in the NUS report entitled "Site Inspection Report, N.L. Industries/Buffalo Plant, Depew, New York," dated July 29, 1988.

In early 1998, the NYSDEC approached Norampac regarding the elevated PAH and metals detected at the subject property in 1987, and requested that Norampac carry out a subsurface investigation. Since that time, XCG has completed a number of subsurface investigations, in addition to the aforementioned Limited Phase 1 ESA. These investigations are summarized as follows:

- "Draft, Limited Phase 2 Environmental Site Assessment, 3241 Walden Avenue, Depew, New York," February 10, 1999.
- "Draft, Limited Phase 2 Environmental Site Assessment, Former Oil Tanks Area, 3241 Walden Avenue, Depew, New York," February 10, 1999.
- "Draft, Additional Phase 2 Environmental Site Assessment, 3241 Walden Avenue, Depew, New York," May 18, 1999.
- "Draft, Off-Site Surficial Soil Investigation, 3241 Walden Avenue, Depew, New York," July 26, 1999.

Copies of these documents have been submitted to the NYSDEC. In addition to the above investigations, additional surficial sampling was conducted at the west side of the property in June 1999; however, the analytical results of these samples were not summarized in a report. The findings of these investigations are briefly summarized in Section 3.

2.5 Interim Remedial Measures

Upon completion of these subsurface investigations, Norampac implemented Interim Remedial Measures (IRM) at the property in July 1999, which consisted of covering the central portion of the property with 0.15 metres (6 inches) of topsoil, hydroseeding the topsoil, and erecting a chain-link fence around the perimeter of this area. The IRM activities are summarized in Norampac's report entitled "Report on the Implementation of the Interim Remedial Measures at 3241 Walden Avenue, Depew, New York, July 12, 1999, to July 26, 1999," dated September 14, 1999.

3. INITIAL EVALUATION

3.1 Site Contamination

The above subsurface investigations were conducted in a phased approach to obtain greater insight of site conditions with each step, which was used to develop the scope of work for subsequent sampling. Borehole drilling, monitoring well installation, surface soil sampling, and laboratory analyses of soil, groundwater, and surface water samples have been conducted at all exterior locations of the property. This includes the east side of the property (paved parking lot), rail siding to the south of the building, trucking area, central portion of the site, and west side of the property. The total on-site testing program conducted by XCG in 1998 and 1999 is briefly summarized as follows:

- Drilling 42 boreholes across the entire property.
- Installing 7 groundwater monitoring wells.
- Collecting 24 surface soil samples.
- Laboratory analyses of 88 soil samples for metals, from both the fill and native silty clay.
- Laboratory analyses of 14 soil samples for TCLP metals.
- Laboratory analyses of 17 soil samples for PAHs.
- Laboratory analyses of 11 soil samples for volatile organic compounds (VOCs).
- Laboratory analyses of 1 soil sample for PCBs.
- Laboratory analyses of 1 surface water sample for metals, PAHs, and anions.
- Laboratory analyses of 9 groundwater samples for metals.
- Laboratory analyses of 4 groundwater samples for PAHs.
- Laboratory analyses of 2 groundwater samples for VOCs.
- Laboratory analyses of 4 groundwater samples for anions.

The above testing has provided a significant quantity of data to determine the extent of contamination on the property. The subsurface investigations conducted to date have provided a clear indication of the extent of petroleum and metal impacts throughout the exterior of the property.

A majority of the fill material at the subject property contains metals, and lead in particular, at concentrations that exceed the TAGM 4046 Cleanup Objectives or

Eastern UST/New York State Background Values. The TCLP results indicate that much of the metals impacted fill exceeds the regulatory limit for lead. The primary contaminant of concern appears to be lead in soil.

The underlying very stiff to hard silty clay is acting as an effective barrier to vertical migration of contaminants. This is supported by the groundwater results, as the concentrations of lead only marginally exceeded the TOGS 1.1.1 Standard in three monitoring wells. Residual petroleum hydrocarbon impacts were detected in the fill material, but to a much lesser extent. Petroleum impacts were limited to the rail siding, former lagoon/marsh area, and south part of the trucking area. The petroleum impacts are situated within the same medium (i.e. fill) and lateral extent, as the elevated metals and are considered to be co-contaminants. As such, the residual petroleum will be addressed as part of the remediation of the metals-impacted fill.

XCG believes that the investigations conducted to date have provided sufficient data to fully characterize the subsurface conditions at all exterior locations on the property. Carrying out any additional extensive drilling programs at exterior locations would be considered excessive and would not provide any added value to the understanding of the extent of contamination on-site. Further, it would only serve to delay the process of completing the RI/FS. There is, however, one general area of minor data gap and is as follows:

- Fill quality below the building floor slab.

A number of building expansions occurred in the earlier part of the century and it is unknown if metals containing waste was placed within the building expansion area, prior to expansion. Considering that metals impacted fill is present throughout the subject property, the possibility exists that impacted fill is present beneath the building. In order to complete the site characterization, testing of the soil beneath the building floor slab would be required.

3.2 Potential Exposure Pathways

Although the elevated concentrations of lead are present in the fill material, the exposure pathway of direct human contact has been significantly reduced in the interim, with the implementation of the IRM. The central portion of the property, where elevated lead concentrations were detected at surface, has now been covered with a topsoil cover and access has been reduced with the installation of a fence. The fill at the west side of the property has elevated lead concentrations in the fill zone; however, the concentrations at surface were below the TAGM 4046 Background Values. As such, any direct human contact in this area would not be considered a significant concern. Further, the lead-impacted fill at the east side of the property (i.e. parking lot) is covered with asphalt.

Lead concentrations exceeding the TAGM 4046 Background Values were detected in the fill material in the trucking yard. Any potential exposure to this fill material has been significantly reduced by the recent addition of a new gravel cover in the trucking yard. The fill quality beneath the building floor slab is currently unknown. However, exposure to lead impacted fill beneath the building (if any) would be mitigated by the concrete floor slab.

The potential for groundwater exposure is not considered significant, given that lead concentrations in groundwater only marginally exceeded the applicable standard at three locations, and that groundwater is not used for potable purposes in the subject property area. Depew is municipally serviced by water drawn from a surface water body.

3.3 Preliminary Health Assessment

As discussed above, the potential for health risks by direct human contact at the central portion of the property has been addressed in the interim by the IRM. The potential health risks by direct contact at the west side of the property is not considered to be significant, given that the lead concentrations at surface are below the TAGM 4046 Background Values. The potential health risks at the east side of the property is minimal as the metals-impacted fill is covered by asphalt, thereby eliminating the direct contact exposure scenario. The new gravel cover has temporarily mitigated the possible health risks associated with exposure to impacted fill material in the trucking yard. The health risks associated with impacted fill beneath the building (if any) are not expected to be significant due to the absence of exposure.

4. WORK PLAN APPROACH

A phased approach to the RI/FS will be implemented in order to achieve the goals in a focussed, practical, and cost-effective manner. The phased RI/FS will include all the requirements outlined in the US EPA guidance document. Although a phased approach for the field investigations will be applied, it is anticipated that only one more round of sampling will be sufficient to fill in the identified data gaps. This initial phase will consist of drilling through the floor slab to collect samples of the underlying fill material. The data from this initial soil sampling will be evaluated to complete the site characterization. Subsequent sampling phases in these areas, if required, will be developed based on the findings of the initial phase.

The information collected in this proposed additional sampling, as well as the extensive data obtained from previous investigations will be used to complete the RI of the subject property. Clean-up criteria for the metals, and lead in particular, will need to be established early in the RI/FS process. A target remediation value is required in order to assess the various remedial alternatives. XCG understands that Norampac and NYSDEC have previously discussed using a clean-up criterion for lead that is higher than the Background Values stated in TAGM 4046. The conclusions of the RI will be used to develop remedial alternatives in the FS.

5. REMEDIAL INVESTIGATION/FEASIBILITY STUDY TASKS

5.1 Project Planning

The tasks included in the project planning for the RI/FS of the property located at 3241 Walden Avenue in Depew, New York, is summarized as follows:

1. Document review.
2. Preliminary evaluation of available data.
3. Preparation of work plan.
4. Work plan review and approval by NYSDEC.
5. Field investigation planning, health and safety plan, and community relations.
6. RI completion.
7. FS completion.

The first three tasks have been completed in the preparation of this work plan. Tasks 4 will be completed once NYSDEC reviews this plan, while Tasks 5 to 7 are discussed below. Preparations for the field investigation will begin immediately upon receiving approval from NYSDEC. A proposed schedule using assumptions is provided in Figure 2.

5.2 Field Investigation

As discussed previously, the data gap identified during review of existing information include:

1. Fill quality below the building floor slab.

In order to obtain this additional data, the following activities will be conducted as the initial phase of the RI.

FIGURE 2

PROPOSED REMEDIAL INVESTIGATION/FEASIBILITY STUDY SCHEDULE

3241 WALDEN AVENUE, DEPEW, NEW YORK

TASK	1999 (week beginning)							2000 (week beginning)															
	November			December				January					February				March				April	
	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	6	13	20	27	3	10
Submit Work Plan to NYSDEC	*																					
NYSDEC Review		■	■																			
Revision				■																		
Re-Submit Work Plan to NYSDEC				■																		
NYSDEC Approval					■	■																
Implement field investigations								■														
Laboratory analysis									■													
Data validation										■												
RI Reporting											■	■										
Conduct FS													■	■	■							
Complete RI/FS Report																■	■					
Review by Norampac																		■	■			
Revision to RI/FS Report																				■	■	
Submit Draft RI/FS Report to NYSDEC																						**

NOTES:

* Work Plan to be submitted by November 19, 1999

** RI/FS Report to be submitted by April 15, 2000

Schedule is based on no additional sampling after initial phase

Schedule assumes that no bench scale/pilot testing is conducted

5-997-02-01

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5.2.1 Sampling of Fill Beneath the Floor Slab

Soil samples are proposed to be collected from beneath the building's floor slab to complete the site characterization of the subsurface conditions. At this time, soil sampling is proposed to be conducted with a truck-mounted direct-push Geoprobe sampler. The Geoprobe was used in previous investigations at the property and was successful in obtaining samples in both the fill and native silty clay units. However, the applicability of this drilling device, with respect to access and space limitations inside the building, will need to be determined before the field investigation commences. Alternatively, the fill samples may be collected by coring through the concrete and collecting the samples with a manual stainless steel sampler. Soil samples from below the floor slab will only be collected from the fill zone. A total of up to eight sampling locations are proposed for the inside of the building (see Figure 1). Up to nine soil samples, including one duplicate QA/QC sample, will be analyzed for metals. The inside sampling will be conducted at the same time as the surficial soil sampling, to be cost-effective.

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5.2.2 Remedial Investigation Report

Upon completion of the initial phase of the proposed additional investigations, a brief preliminary report will be provided to NYSDEC for review. Assuming that this new data is sufficient to supplement the existing site information, a comprehensive draft RI report will be prepared, which will include all analytical findings, site observations, and conclusions of all investigations conducted. A figure showing all sampling locations, borehole logs, and laboratory certificates of analyses will be included in this report.

XCG and Norampac will conduct multiple internal reviews of the draft RI report to provide quality control. As requested by NYSDEC, the draft RI report will be combined with the FS report to provide one single report.

5.3 General Field Procedure

The field investigation will be conducted using various quality assurance and quality control measures to ensure proper sample collection, and data management and evaluation. These protocols are described in the Quality Assurance Project Plan (QAPP), included as Appendix A. The Field Sampling Plan (FSP) is provided in Appendix B. Field investigation activities will be conducted in accordance with health and safety protocols to protect the investigation team, on-site workers, and off-site pedestrians. A site-specific health and safety plan (HSP) was prepared by XCG for Norampac prior to implementation of the IRM activities (see Appendix C). Since the risks associated with the proposed additional soil investigation is much lower than the implementation of the IRM (e.g. no heavy earth moving equipment, no dust generated, etc.), the site-specific HSP will not be re-written for the sampling program. Rather, XCG will use the protocols and information established in this document, such as emergency contact numbers and routes to hospitals.

5.4 Community Relations

Similar to the implementation of the IRM, the local community will be informed of the proposed RI/FS activities following approval by NYSDEC, but prior to commencement of the investigations. The steps used in involving the community will be similar to those procedures agreed upon between NYSDEC and Norampac prior to carrying out the IRM. These procedures would include the placement of the Work Plan in the public library, issuance of letters to the local residents, and offering an opportunity for public meetings at project milestones.

5.5 Feasibility Study

Remedial alternatives will begin to be considered as more information is reviewed throughout the RI process. The focus of the FS will be determined based on the completed RI and will follow the requirements outlined in NYSDEC's TAGM 4030. A list of potential remedial alternatives will be assembled, reviewed, and assessed against each other. The long list of remedial alternatives will be evaluated based on cost, implementability, and effectiveness, in an effort to reduce the potential candidates. The short list of alternatives will then be further evaluated against the following seven CERCLA criteria:

1. Short-term effectiveness
2. Long-term effectiveness
3. Reduction of toxicity, mobility, or volume
4. Implementability
5. Cost
6. Compliance with State and Federal ARARs
7. Overall protection of human health and the environment.

Treatability studies.

If potential remedial technologies require bench or pilot scale testing, XCG will consult with Norampac and NYSDEC prior to conducting these additional activities. Bench and pilot scale testing may require a number of months to complete, and as such, would affect the RI/FS report deadline established by NYSDEC (i.e. April 15, 2000). The evaluation process, findings, and preferred remedial alternative will be summarized and incorporated into a combined RI/FS report.

APPENDIX A

QUALITY ASSURANCE PROJECT PLAN

XCG

EXCELLENCE IN ENVIRONMENTAL CONSULTING SERVICES

DRAFT

XCG File #5-997-02-01

November 12, 1999

QUALITY ASSURANCE PROJECT PLAN
3241 WALDEN AVENUE
DEPEW, NEW YORK

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TABLE OF CONTENTS

FIGURES

TABLE OF CONTENTS (CONT'D)

TABLE

APPENDICES

1. PROJECT DESCRIPTION

The subject property is located at 3241 Walden Avenue in Depew, New York. The property is situated on the south side of Walden Avenue, approximately 178.1 metres (584.42 feet) west of the centre line of Transit Road. The property is legally described as Part of Lot 68, Township 11, Range 7 of the Holland Land Company's Survey in the Village of Depew, Town of Cheektowaga, County of Erie (the layout of the property is shown in Figure 1).

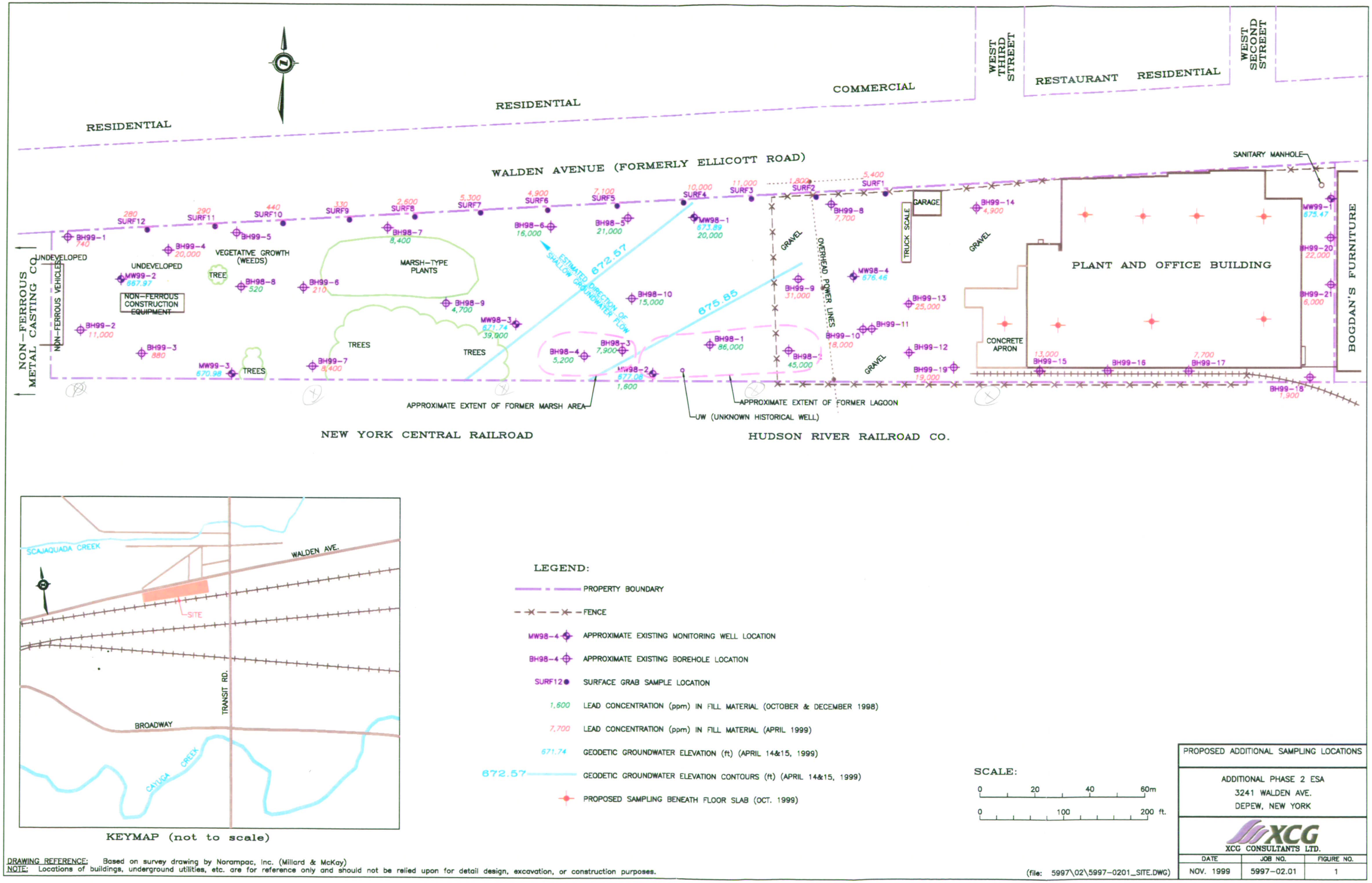
Metro Waste Paper Recovery Inc. (Metro Waste), a member of the Cascades Group, is currently operating paper fibre recycling activities at the subject property. The operations are limited to the east side of the property (i.e. as far west as the fence-off trucking area). Paper fibre recycling has been conducted on the site by various companies, since 1974.

The subject property was first developed for industrial use in 1892. Past on-site activities have included brass foundry operations, which were conducted between 1892 and 1972 (i.e. 80 years), smelting operations conducted in the early part of the century, and the processing of babbitt. Brass is an alloy of copper and zinc, and babbitt is formed from an alloy of various metals including lead and copper. Waste produced by these operations, including the dredged material from the former settling lagoon, was apparently spread throughout the site. These historical activities explain the elevated levels of lead, zinc, and copper detected in the fill material.

In early 1998, the NYSDEC approached Norampac regarding the elevated polycyclic aromatic hydrocarbons (PAH) and metals detected at the subject property in 1987, and requested that Norampac carry out a subsurface investigation. Since that time, XCG has completed a number of subsurface investigations.

The subsurface investigations conducted to date have provided a clear indication of the extent of petroleum and metal impacts throughout the exterior of the property. A majority of the fill material at the subject property contains metals, and lead in particular, at concentrations that exceed the TAGM 4046 Cleanup Objectives or Eastern UST/New York State Background Values. The TCLP results indicate that much of the metals impacted fill exceeds the regulatory limit for lead. The primary contaminant of concern appears to be lead in soil. The underlying very stiff to hard silty clay is acting as an effective barrier to vertical migration of contaminants. Residual petroleum impacts detected at the site were limited to the rail siding, former lagoon/marsh area, and south part of the trucking area.

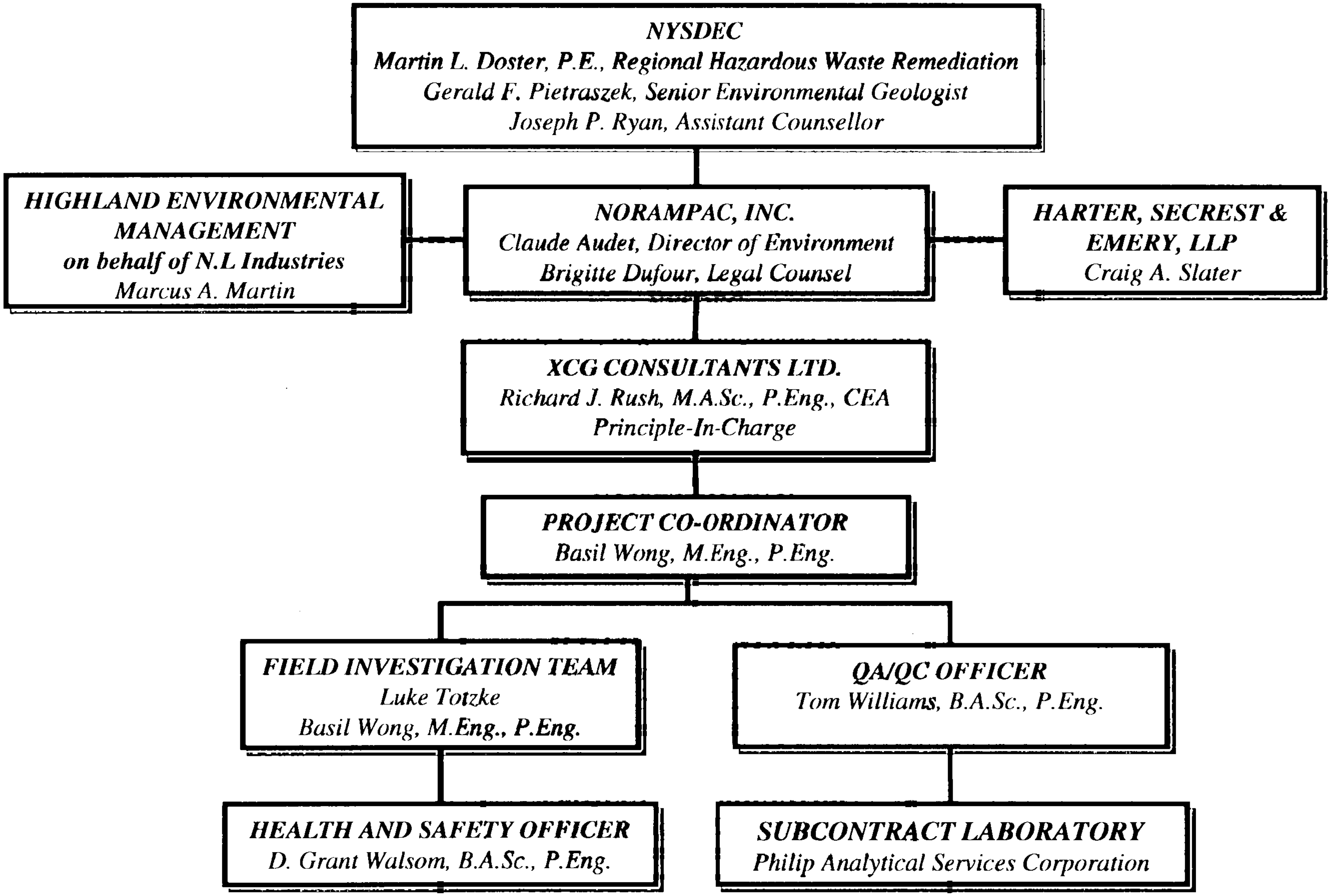
Norampac, Inc. (Norampac) retained XCG Consultants Ltd. (XCG) to carry out a Remedial Investigation and Feasibility Study (RI/FS) of the property located at 3241 Walden Avenue in Depew, New York. This consisted of reviewing existing site information to determine if additional investigations may be required to address any data gaps.


RESIDENTIAL
RESIDENTIAL
COMMERCIAL
WEST THIRD STREET
RESTAURANT
RESIDENTIAL
WEST SECOND STREET
WALDEN AVENUE (FORMERLY ELLICOTT ROAD)
SANITARY MANHOLE
NON-FERROUS METAL CASTING CO.
NON-FERROUS VEHICLES
UNDEVELOPED
UNDEVELOPED
VEGETATIVE GROWTH (WEEDS)
TREE
NON-FERROUS CONSTRUCTION EQUIPMENT
MARSH-TYPE PLANTS
TREES
TREES
TREES
ESTIMATED SHALLOW GROUNDWATER DIRECTION OF FLOW
672.57
675.85
GRAVEL
OVERHEAD POWER LINES
TRUCK SCALE
GARAGE
GRAVEL
GRAVEL
PLANT AND OFFICE BUILDING
CONCRETE APRON
BOGDAN'S FURNITURE
APPROXIMATE EXTENT OF FORMER MARSH AREA
UW (UNKNOWN HISTORICAL WELL)
APPROXIMATE EXTENT OF FORMER LAGOON
NEW YORK CENTRAL RAILROAD
HUDSON RIVER RAILROAD CO.
LEGEND:
PROPERTY BOUNDARY
FENCE
MW98-4 APPROXIMATE EXISTING MONITORING WELL LOCATION
BH98-4 APPROXIMATE EXISTING BOREHOLE LOCATION
SURF12 SURFACE GRAB SAMPLE LOCATION
1,600 LEAD CONCENTRATION (ppm) IN FILL MATERIAL (OCTOBER & DECEMBER 1998)
7,700 LEAD CONCENTRATION (ppm) IN FILL MATERIAL (APRIL 1999)
671.74 GEODETIC GROUNDWATER ELEVATION (ft) (APRIL 14&15, 1999)
672.57 GEODETIC GROUNDWATER ELEVATION CONTOURS (ft) (APRIL 14&15, 1999)
PROPOSED SAMPLING BENEATH FLOOR SLAB (OCT. 1999)
SCAJAQUADA CREEK
WALDEN AVE.
SITE
TRANSIT RD.
BROADWAY
CAYUGA CREEK
KEYMAP (not to scale)
SCALE:
0 20 40 60m
0 100 200 ft.
PROPOSED ADDITIONAL SAMPLING LOCATIONS
ADDITIONAL PHASE 2 ESA
3241 WALDEN AVE.
DEPEW, NEW YORK
XCG CONSULTANTS LTD.
DATE NOV. 1999
JOB NO. 5997-02.01
FIGURE NO. 1
DRAWING REFERENCE: Based on survey drawing by Norampac, Inc. (Millard & McKay)
NOTE: Locations of buildings, underground utilities, etc. are for reference only and should not be relied upon for detail design, excavation, or construction purposes.
(file: 5997\02\5997-0201_SITE.DWG)

2. PROJECT ORGANIZATION AND RESPONSIBILITIES

Figure 2 shows the organization of the project management team and areas of responsibilities. The resumes of key project staff members are included in Appendix B.

FIGURE 2 – PROJECT TEAM ORGANIZATION



3. QA/QC OBJECTIVES FOR MEASUREMENT DATA

The laboratory shall ensure a level of quality that meets the standards established in obtaining its certification from the New York State Department of Health (NYSDOH). Further, field duplicate samples will be collected and analyzed for quality assurance/quality control purposes (QA/QC). The number of duplicates to be analyzed is summarized in the Field Sampling Plan (FSP).

The objective of the QA/QC program is to ensure completeness, representativeness, comparability, precision, and accuracy of the measured data.

The completeness of the laboratory analyses will be evaluated by comparing the number of samples intended to be analyzed with the actual number successfully measured and confirmed. The data must meet QC acceptance for 100 percent of the requested analyses.

The collected samples must be representative of the environmental conditions in the area at which the samples were collected. Non-dedicated sampling equipment will be decontaminated between sampling points to ensure that cross-contamination does not occur. The decontamination procedures are described in the Sampling Procedures section (Section 4). The analysis of the field duplicates will be used to evaluate the representativeness of the analytical data.

In order for the analytical results to be comparable, consistency must be maintained in the collection, preparation, handling, and laboratory analysis of the samples. The results from the future investigations will be compared with the results of the previous subsurface investigations. As such, the NYSDOH certified laboratory will use the analytical methods consistent with those used for metals analyses in previous investigations.

The analytical data will be validated by evaluating the precision and accuracy of the results. The number of laboratory duplicate, spiked, and blank samples will depend on the number of samples to be analyzed. There will be at least one field duplicate for the soil samples collected for metals analyses.

4. SAMPLING PROCEDURES

A brief description of the procedures to be used during the borehole drilling is provided in this section. Drilling will follow the methodology outlined in the NYSDEC document entitled "Guidelines for Exploratory Boring, Monitoring Well Installation, and Documentation of These Activities."

4.1 Borehole Drilling and Sampling

The boreholes will be advanced through the building floor slab using a direct-push Geoprobe sampler. If the Geoprobe is not suitable for sampling due to space restrictions, a hole will be cored through the floor slab and the samples will be collected manually or with a tripod sampler.

The boreholes will be advanced to a depth just beyond the contact of the fill material and native silty clay. The Geoprobe will collect soil samples continuously with a 1.2 metre (4 feet) long, 0.05 metre (2 inch) diameter, stainless steel cylindrical sampler. The interior of the sampler shall be lined with a new plastic sleeve for each sampling interval. The collected soil samples will be placed in laboratory prepared glass bottles, labelled, sealed, and stored in coolers containing ice/cooler packs.

The borehole drilling and sampling program will be conducted under the full-time supervision of an XCG Consultants Ltd. engineer or an environmental engineering technologist. The soil samples will be described using the New York State Soil Description Procedure (see Appendix A). The Field Sampling Plan provides the specific soil description and collection procedures.

4.2 Decontamination

Drilling equipment and associated tools including the Geoprobe samplers and wrenches that have previously contacted contaminated material shall be decontaminated before commencement of drilling and sampling activities. Further, decontamination will also be conducted between sampling depths and drilling locations. Decontamination procedures will include an initial wash with detergent and water, followed by a rinse with clean water, and a final rinse with distilled water. The water from the decontamination conducted during the inside building drilling will be contained and transferred to the trucking area.

4.3 Sample Preservation and Shipment

Since the soil samples are planned for metals analyses only, no special preservatives are required. If evidence of organic or petroleum impact is detected during sampling, soil samples will also be contained in laboratory prepared bottles with teflon-lined lids for potential volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAH) analyses. All jarred samples will be stored in coolers with ice or cooler packs, such that the temperature is maintained at approximately 4°C. The laboratory courier services will collect the samples from the subject site and chain-of-custody procedures will be maintained throughout the sample handling and transfer process.

5. SAMPLE CUSTODY

Procedures will be established to ensure the proper handling and transferring of samples. Sample custody procedures beginning from the field sampling to laboratory testing to receipt of final results are briefly described below.

5.1 Field Sample Custody

Each sample bottle is to be individually labelled with the relevant information including client/project number, sample location and description, type of analysis required, preservation technique, sample type, date and time, and sampler's signature or initials. This information is then transferred onto the chain-of-custody. An example chain-of-custody form from the laboratory to be used in this investigation is provided in Appendix C. The samples are maintained in the coolers at a temperature of approximately 4°C until they arrive at the laboratory. Samples will be collected by the laboratory's sample courier service within 24 to 48 hours of the day of collection. Upon relinquishing the samples to the laboratory, the field sampler shall sign and keep one copy of the chain-of-custody, which is in quadruplicate carbon copy form. The remaining three copies of the chain-of-custody accompanies the samples through the laboratory's internal transfer process.

5.2 Laboratory Sample Custody

The site investigation team or Project Manager will inform the laboratory of the forthcoming samples and their anticipated time of arrival. In order for the laboratory to be well prepared prior to receiving the samples, the site investigation team leader will inform the laboratory of any special requirements, such as rush analysis or a large number of samples are expected.

The laboratory will conduct the following:

1. Designate a custodian to be responsible for maintaining the custody of the samples and associated documentation.
2. The custodian will compare the chain-of-custody with the labelled sample bottles for correctness. Conditions of the samples (e.g. broke or leaking bottles) upon receipt at the laboratory will be noted on the chain-of-custody. The custodian will then sign this form and indicate the date and time received.

3. The laboratory will immediately notify the site investigation team leader of any discrepancies in the chain-of-custody or defects in the samples. Any corrective actions will be conducted immediately.
4. The samples are transferred to a secured storage area and maintained at a temperature of approximately 4°C until analyses are conducted.
5. To ensure quality control, the chain-of-custody records accompanies the samples through the laboratory handling process, until the analyses are completed.
6. One of the three carbon copies of the chain-of-custody is returned with the laboratory's certificates of analysis and is to be maintained as part of the permanent project files.

5.3 Final Evidence Files

The original laboratory certificates of analyses become part of the final evidence files and stored in a secured area.

A sample or an evidence file is under custody if:

- It is in your possession.
- It is in your view, after being in possession.
- It was in your possession and you placed it in a secure area.
- It is in a designated secure area.

6. CALIBRATION PROCEDURES

Laboratory instruments and equipment used to measure contaminant concentrations in samples shall be calibrated with sufficient frequency to ensure the accuracy and reproducibility of results. Calibration will be conducted as outlined in the manufacturer's specifications. The laboratory will use procedures for instrument calibration, calibration verification, and calibration frequency consistent with those methods approved in obtaining its New York State Department of Heath certification.

7. ANALYTICAL PROCEDURES

To ensure that the analytical procedures conform to the requirements of New York State, the laboratory conducting the analyses must be certified by the New York State Department of Health. As with the previous subsurface investigations, Philip Analytical Services Corporation (PASC) will be retained to conduct the analytical testing. PASC's Environmental Laboratory Accreditation Program (ELAP) Identification Number is 10756.

The analytical procedures used for the analysis of metals in soils will be consistent with those methods used in the previous investigations. The methods are as specified in SW846, Standard Methods 19th Edition. Soil samples will be analyzed for metals using inductively-coupled plasma (ICP) emission spectroscopy/atomic emission spectroscopy (AES). The laboratory shall achieve the method detection limits similar to the previous sample analytical programs and are summarized in Table 1.

TABLE 1
METHOD DETECTION LIMITS FOR ICP METALS

PARAMETER	METHOD DETECTION LIMIT (mg/kg)
Aluminum	3
Barium	0.1
Beryllium	0.1
Cadmium	0.2
Calcium	20
Chromium	0.4
Cobalt	1
Copper	0.6
Iron	1
Lead	2
Magnesium	5
Manganese	0.5
Molybdenum	1
Nickel	1
Phosphorus	6
Potassium	100
Silver	1.0
Sodium	10
Thallium	6
Vanadium	0.5
Zinc	0.5

8. DATA REDUCTION, VALIDATION, AND REPORTING

The analyses to be conducted in the proposed sampling program consist of metals in soils. Depending on field observations, the soil samples may also be analyzed for VOCs and PAHs. The laboratory will use data reduction procedures to qualify and quantify the metals, VOCs, and PAHs analyses consistent with those approved in obtaining its NYSDOH ELAP certification.

To maintain consistency between the proposed sampling and previous investigations, the analytical reports will be prepared in a format similar to the previous analyses. The completed chain-of-custody sheets will be attached to the Certificates of Analyses reports.

9. INTERNAL QUALITY CONTROL

Each batch of soil samples submitted to the laboratory will be analyzed simultaneously with laboratory duplicates, method blanks, spiked blanks, and matrix spikes. The analyses of blanks are used to determine if contaminants are introduced by the analytical method. The blank water sample can be prepared by reverse osmosis and Super-Q filtration systems, or distillation of water containing $KMnO_4$. The spiked blank is produced by adding standard solutions to the blank sample. The matrix spike is prepared by adding standard solutions to the samples.

10. PERFORMANCE AND SYSTEMS AUDITS

The laboratory internal audits consist of a Sample Audit Program, which is carried out monthly by the QA office through observations, interviews, examination of records, and documentation. This is conducted to determine whether policies, procedures, and standard operating procedures are implemented effectively and as documented. In addition, this audit is conducted to determine if resources, policies, and procedures are suitable to achieve the quality objectives. Method Audits are conducted annually or bi-annually by Senior Management personnel. The Method Audit objectives are similar to the Sample Audits. Further, external Performance Audits are conducted quarterly. PASC participates in the New York State's Non-Potable Water and Solid/Hazardous Waste Performance Evaluation quarterly studies. Also, New York State laboratory certification audits occur unannounced annually.

11. PREVENTATIVE MAINTENANCE

Preventative maintenance will be carried out on sampling and measurement equipment in accordance with manufacturer's specified requirements. The servicing will be conducted by qualified personnel and will follow the schedule recommended by the manufacturer or as deemed necessary. Regular maintenance of critical measurement systems will minimize any potential downtime. Logs shall be maintained to document the servicing date and procedures conducted during each maintenance period. All maintenance records will be filed in a designated area of the laboratory and may be audited at any time.

12. DATA ASSESSMENT PROCEDURES

The laboratory will evaluate the precision and accuracy of the data by using the methods approved by the NYSDOH in obtaining its ELAP certification. Completeness is determined by comparing the number of samples to be analyzed for with the actual number successfully measured and verified.

The accuracy of the data may be determined by calculating the percent recovery as follows:

$$\% = \frac{Ss - So}{X} \times 100$$

where:

So = the background value
S = the concentration of the spike added to the sample
Ss = the concentration of the sample with the spike added
% = percent recovery

The precision of the data may be determined by calculating the relative percent difference as follows:

$$\%\ diff = \frac{V1 - V2}{0.5\ (V1 + V2)} \times 100$$

where:

V1, V2 = the two concentrations of the duplicate samples

13. CORRECTIVE ACTIONS

Any deviations, errors, deficiencies, or equipment malfunctions must be investigated and addressed immediately. Corrective actions must be documented where audit findings, proficiency testing, client feedback, or any other circumstance casts doubt on the correctness or validity of the laboratory's test results. Prescribed methods have been established by the laboratory for initiating corrective actions for audits and proficiency checks. Client feedback or other circumstances that are not covered in the above methods are to be handled according to the standard operating procedures (SOP) for Corrective Action Response.

The SOP for Corrective Action Response must be followed whenever data are revised after they have been reported, and a revised report is sent to the consultant. The SOP for Corrective Action Response may be used wherever audit procedures do not have specific response report forms.

Acceptable resolution, where warranted, may include any combination of retest, third party testing, credit or refund as approved by Senior Management. If the investigation of a technical complaint causes doubt concerning laboratory performance the QA Scientist may, after appropriate investigation, initiate either corrective action or a more comprehensive review. The QA Scientist shall maintain on a file a record of all complaints and the actions taken.

14. QUALITY ASSURANCE REPORTS

Section 8 described the procedure for reporting results while the frequency of system and performance audits was described in Section 10.

APPENDIX A

STATE OF NEW YORK SOIL DESCRIPTION PROCEDURE

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
RAYMOND T. SCHULER, COMMISSIONER

SOIL DESCRIPTION PROCEDURE

OFFICIAL ISSUANCE NO. 7.41-5STP 2/75

SOIL MECHANICS BUREAU
SOIL TEST PROCEDURE STP-2

MAY 1, 1975

INTRODUCTION

This manual presents a procedure for describing soil samples obtained for earth and foundation engineering purposes by the New York State Department of Transportation. The procedure involves visually and manually examining soil samples with respect to texture, plasticity and color. A method is presented for preparing a "word picture" of a sample for entering on a subsurface exploration log or other appropriate data sheet. The procedure applies to soil descriptions made in the field or laboratory.

It should be understood that the soil descriptions are based upon the judgment of the individual making the description. Classification tests are not intended to be used to verify the description, but to provide further information for analysis of soil design problems or for possible use of the soil as a construction material.

It is the intent of this system to describe only the constituent soil sizes that have a significant influence on the visual appearance and behavior of the soil. This description system is intended to provide the best word description of the sample to those involved in the planning, design, construction, and maintenance processes.

DEFINITION OF TERMS

Boulder - A rock fragment, usually rounded by weathering or abrasion, with an average dimension of 12 inches or more.

Cobble - A rock fragment, usually rounded or subrounded, with an average dimension between 3 and 12 inches.

Gravel - Rounded, subrounded, or angular particles of rock that will pass a 3 inch square opening sieve (76.2 mm) and be retained on a Number 10 U.S. standard sieve (2.0 mm).

(The term "gravel" in this system denotes a particle size range and should not be confused with "gravel" used to describe a type of geologic deposit or a construction material.)

Sand - Particles that will pass the Number 10 U.S. standard sieve and be retained on the Number 200 U.S. standard sieve (0.074 mm).

*Silt - Material passing the Number 200 U.S. standard sieve that is nonplastic and exhibits little or no strength when dried.

*Clay - Material passing the Number 200 U.S. standard sieve that can be made to exhibit plasticity (putty like property) within a wide range of water contents and exhibits considerable dry strength.

Fines - The portion of a soil passing a Number 200 U.S. standard sieve.

Marl - Unconsolidated white or dark gray calcium carbonate deposit.

Muck - Finely divided organic material containing various amounts of mineral soil.

Peat - Organic material in various stages of decomposition.

Organic Clay - Clay containing microscopic size organic matter. May contain shells and/or fibers.

Organic Silt - Silt containing microscopic size organic matter. May contain shells and/or fibers.

*Note - When applied to gradation test results, silt size is defined as that portion of the soil finer than the No. 200 U.S. standard sieve and coarser than 0.002 mm. Clay size is that portion of soil finer than 0.002 mm. For the visual-manual procedure the identification will be based on plasticity characteristics.

Coarse-Grained Soil - Soil having a predominance of gravel and/or sand.

Fine-Grained Soil - Soil having a predominance of silt and/or clay.

Mixed-Grained Soil - Soil having significant proportions of both fine-grained and coarse-grained sizes.

VISUAL - MANUAL IDENTIFICATION

Gravel - Identified by particle size. The particles may have an angular, rounded, or subrounded shape. Gravel size particles usually occur in varying combinations with other particle sizes.

Sand - Identified by particle size. Gritty grains that can easily be seen and felt. No plasticity or cohesion. Size ranges between gravel and silt.

Silt - Identified by behavior. Fines that have no plasticity. May be rolled into a thread but will easily crumble. Has no cohesion. When dry, can be easily broken by hand into powdery form.

Clay - Identified by behavior. Fines that are plastic and cohesive when in a moist or wet state. Can be rolled into a thin thread that will not crumble. When dry, forms hard lumps which cannot be readily broken by hand.

Clay is often encountered in combination with other soil sizes. If a sample exhibits plasticity or cohesion it contains clay. The amount of clay can be related to the degree of plasticity or cohesiveness; the higher the clay content the greater the plasticity.

Marl - A white or gray calcium carbonate paste. May contain granular spheres, shells, organic material or inorganic soils. Reacts with weak hydrochloric acid.

Muck - Black or dark brown finely divided organic material mixed with various proportions of sand, silt, and clay. May contain minor amounts of fibrous material such as roots, leaves, and sedges.

Peat - Black or dark brown plant remains. The visible plant remains range from coarse fibers to finely divided organic material.

Organic Clay - Dark gray clay with microscopic size organic material dispersed throughout. May contain shells and/or fibers. Has weak structure which exhibits little resistance to kneading.

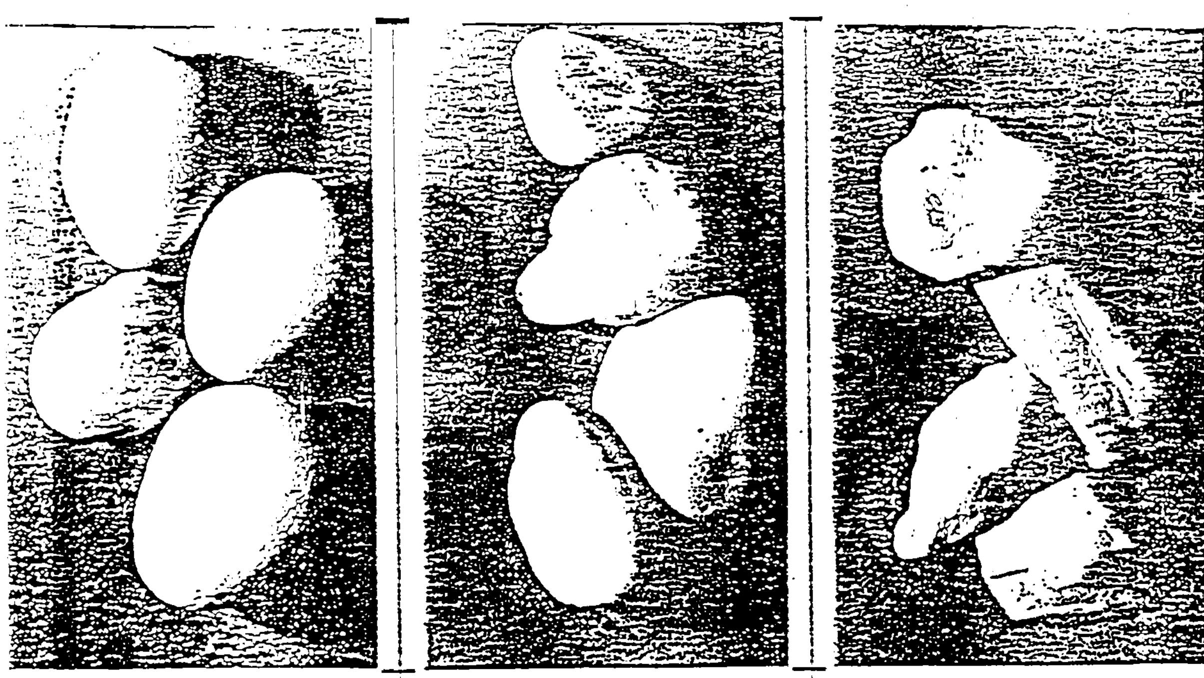
Organic Silt - Dark gray silt with microscopic size organic material dispersed throughout. May contain shells and/or fibers. Has weak structure which exhibits little resistance to kneading.

Fill - Man-made deposits of natural soils and/or waste materials. Document the components carefully since presence and depth of fill are important engineering considerations.

BOULDER	COBBLE	GRAVEL Coarse	GRAVEL Fine	SAND Coarse	SAND Fine	SILT	CLAY

Boundary	SIEVE SIZES	PARTICLE SIZE - mm
Boulder / Cobble	12"	304.8
Cobble / Coarse Gravel	3"	76.2
Coarse Gravel / Fine Gravel	1"	25.4
Fine Gravel / Coarse Sand	#10	2.00
Coarse Sand / Fine Sand	#40	0.42
Fine Sand / Silt	#200	0.074
Silt / Clay		0.002

PARTICLE SIZE LIMITS



ROUNDED	SUBROUNDED	ANGULAR

EXAMPLES OF PARTICLE SHAPES

IDENTIFICATION PROCEDURE CHART

COARSE-GRAINED SOILS
(Identify by Size of Particle)

- **BOULDERS** — Greater than 12"
- **COBBLES** — 12" to 3"
- **GRAVEL** — 3" to No. 10
  - Coarse - 3" to 1"
  - Fine - 1" to No. 10
- **SAND** — No. 10 to No. 200
  - Coarse - No. 10 to No. 40
  - Fine - No. 40 to No. 200

FINE-GRAINED SOILS
(Identify by Behavior-Individual Particles Not Visible)

SILT

1) Nonplastic
2) Powders easily when dry
3) Dries rapidly
4) Free water appears when shaken
5) Wire cut surface - rough

CLAY

1) Plastic, acts like putty when moist and wet
2) High dry strength
3) Dries slowly - sticky
4) No free water when shaken
5) Wire cut surface - smooth

MIXED-GRAINED SOILS

Significant proportions of coarse-grained and fine-grained sizes. Make judgment on whether fine-grained or coarse-grained predominates in behavior.

ORGANIC SOILS

(Identify by Appearance, Behavior, Color, etc.)

- PEAT
- MUCK
- MARL
- ORGANIC SILT
- ORGANIC CLAY

SOIL SAMPLE IDENTIFICATION PROCEDURE

1st Decision -

Is sample coarse-grained, fine-grained, mixed-grained or organic?

If mixed-grained, decide whether coarse-grained or fine-grained predominates.

2nd Decision -

What is principal component?

Use as noun in soil description.
Example: Sand

3rd Decision -

What is secondary component?

Use as adjective in soil description.
Example: Silty Sand

4th Decision -

Are there additional components?

Use as additional adjective.
Example: Silty Sand, Gravelly

EXAMPLES OF DESCRIPTIONS OF THE SOIL COMPONENTS

Sand - Describes a sample that consists of both fine and coarse sand particles.

Gravel - Describes a sample that consists of both fine and coarse gravel particles.

Silty Fine Sand - Major component fine sand, with nonplastic fines.

Sandy Gravel - Major component gravel size, with fine and coarse sand. May contain small amount of fines.

Gravelly Sand - Major component sand, with gravel. May contain small amount of fines.

Gravelly Sand, Silty - Major component sand, with gravel and nonplastic fines.

Gravelly Sand, Clayey - Major component sand, with gravel and plastic fines.

Sandy Gravel, Silty - Major component gravel size, with sand and nonplastic fines.

Sandy Gravel, Clayey - Major component gravel size, with sand and plastic fines.

Silty Gravel - Major component gravel size, with nonplastic fines. May contain sand.

Clayey Gravel - Major component gravel size, with plastic fines. May contain sand and silt.

Clayey Silt - Major component silt size, with sufficient clay to impart plasticity and considerable strength when dry.

Silty Clay - Major component clay, with silt size. Higher degree of plasticity and higher dry strength than clayey silt.

The above system may be expanded where necessary to provide meaningful descriptions of the sample.

Examples:

Shale fragments - Cobble and gravel size, silty

Decomposed rock - Gravel size

OTHER INFORMATION FOR DESCRIBING SOILS

1. COLOR OF THE SAMPLE - Brown, Gray, Red, Black, etc.

2. MOISTURE CONDITION - Dry, Moist, Wet.
   Judge by appearance of sample before manipulating.

3. PLASTICITY - Plastic, Low Plastic, Nonplastic.
   Note: Sample must be in moist or wet condition for plasticity determination. For dry samples requiring wetting make note in description. Example - "plastic (low or nonplastic) when wet."

   Plasticity not required for marl, muck and peat.

4. STRUCTURE - Fissured, Blocky, Varved, Layered.
   (Indicate approximate thickness of layers)
   The description of layering for coarse-grained soils must be made from field observations before sample is removed from sampler.

5. PARTICLE SHAPE - Angular, Rounded, Subrounded

6. Other words, phrases, notes or remarks that will add to the meaningfulness of the complete soil description.

PREPARING THE WORD PICTURE

The word-picture is the description of the soil sample as determined by the visual-manual procedure. Where applicable, the following are to be included in the word-picture:

PERTINENT INFORMATION	EXAMPLE
1. Color of the sample	Brown
2. Description of Soil Components	Silty Gravel
3. Moisture Condition	moist
4. Plasticity	nonplastic
5. Structure	
6. Particle shape	angular
7. Other	cemented

The written description for the given example is:
Brown Silty angular Gravel, moist, nonplastic, cemented.

EXAMPLES OF COMPLETE SOIL DESCRIPTIONS

Light Gray Silty Clay, moist, plastic, with 1/2 inch layers of wet, gray Silt, nonplastic

Red brown Clayey Silt with 1/4 inch layers of Silty Clay, moist, plastic

Brown Silty fine Sand, wet, nonplastic

Gray Sandy rounded Gravel, dry, nonplastic

Gray Sandy angular Gravel, Clayey, moist, low plastic

Dark Brown Silty Sand, wet, nonplastic

Red Brown Sand, dry, nonplastic, with roots

Fill - Brown Sandy subrounded Gravel, with pieces of brick and cinders, wet, nonplastic

Fill containing cinders, paper, garbage, and glass, wet

Dark Gray Organic Clay, with shells and roots, moist, plastic

Light Brown Sand, wet, nonplastic

Gray Clayey Sand with angular Gravel, moist, low plastic

Black Sandy Muck, wet

Dark brown fibrous Peat, wet

Dark brown Peat, wet

TRAINING SUGGESTIONS

The following sequence is suggested for training personnel in the use of the system:

1. Learn definition of terms (pages 1 and 2).

2. Provide individual samples of gravel, sand and silt and clay. Include complete range of sizes for gravel and sand. This allows visual calibration of size limits of coarse-grained soils and experience in identifying fine-grained soils by behavior. Refer to visual-manual identification (pages 3 and 4) and Identification Procedure (pages 5 and 6).

3. Provide coarse-grained and fine-grained samples to practice identification and description of soil components.

4. Provide mixed-grained samples for identification and procedure.

5. Provide organic soils for description.

APPENDIX B

RESUMES OF KEY XCG PERSONNEL

RICHARD J. RUSH, M.A.Sc., P.Eng., CEA
Partner

SUMMARY

Mr. Rush attained his B.A.Sc. Degree in Civil Engineering at the University of Waterloo: and a Masters Degree in Environmental Engineering at the University of British Columbia.

Mr. Rush has worked in the environmental engineering field since 1969, when he started working in a Water Pollution Control Laboratory. Prior to 1990, Mr. Rush was a partner in another consulting firm where he gained extensive expertise in the process design of industrial and municipal wastewater treatment, and sludge management systems. He was involved in treatability and design studies for several industrial facilities, including cheese plants, meat packaging plants, leather tanneries, pulp and paper mills, vegetable processing plants, two synthetic chemicals plants, and metal finishers. During the same period, Mr. Rush also became heavily involved in evaluating and designing anaerobic treatment facilities for food and agricultural wastes. He also managed the City of Kitchener Landfill gas assessment and the Region of Waterloo sewage sludge management master plan project.

For 10 years he was responsible for the hydrogeological, hazardous, and solid waste management business area. During that period, he managed a diverse range of landfill site studies, industrial and hazardous waste site assessments, clean-up plans, property environmental audits, and design/remediation management at PCB sites, leaking underground fuel tank sites, solvent spills, coal tar sites, as well as sites contaminated with pesticides, oil, lead, cyanide, NDMA, and other contaminants.

He was project manager of several large complex remediation projects such as:

- Remediation of PCBs along seven kilometres of Pottersburg Creek in London.
- Clean-up of the Waterloo City Centre Coal Gas Plant Site (and studies at several other coal tar sites).
- Environmental audit of the whole area around Petrolia Ontario (that has over 100 large in-ground tanks with a variety of hazardous and oily wastes in them).
- The Elmira/Uniroyal groundwater NDMA contamination investigation and remediation planning.

Since starting XCG in 1990, Mr. Rush has managed and/or provided QA/QC review on over 800 Phase 1 environmental site assessments, over 200 Phase 2 environmental site assessments, and dozens of Phase 3 remediation projects involving most of the practical remediation technologies.

He has also been responsible for over 300 environmental compliance audits and over 40 environmental management system (EMS) reviews. Mr. Rush has worked as an expert witness for various law firms in the area of site remediation and contaminant hydrogeology.

EXPERIENCE

Examples of projects representative by category is as follows:

Environmental Auditing Projects

- Several pre-acquisition or environmental compliance audits of hazardous and non-hazardous waste management facilities throughout North America including the specific examples included below.

- Managed environmental and corporate compliance audits of seven waste transfer, storage, and disposal facilities located throughout the United States. Mr. Rush's responsibilities included listing of wastes received and generated by the facilities according to their codes under the US EPA Waste Classification System, detailed review of facility permit conditions and applicable federal and state legislation, contacts with regulatory authorities, evaluation of facility compliance with permit conditions and legislation, and preparation of closure cost estimates based on facility waste inventories and clean-up cost estimates.

- Conducted an environmental audit of a large Hazardous and Non-Hazardous Waste Processing and Transfer Station in Montreal, Quebec. This facility receives a wide variety of liquid wastes in both drums and vacuum trucks. The majority of these wastes are bulked, stored, and then shipped to licensed disposal facilities. Waste oil and oily water are treated on-site in a treatment system which includes biological, chemical, and mechanical processes. Mr. Rush conducted a site inspection and wrote an audit report for this facility. The audit included a detailed review of all approvals and permits and an assessment of the facility's compliance with the approval documents and applicable regulations. Evaluation of compliance included a comparison of the waste classifications approved for receipt at the facility with the actual waste receipts.

- Conducted environmental audits of three landfill sites in Southern Ontario: the Gore Landfill Site in Harwich Township, the Petrolia Landfill Site near Petrolia, and the K&E (Blackwell Road) Landfill Site in Sarnia. Mr. Rush conducted site inspections and wrote individual audit reports for each site. Each audit included a detailed review of all certificates of approval and operating permits and an assessment of the facility's compliance with the approval documents and applicable regulations. Evaluation of compliance included a comparison of the waste classifications approved for receipt at each facility with the actual waste receipts observed at each site. Potential risks to the environment were also assessed. Standards of safety and security at each facility were evaluated. Facility operating plans were reviewed to determine the degree of conformity with existing operations. Recommendations were made to reduce environmental, safety, and health risks and cost estimates for these recommendations were prepared.

- Conducted environmental audits of two dry landfill sites near Montreal, Quebec: Saint-Amable Landfill Site and Saint-Mathieu-de-Beloeil Landfill Site. Mr. Rush conducted site inspections and wrote individual audit reports for each site. Each audit included a detailed review of all approvals and permits and an assessment of the facility's compliance with the approval documents and applicable regulations. Evaluation of compliance included a comparison of the waste classifications approved for receipt at each facility with the actual waste receipts observed at each site. Potential risks to the environment were also assessed. Standards of safety and security at each facility were evaluated. Facility operating plans were reviewed to determine the degree of conformity with existing operations. Recommendations were made to reduce environmental, safety, and health risks and cost estimates for these recommendations were prepared.

- Conducted environmental audits of two recycling facilities in Southern Ontario: Gore Sanitation Services' Recycling Facility in Harwich Township and All-Star Recycling in Sarnia. Both facilities receive solid recyclable wastes such as metal cans, plastic containers, newspapers, and cardboard. The materials are stored, sorted, baled, and then shipped to various markets. Mr. Rush conducted a site inspection for one of the sites and wrote individual audit reports for both sites. Each audit included a detailed review of all certificates of approval and permits and an assessment of the facility's compliance with the approval documents and applicable regulations.

- Managed the annual environmental compliance audit of a large industrial facility used for recycling of waste metals including tin and lead. The Audit included an evaluation of air emissions, a review of wastewater treatment processes, and comparison of effluent quality to Sewer Use By-Laws.

- Conducted an Environmental Audit of a large waste oil treatment and recycling company in Ontario. The Audit included a thorough subsurface investigation of soil and groundwater quality on the property.

- Pre-Acquisition Audit of a large liquid and solid hazardous waste treatment and recycling company in Ontario. The Audit included a detailed investigation of all waste treatment process operations, a review of waste inventory management systems including processing of manifests, and a thorough subsurface investigation requiring 18 monitoring wells (some nested) and 20 boreholes.

- Pre-acquisition audit of the Varnicolor Solvent Recycling facility in Elmira, Ontario. The Audit included a peer review of Audit Report prepared by others and a review of Remediation Agreements with the MOEE. The objective was to provide an independent review of site remediation costs prior to closing the property transaction.

- Several pre-purchase environmental audits of industrial facilities at the request of banks or owners prior to purchase or power of sale, including:

  - a plant manufacturing electrical insulator components in Elmira, where soil contamination, air emissions, wastewater discharge, and solid waste disposal compliance were assessed. Cost estimates for plant upgrading and clean-up were provided to the prospective purchaser.

  - two simultaneous, pre-purchase environmental audits (within 4 weeks) of two major industrial recycling firms in Ontario for a major player in the Waste Management Industry. Both projects involved soils, groundwater, air emissions, and wastewater discharge compliance from various metal recovery processes and chemical waste streams. Sampling and testing were carried out and results were compared to the applicable regulations and standards. The costs to bring the facilities into compliance were estimated based on conceptual designs developed by XCG. Both were complex industrial plants. Both were $2 million plus facilities which were eventually acquired, based on values determined from the audits.

  - a pesticide manufacturing plant in Brantford where the main concerns were compliance with wastewater and air emissions.

  - a large rubber and plastics plant that had operated for over 80 years on a site in Kitchener. Extensive soil and groundwater testing was performed and based on the contamination found, cost estimates for remediation were provided.

  - an aircraft painting shop in Ontario was assessed with regard to compliance with Ministry of the Environment standards for air emissions, wastewater discharge, and soil contamination. Ministry of Labour (MOL) reports were reviewed to assess compliance with MOL work place air quality regulations. Recommendations were made.

  - a Manufacturer of large overhead doors and industrial cranes was inspected for evidence of wastes on the premises and evidence of past non-compliance with environmental regulations.

  - a stove manufacturing facility that had shut down was inspected to assess the costs of disposing of porcelain sludge, dust from the air filtration baghouse, and other wastes.

  - a drum recycler was audited to determine whether the facility was in compliance with air, wastewater, occupational health, and other environmental regulations and guidelines. Recommendations were made for further detailed studies to determine the extent of soil and groundwater contamination on the property.

  - the former Stelco Bar Mill property in Hamilton where the main concern was the extent of hazardous and non-hazardous waste remaining on the property. Key aspects of this pre-purchase environmental audit included delineating the locations where iron oxide dust from the baghouse remained on-site, evaluating the on-site wastewater treatment systems, developing clean-up plans, and estimating costs of remediation to meet provincial and federal site clean-up criteria.

  - a high tech machine shop in Guelph where the purchaser wanted assurances that the facility was in compliance with environmental regulations. A review of wastewater, air emissions, and occupational health and safety aspects of the operation was undertaken. Risks of future non-compliance with air regulations were discussed and costs for dealing with certain areas of concern were provided.

- a metal fabricator specializing in conveyor systems was inspected for areas of non-compliance with environmental regulations and to verify whether past practices had affected quality of water in the private well on the property. The well water was sampled and proven to meet Provincial Drinking Water Quality Objectives. There were no air or wastewater emissions problems but a small volume of oil contaminated soil required removal. Cost estimates were provided.

- Conducted a "Post-Mortem" Environmental Audit of a leading refining and smelting plant (3 years after it was expropriated) to assess the fair market value in a hearing at the Ontario Municipal Board. This involved extensive evaluation of wastewater, stormwater, in-plant air, and atmospheric air emissions compliancy and design/costing upgrades that would have been required to bring the plant into compliance with environmental regulations of the day (1988).

- Annual environmental risk inspections at five bulk fuel storage sites for the owner (part of their corporate "due diligence" program).

- The inspections include the assessment of compliance with provincial and federal environmental regulations including those governing air emissions, wastewater and stormwater discharges to sewers or rivers, soil and groundwater quality, and spills. Other issues such as health and safety and compliance with the Gasoline Handling Act are also addressed, annually.

- Environmental liability assessments on several gas station properties for the prospective purchasers or current owners

  - the extent of soil and groundwater contamination was determined, and the costs for clean-up to appropriate standards was provided.

- Performed environmental audits and developed/supervised decommissioning plans for three large, old factory sites being redeveloped into residential condominiums (one furniture factory, one woolen mill, one tannery).

- Assessed the environmental liabilities of two properties for a bankruptcy firm <u>prior</u> to their agreeing to act as receivers for bankrupt industries.

  - a plastics moulding plant in Waterloo where the main concern was the cost of disposing of wastes and chemicals left in the plant.

  - a metal fabricating shop in Waterloo where drums of wastes had been stored.

- Conducted three environmental audits for law firms, on behalf of purchasers or sellers to assist in appraising the real value of property with Underground Storage Tanks.

- Investigated PCB contamination on an old industrial property to determine the clean-up costs prior to redevelopment.

- Conducted hydrogeological investigations and site clean-ups required by orders from the Ministry of Environment and Energy (fuel depot, leather tannery, printing plant, gravel pit with buried waste).

- A community-wide, Environmental Audit to determine the impact of over 100 large, in-ground oil/industrial waste storage tanks in the Petrolia area, including tank sampling under strict health and safety protocols, hydrogeological investigation, run-off sampling, and an air quality assessment. The study included development of remedial alternatives and preliminary costing of the best alternatives.

Hydrogeological, Solid, and Hazardous Waste Site Remediation Projects

- During 1989 to March 1990 when he left CH_2M Hill, Mr. Rush was overall project manager for the "Elmira Groundwater NDMA Contamination Project" which is one of the largest and most complex water supply contamination remediation projects ever undertaken in Canada. The project team includes over 70 engineers, hydrogeologists, chemists, biologists, technicians, drilling contractors, and other support staff. Several large tasks were conducted simultaneously, including:

  - installation and monitoring of a groundwater "sentry" well network to ensure health protection.
  - development and performance evaluation of legally defensible NDMA sampling and analytical protocols.
  - development of detailed contingency plans for emergency water supplies.
  - review toxicological information on NDMA and liaise with the public on health issues.
  - contaminant source/plume drilling program (over 30 deep monitoring wells were drilled and sampled).
  - conduct a class EA for interim (emergency) water supply.
  - conduct treatability research and develop design specifications for a NDMA treatment plant (advanced oxidation process technology).
  - fast track design/construction of a new water supply well and treatment facility for a purge well to protect the new water supply.
  - develop longer term plume/source remediation plans and conduct a class EA for long-term water supply.

- Investigation and Remediation of coal tar buried in a gravel pit near Guelph, Ontario. Over 5,000 tonnes of contaminated soil were excavated and biological treatability testing was carried out to support full scale on-site treatment of the soil. Extensive hydrogeological studies were undertaken along with surface water and local water supply well monitoring. A groundwater treatment system involving oil separation (for both DNAPLs and LNAPLs), filtration, and activated carbon treatment was designed and implemented.

- Development of contaminated groundwater treatment alternatives at a former chemical landfill site, Gloucester Site, near Ottawa airport for Transport Canada. This involved on-site pilot testing of air stripping, activated carbon, ozonation, and chlorination of organics contaminated groundwater and process design of a purge well system.

- Provided review of hydrogeologic investigation and design reports on the South Easthope Township Landfill site, for a neighbouring industrial client.

- Preparation of a Plan of Development and Operation, including hydrogeological studies, for a municipal landfill site (Township of Grey).

- Hydrogeological Consultant to the Township of West Garafraxa, hired to protect the interests of the Township during the Wellington County Landfill Site Selection process. The two West Garafraxa short-listed sites were ultimately dropped from the list after being shown that they did not meet the Selection criteria.

- Review of design and hydrogeological reports on the Waterloo landfill site for a neighbouring property owner to assess the impact of the landfill on the neighbour.

- Managed an investigation of the closed Kitchener Landfill methane gas recovery and utilization system for the Region of Waterloo.

- Remediation of a former coal gasification plant in Waterloo, Ontario. Project duties included the co-ordination and supervision of investigative and remedial actions, including a hydrogeologic investigation, excavation, stockpiling and removal of coal tar (PAH) contaminated materials from the site, on-site treatment of contaminated water, and groundwater monitoring programs.

- Remediation of PCBs in Pottersburg Creek, London, Ontario. This was a large project for the Ministry of the Environment to remediate PCB contamination in the creek bed sediment and flood plain soils; PCB contamination was identified over a distance of seven kilometres. The project involved extensive sediment and flood plain soil sampling and analysis, development and selection of remedial actions, and presentation of the data and alternatives to governments, committees, and the public. The final design and supervision of remedial work involving removal and secure storage of high PCB soils and capping of large areas of PCB flood plain contamination was completed in 1987, at a cost of more than $7 million.

- Investigation to characterize the quantity and characteristics of hazardous wastes on an inactive industrial fill site located in Hamilton Harbour. The site is to be redeveloped into a major waterfront park as part of the Hamilton Waterfront Master Plan. Approximately 19,000 tons of leachate toxin was delineated, followed by the preparation of a remedial action plan for the entire 35-acre site, prior to development. Site capping, grading, landscaping, and groundwater monitoring plans were included.

- Internal consultant for site assessments and remedial plans for three separate, former coal gasification plant sites (Guelph, St. Thomas, Owen Sound) in Ontario.

- Investigation of coal tar (PAH) contamination in Kettle Creek, Port Stanley, Ontario, for the Ontario Ministry of the Environment. The project included development of a field sampling plan, interpretation of results, and development and costing of alternative remedial measures.

- Waste lagoon decommissioning that included a sampling program to establish quantities and chemical characteristics of sludge in each of four ponds at Uniroyal Chemical in Elmira, Ontario. This was followed by sludge treatment studies and development of the most cost-effective treatment/disposal plan.

- Site characterization study of buried waste and leachate quality at a former Robson-Lang tannery in Oshawa, Ontario. Project included a hydrogeologic investigation and chemical analysis of soil, leachate, and groundwater.

- Hydrogeological investigation at a solvent recovery facility conducted as part of a Certificate of Approval application.

- Hydrogeological investigation at an old metal plating facility in Kitchener, and subsequent process design and costing of a groundwater containment/treatment system to address the elevated levels of cadmium, TCE, 1,2-DCE, and vinyl chloride identified in the shallow aquifer.

- Hydrogeological investigation at a former metal plating sludge lagoon location as part of a plan for property sale and redevelopment.

- Hydrogeological investigation and recommendations for remedial action at an existing industrial operation concerned about high nitrate levels in its process well water.

- Managed more than ten gasoline spills or Leaking Underground Storage Tank (LUST) projects in Ontario.

- Site investigations, including installation of groundwater monitoring wells and ditch sampling, at a chemical plant in Toronto. A second phase involved preparation of design drawings and specifications for the excavation of ditch sediments and spills containment facilities.

Toxic and Hazardous Waste Studies

- Full-scale evaluation of factors affecting trace organics and metals removal at the Hamilton WPCP.

- Preparation of an inventory of special and hazardous wastes from 1,000 industries in Ontario.

- Preparation of an inventory of liquid and special wastes for 475 industries in the Regional Municipality of Waterloo.

- A two-year, lab-scale investigation of the fate and leachability of trace organics and metals during conventional sludge processing at municipal WPCPs (i.e. effect of anaerobic digestion, heat treatment, and polymer addition).

- Preparation of a comprehensive evaluation of the significance of trace organics and metals in petroleum industry sludge disposed of on land.

- Bench-scale treatability of ten hazardous wastes including metal-plating effluents, pickle liquor, oil wastes, and asbestos wastes.

Industrial Wastewater and Sludge Studies

- Treatability studies and upgrading of the effluent treatment system at J.M. Schneider's Kitchener meat-packing plant.

- Characterization and process design for upgrading whey and wash water disposal systems at five Ontario cheese plants.

- Treatability study, design, and installation of a system to remove grease and oil from a pet food manufacturing effluent.

- Pilot-scale belt press dewatering tests of paunch manure and float solids at J.M. Schneider's meat-packing plant, Kitchener.

- A challenging design/construction of a biological treatment plant for a grass-roots vegetable processing plant (where no water use or effluent data was available).

- Development of a short term sludge lagoon clean-out plan and long term operating strategy for lagoon/landfill site at a chemical plant in Sarnia. Led to process design of a sludge dewatering facility (recessed plate-and-frame filter press).

- The feasibility of ensiling food processing and municipal waste activated sludges (WAS) for livestock feed.

- Design, construction, and start-up of Canada's first full-scale anaerobic digester for treating cheese whey at Millbank Cheese and Butter Ltd., Millbank, Ontario

- Evaluation of alternatives for upgrading the wastewater treatment facility for Canada Packers, Harriston.
- Feasibility study of wastewater treatment processes for Industrial Grain Products, Candiac, Quebec.

Municipal Waste Treatment

- Liquid sludge management study for the Region of Waterloo: Review of data, development of alternatives for providing four month sludge storage capacity, attendance at public meetings, and design and construction management of the best alternative.
- Master Wastewater Treatment Study for Region of Waterloo, preparation of a 30-year master plan for wastewater treatment throughout the Region of Waterloo, including conducting process audits at the major treatment plants.
- City of Belleville's Class Environmental Assessment for Sewage Sludge Disposal, including assessment of the existing sludge spreading farm site.
- Development of design criteria and municipal bylaws for storage of liquid manures for the Township of Grey.
- Process design for expansion and upgrading of the Elmira WPCP involving pilot-scale biological nitrification treatability studies, bench and pilot studies of sludge by anaerobic digestion and filter press techniques.
- The assessment of the performance of 30 municipal sewage treatment plants in Ontario and the United States.
- The development of Pollution Control Strategy (PCS) document for the Ontario Ministry of the Environment.
- Development of process designs for upgrading phosphorus removal at two Ontario municipal water pollution control plants.
- Participated as a lecturer in CANVIRO's Sludge Management short course.
- Investigation at lysimeter scale of applying municipal sludges on agricultural land.

Agricultural Waste Treatment

- Preparation of process design and cost estimates for anaerobic digestion systems for over ten farms and/or industries in Canada.
- Bench- and pilot-scale evaluation of anaerobic digestion processes for several animal manures (including beef, hog, and poultry) and industrial wastes (including brewery effluent, waste beer, whey, cheese plant wash water, and textile effluent).
- Conceptual and final design of an anaerobic digester facility at Canada's largest beef feedlot.

Between 1971 and 1977 Mr. Rush worked as a Private Engineer providing services mainly to the Environmental Protection Service at the Wastewater Technology Centre (WTC) in Burlington. During this period he was responsible for many waste treatability and pollution control projects, including preparation of a "Sludge Dewatering Design Manual" for Environment Canada and the Ontario Ministry of the Environment.

Other areas of involvement at the WTC included:

Industrial Wastewater Treatment

- Fish processing waste screening study at three East Coast fish processing plants.
- Treatment of textile mill effluents.
- Evaluation of wastewater technology in the Canadian steel industry.
- Treatment of pulp and paper mill effluents by phys-chem treatment.

Municipal Wastewater Treatment

- Treatability studies of phosphorus removal at three Canadian Forces Bases.
- NTA degradation during summer and winter conditions in an Ontario river.
- Effect of citrate and carbonate detergent on phosphorus removal in municipal WPCPs.
- Lab- and pilot-scale studies of reverse osmosis treatment of municipal wastewater.
- Full-scale study of the control of algae growth in the Welland Canal by addition of alum.
- Development of design and operating procedures for natural freeze-thaw sludge dewatering systems.
- Development of predictive model for phosphorus removal from municipal wastewater.

EDUCATION

B.A.Sc., Civil Engineering, University of Waterloo, 1974
M.A.Sc., Environmental Engineering, University of British Columbia, 1976

PROFESSIONAL DESIGNATION

Certified Environmental Auditor, 1996

PROFESSIONAL REGISTRATION

Ontario Designated Consulting Engineer

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

Professional Engineers of Ontario
Canadian Environmental Auditing Association
Associated Environmental Site Assessors of Canada
Association of Ground Water Scientists and Engineers
Air and Waste Management Association
Canadian Environmental Industry Association

PUBLICATIONS AND PRESENTATIONS

Mr. Rush has authored or co-authored over 50 technical papers and reports on a wide range of environmental engineering topics. He has been an invited speaker at several technical seminars and conferences including presentations dealing with Laboratories' Role in Hazardous Waste Management, Leaking Underground Storage Tank Management, Property Environmental Audits and Spills Regulations and Clean-up. He has been an invited expert participant in a variety of technical and policy workshops.

XCG

BASIL WONG, M. Eng., P. Eng.
Project Manager

SUMMARY

Mr. Wong is a Professional Engineer with over five years of environmental consulting experience. He has worked on a variety of Phase 1 Environmental Site Assessments, Phase 2 Site Investigations, Site Remediation Activities, and Compliance Audits. Mr. Wong recently joined XCG Consultants Ltd. in July 1997. He was previously employed with CH2M Gore & Storrie Limited (formerly CH2M Hill Limited) for approximately four and one-half years and also had work experience with Dames & Moore, Canada.

Mr. Wong attained his Bachelor of Applied Science in Civil Engineering at the University of Waterloo. He is also in the process of completing an Environmental Masters of Engineering degree at the University of Guelph.

EXPERIENCE

Examples of projects that Mr. Wong has been involved with are briefly described below:

Phase 1 Environmental Site Assessments and Compliance Audits

- Pre-acquisition Audits of a baking facility that included historical records review, interview with site personnel, facility inspection, review of available on-site records, and evaluation of compliance with applicable regulations. A report was prepared outlining environmental and compliance issues of concern and related liabilities.

- Compliance Audit of a waste treatment and transfer facility in South Carolina. The study consisted of an assessment of the plant's operations since XCG's Pre-Acquisition Audit of the facility was conducted.

- Pre-acquisition Audit of 18 metal recycling related facilities in Ontario, Quebec, New Brunswick, and New York. The audit consisted of site reconnaissance, interviews, records inspection, review of operations and related compliance with applicable regulations and approval certificates (permits, licenses etc.), evaluation of environmental controls and management systems, and review of correspondence with regulatory authorities.

- Pre-acquisition Audit of 17 metal recycling related facilities in the southern US states. The scope of work was similar to the above and was conducted to identify potential environmental liabilities and regulatory compliance status for the prospective purchaser.

- Compliance Audit of a waste transfer facility located in Moncton, New Brunswick. The audit consisted of comparison of operations to applicable regulations, review of correspondence with regulatory authorities, and evaluation of effectiveness of environmental management systems.

- Phase 1 Environmental Site Assessment of five feed and fertilizer facilities in south-central Ontario. Mr. Wong's involvement in these studies consisted of a site visit, review of current and historical practices to identify areas of potential contamination, correspondence with regulatory agencies, and report preparation.

Phase 2 Site Investigations

- Project Manager of a multi-site Phase 2 Environmental Site Assessment of heavy construction equipment facilities located in Ontario. The study was conducted to identify potential environmental liabilities associated with the facilities prior to its acquisition.

- Project engineer for a Phase 2 site investigation of a bus garage in Toronto, Ontario. The project tasks consisted of delineation of a free-phase diesel product plume both on-site and on adjacent residential properties, sampling, hydrogeological testing, air monitoring in the adjacent houses, and report preparation.

- Project manager for a subsurface investigation of a vehicle service yard located in Etobicoke, Ontario. The environmental concern was related to a leaking gasoline underground storage tank. Mr. Wong's responsibilities included the design of a drilling program, monitoring well installation, soil and groundwater sampling, and report preparation.

- Project manager of a Phase 2 Environmental Site Assessment of a property contaminated with mercury. Supervised the subsequent remediation of the contaminated soil.

- Site investigator for a Phase 2 Environmental Issues Inventory at 14 First Nations communities for Matawa First Nations Management in Northern Ontario.

- Project engineer for a subsurface investigation of an underground storage tank area at a bus garage in Scarborough, Ontario. The field investigation consisted of borehole drilling, monitoring well installation, soil and groundwater sampling, hydrogeological testing, and report preparation.

Site Remediation Activities

- Project manager and site supervisor for the removal and remediation of 50 underground storage tanks throughout Alberta for a natural gas company. Responsibilities included supervision of the tank removal work, confirmatory sampling, reporting, project scheduling, and logistics.

- Site supervisor for the remediation of a property related to the construction of a new casino in Windsor, Ontario. Responsibilities included directing the excavation process, supervising on-site consulting staff, collecting confirmatory samples and assessing results, recording daily field notes, surveying and measurements, and preparing weekly summary reports and a final detailed report.

- Site supervisor for the remediation of a property contaminated with volatile organic compounds (e.g. styrene).

- Project engineer for the design and installation of a free phase product recovery system at a bus garage in Toronto, Ontario. Other responsibilities included regular monitoring, correspondence with the client, and regular progress reports.

- Project engineer for the removal and remediation of multiple underground storage tanks at a facility in Scarborough, Ontario.

EDUCATION AND TRAINING

Bachelors of Applied Sciences in Civil Engineering with an Option in Water Resources Engineering, University of Waterloo, 1992

Masters of Engineering in Environmental Engineering at the University of Guelph, 1998

OSHA 40 hour Health and Safety Training

PROFESSIONAL ORGANIZATIONS

Professional Engineers of Ontario

SUMMARY

Since completing the requirements for a Degree in Geological Engineering at the University of Windsor in 1988, Mr. Williams has worked on a variety of hazardous waste, solid waste, and groundwater contamination projects. In September 1988, he joined Canviro Consultants (now CH2M Gore and Storrie) in Waterloo as a Project Engineer where he worked on projects ranging from Phase 1 Environmental Assessments to a Remedial Investigation/Feasibility Study at a Superfund site in southern California. Mr. Williams joined XCG Consultants Ltd. in October of 1994 as a Project Engineer where he continued to work on Phase 1 and Phase 2 Environmental Site Assessments, remedial investigations, and site clean-ups.

EXPERIENCE

Examples of projects represented by category include:

Phase 1 Environmental Site Assessments and Compliance Audits

- Project Auditor on a team that conducted pre-acquisition and due diligence environmental audit of 72 waste management sites throughout Ontario and Quebec. This project was a sub-consultant to a large US Environmental Engineering firm which was hired to conduct due diligence pre-acquisition audits at sites throughout North America. Sites included landfill sites, waste transfer stations, hauling operations, medical waste facilities, thermal treatment facilities, and other miscellaneous sites. All site visits were co-ordinated to be completed within a 10 day period and the draft report was available within two weeks of the final site visit. The review included an assessment of regulatory compliance, identification of environmental risk and liability, and quantification of significant remedial costs.

- Worked as part of a team to complete an environmental audit at a biomedical waste transfer station and a biomedical incinerator with extreme time constraints.

- Completed property transaction site assessment for a major food company.

- Project Auditor on a team that conducted annual compliance audits on Waste Management and Industrial Recycling facilities in British Columbia, Alberta, Ontario, and Quebec, Canada; six States in the US; and Mexico. These involved full Phase 1 Environmental Site Assessments along with the compliance audits.

- Project Manager for a pre-purchase Phase 1 Environmental Site Assessment of The Northern Algonquin Brewing Company Limited in Formosa, Ontario. The Phase 1 ESA included a detailed records review, interviews with site personnel, a site visit, a review of waste treatment process operations and a review of waste inventory management systems. The purpose of the Phase 1 ESA was to identify any environmental damage or practices that had or could have potentially had a significant impact on the value of the property or business.

- Project Auditor on a team that assessed the environmental liabilities of the over 250 Safety-Kleen operations in Canada, U.S.A., United Kingdom, Ireland, France, Belgium, Germany, Italy, and Spain. Among the main operating assets were two of North America's largest used oil re-refineries. In addition to the oil re-refineries there were ten solvent recycling facilities in the U.S., one in the United Kingdom, and two in Germany. The remaining facilities were service centres (collection depots for waste oil and solvents) and distribution centres (for recovered products and other items for sale to customers).

Phase 2 Site Investigations and Site Remediations

- Project Manager for the Phase 1 and Phase 2 Environmental Site Assessment and site remediation of a former foundry property. The site contained fill of varying quality overlying clay. There were no groundwater receptors in the area and the main concern was cleaning up the site to the satisfaction of the purchaser. On-site remedial options were considered but were not cost competitive. Approximately 1,700 tonnes of hydrocarbon impacted soil were removed from one area of the property while approximately 3,200 tonnes of metals impacted soil were removed from a second area of the property. Negotiations on behalf of the client resulted in some of the metals impacted soil being accepted at the regional landfill site as daily cover, thus reducing disposal costs significantly.

- Project Manager for a Phase 2 Subsurface Investigation of a major transfer station for Growmark Inc. Processing and bagging of bulk fertilizers was conducted at the transfer station. The work involved the decommissioning of the bulk fuel facility and conducting a drilling and sampling program to determine that any impacts to the subsurface remain on the subject property.

- Project Manager for the decommissioning of gasoline refuelling stations, waste oil USTs, and below grade hydraulic hoists at numerous Bell Canada properties on behalf of Nexacor Realty Management Inc., agent to Bell Canada.. These projects involved the hiring of the excavation subcontractor who would excavate and remove the USTs and associated piping, as well as any impacted soil, supervising the subcontractor, collecting verification samples and preparation of a decommissioning reports.

- Project Engineer for Phase 2 ESA of a major battery recycling facility on behalf of a prospective purchaser. A total of fifty-four (54) boreholes (including 26 monitoring wells) were completed in a two week period. The subsurface investigation focused on identifying any shallow soil or groundwater contamination that may present a significant environmental liability for the property.

- Project Engineer for an Environmental Review and Phase 2 Subsurface Investigation at the Former Inglis Plant in Cambridge, Ontario conducted on behalf of a prospective purchaser. As part of this investigation, a review of all existing reports of environmental activities at the site was conducted as well as an update of the existing Phase 1 Baseline Environmental Study. Areas of environmental concern associated with the former use of trichloroethylene (TCE) were identified during these activities. Subsequently, the Phase 2 activities involved the drilling of four deep boreholes completed into the municipal aquifer to investigate the possibility of impacts on the groundwater beneath the property.

- Project Engineer for a Phase 2 Environmental Site Assessment at a former concrete block production facility for Lafarge Construction Materials. The purpose of the Phase 2 ESA was to determine if the historic use of the facility had impacted the subsurface soil and groundwater above the MOE residential/parkland guidelines. The Phase 2 activities included drilling a total of eighty-four (84) boreholes across the 3.6 hectare property. Thirty-one (31) boreholes were completed with groundwater monitoring well installations which were developed and sampled.

- Project Engineer conducting a peer review of site remediation activities at a wholesale lumber operation in Kitchener, Ontario. The activities conducted on behalf of a prospective purchaser involved peer review of the remediation activities, reporting and submission of a Record of Site Condition (RSC) conducted by the owners consultant. The remediation activities conducted by the owners consultant included the removal of approximately 1,000 tonnes and 2,000,000 litres of hydrocarbon impacted soil and groundwater from the subject property. Upon completion of the remediation activities the owners consultant submitted a RSC for the subject property to the MOE.

- Supervised a Subsurface Investigation at an industrial property with soils and groundwater contaminated with xylenes and heavy oils.

- Project Manager on a Phase 2 Environmental Site Assessment at a service station/garage in Kitchener with subsurface contamination by TCE from historical operations in the area of the site.

- Project Engineer on a Phase 2 Environmental Site Assessment at a former tire manufacturing facility in Kitchener.

- Project Engineer for a Subsurface Investigation of the product storage area at the Uniroyal-Goodrich South Plant in Kitchener, Ontario. The investigation involved drilling a total of 19 boreholes in the product storage area to identify the extent of soil impacted by PAHs and heavy oils.

- Project Engineer responsible for developing contract documents and specifications for coal tar remediation work and concrete rehabilitation work. The specifications were prepared for the Stratford Public Utilities Commission. Subsequently managed on-site remediation and rehabilitation activities associated with the coal tar impacts on the Erie Street Trunk Storm Sewer.

- Project Engineer for a Subsurface Investigation of a former disposal area for a facility that produced coal tar impregnated pipe. The investigation involved drilling boreholes to identify the vertical and horizontal extent of coal tar and identifying several remedial options.

- Project manager for a Phase 2 Subsurface Investigation of a former coal gasification plant conducted on behalf of the City of Kitchener. The Phase 2 activities included drilling eighteen shallow boreholes and one deep borehole around the perimeter of the former coal gasification plant. The purpose of the subsurface investigation was to determine the physical extent of coal tar and/or properties of coal tar that were beyond the former coal gasification plant and on the City of Kitchener property.

- Project engineer for a Phase 2 Subsurface Investigation of a former coal gasification plant conducted on behalf of the City of London. The Phase 2 activities included drilling shallow boreholes, sediment sampling, seep sampling and stormwater sampling around the perimeter of the former coal gasification plant. The purpose of the subsurface investigation was to determine the physical extent of coal tar and/or properties of coal tar that were beyond the former coal gasification plant and impacting the Thames River.

- Project Manager for a Fixed Price Clean-up of a former CP Rail property in Toronto. Responsibilities included managing the remediation activities conducted on-site throughout the redevelopment of the property. On-site soil management approaches were employed with careful sorting of material, on-site placement and selection of disposal sites to minimize project costs. On-site responsibilities also included the management of material including asphalt paving, concrete parking curbs, bushes and trees and underground storage tanks and associated piping. During the remediation activities, liaised with the City of Toronto Works Department, Urban Development Services and Medical Officer of Health. A Dust Control Plan was implemented during the remediation activities and continuous air monitoring was conducted. Approximately 10,000 tonnes of impacted material was excavated for off-site disposal. Upon completion the remediation activities, certification in writing was provided to the Medical Officer of Health, as required under an Ontario Municipal Board decision, that the property has been remediated to meet the MOE Guidelines for residential property. Consulting fees for this project were $50,000. The total cost of this project was $550,000.

- Project Manager for a project providing environmental consulting services for the Corporation of the City of Hamilton. The City planned to purchase a former CP Rail transfer yard in downtown Hamilton with the intent of developing the property into a park following remediation by CP Rail and its Consultant. The property was contaminated with metals, PAHs, and TPH above MOE

Table B criteria for parkland use. Responsibilities for the project included a peer review of several reports for the property, review of the planned remedial activities and providing on-site services during the remedial activities on behalf of the City.

- Project Manager for an Updated Phase 1 ESA and Phase 2 Subsurface Investigation of a former CN Rail property for Canada Lands Company Ltd. Fill material and native soil that exceeded MOE Table A residential/parkland guidelines but meets industrial/commercial guidelines was identified on-site. Fill material and native soil that exceeded the MOE Table A industrial/commercial guidelines was also identified on-site. Through discussions with the regional municipality and CLC, it was identified that by using an on-site management approach, some of the fill material and native soil could be used as subgrade material during future development of public roadways, right-of-ways, and commercial areas on the subject property. By presenting the option of on-site management of impacted material, CLC was able to effectively market the property for future development.

- Project Manager for a Limited Phase 2 Subsurface Investigation at a commercial/industrial property located in Kitchener, Ontario. The Limited Phase 2 Subsurface Investigation identified an area on the subject property which contained various contaminants at concentrations exceeding the MOE Table A Guideline criteria for industrial/commercial land use. Based on the field observations and the analytical results, the volume of soil impacted above MOE Table A Guideline criteria was approximately 4,250 m^3. Analytical results also indicated that some of this material is considered as a hazardous waste. Preliminary remediation cost estimates for excavating and disposing of all the impacted material ranged from $575,000 to $700,000 based upon the work completed. An on-site soil management plan was implemented and involved the excavation of impacted material which was screened, segregated, stockpiled, and sampled to identify the most cost effective disposal options. By implementing the on-site management of impacted material, the client was able to cost effectively divest the property. Total project cost was approximately $250,000.

- Co-ordinated and conducted subsurface investigation activities during an environmental audit of Pearson International Airport.

- Project Manager for the site remediation activities in the area of a former bulk fuel depot and former gasoline underground storage tank on behalf of Growmark Inc. The remediation activities included the excavation and disposal of approximately 680 tonnes of hydrocarbon impacted soil. Verification soil samples were collected from the final excavation and a report indicating the analytical results met the applicable MOE guideline criteria was submitted to the client.

- Project Manager soil characterization and site remediation activities at over 15 UPI bulk fuel facilities throughout Ontario. The characterization work included borehole drilling and/or test pitting, field screening of soil samples with a HNu photoionization meter, laboratory analysis, and quantity estimates for soil impacted above the Ontario guidelines. Soil impacted above guidelines was subsequently excavated and disposed of off-site.

- Project Manager for numerous Phase 2 Environmental Site Assessments throughout Ontario for Bell Canada. The Phase 2 investigations included borehole drilling and soil sampling, monitoring well installations, groundwater sampling, and at several sites geophysical surveys.

- Site engineer for the construction of a landfill gas collection system. Supervised subcontractors during installation of gas withdrawal wells, gas headers, and gas collection building.

Hydrogeological Projects

- Project Manager for the Evaluation of Bedrock Aquifer Resources at The Northern Algonquin Brewing Company Limited in Formosa, Ontario. This project was completed to provide a prospective purchaser with assurances that the water supply at the existing facility would be sufficient for their operations. The available background hydrogeological data was evaluated to determine whether or not the bedrock aquifer could sustain the groundwater pumping rates that were permitted for the brewery and to determine if the bedrock aquifer would sustain significantly higher pumping rates.

- Project Engineer for a preliminary hydrogeological investigation for a proposed residential community on a 18.2 hectare property located south of Aberfoyle, Ontario. The objectives were to determine the hydrogeological suitability of the property for residential development, particularly with regard to the availability of a suitable water supply and to determine the potential impact on groundwater and surface water of on-site sewage disposal using communal septic systems. The investigation included installation of ten shallow monitoring wells and excavation of eighteen test pits. The shallow groundwater flow direction was interpreted from water levels and the flow rate was determined from hydraulic conductivity tests performed on select monitoring wells. Nitrate loading calculations were used to estimate the nitrate concentration which would result in the groundwater from the sewage disposal system.

- Project Engineer for a preliminary hydrogeological investigation for a proposed residential community on a 30.3 hectare property, located west of Elora, Ontario. The objectives were to determine the hydrogeological suitability of the property for residential development, particularly with regard to the availability of a suitable water supply and to determine the potential impact on groundwater and surface water of on-site sewage disposal using communal septic systems. The investigation included installation of ten shallow monitoring wells and excavation of twenty-three test pits. The shallow groundwater flow direction was interpreted from water levels and the flow rate was determined from hydraulic conductivity tests performed on select monitoring wells. Nitrate loading calculations were used to estimate the nitrate concentration which would result in the groundwater from the sewage disposal system.

- Project Engineer for a preliminary hydrogeological study at a proposed extractive development in Puslinch Township. The objectives of the study were to determine the hydrogeologic suitability of the property for development as a commercial gravel pit and to determine the potential impact of the development on local groundwater and surface water resources. The project involved review of existing geological reports, a hydrogeological study of the neighbouring property, MOE water well records, and the results of a soils investigation by a geotechnical engineer.

- Project Engineer on a geotechnical investigation for a proposed spray irrigation system. The objectives of the investigation wee to assess the potential impacts of the proposed spray irrigation system on the surface water and the groundwater resources near the site. The investigation included a review of geological reports and surface drainage maps, investigation of subsurface conditions, determination of groundwater flow directions and flow rates, estimate loading of pollutants to the nearby river and determine the impact of irrigation on the water supply of nearby residences.

- Project Manager for a septic suitability study for the Waterdown Sportsmen's Club. The purpose of the study was to evaluate the suitability of the subject property for a communal septic system. The study included a review of available geological and hydrogeological reports, MOE water well records and nitrate loading calculations to estimate the nitrate concentration which would result in the groundwater from the sewage disposal system.

- Field supervision of a team of subcontractors working on a hydrogeological investigation of a municipal aquifer contaminated by TCE. The project was part of an investigation at a Superfund site in southern California.

- Conducted a hydrogeological investigation of the groundwater quality in the vicinity of a dry well used for solvent disposal.

- Supervised the field component of a hydrogeological investigation of contaminant transport in groundwater at a large industrial site located on fractured clay.

- Field supervision of a team of subcontractors working on a hydrogeological investigation of a municipal aquifer contaminated by NDMA.

- Conducted and investigation of groundwater quality in the vicinity of existing sludge lagoons.

EDUCATION

B.A.Sc. (1988), Geological Engineering, University of Windsor, Ontario.

CONTINUING EDUCATION

- "Introduction to Construction Project Management" - CH2M HILL internal seminar, March, 1991
- "40-hour EPA Hazardous Waste Site Training Course," 1988
- "40-hour Refresher Training," 1992
- St. John's "Standard First Aid" & Red Cross "Heart Saver (A) CPR"

XCG

SUMMARY

Mr. Totzke joined XCG in May 1996. He has background experience in the civil engineering and surveying fields. At XCG Luke is responsible for supervision of field programs, borehole and monitoring well installations, performing environmental field sampling and sample selection for laboratory analysis. His project experience at XCG includes a number of environmental site investigations and remediation of contaminated sites.

EXPERIENCE

XCG Consultants Ltd.

- Coordinate utility locates, site clearance and site preparation for Phase 2 ESA's.
- Supervision and logging of shallow and deep aquifer monitoring well installations.
- Use of site screening equipment HNU PID, Mini Rae PID, and Organic Gastechtor.
- Completed well development calculations for purging of monitoring wells.
- Familiar with GTLog Borehole Logging program.
- Familiar with soil and groundwater sampling methods and QA/QC protocols.
- Operation of WaTerra Hydrolift Pump for well development.
- Experience in surveying monitoring well locations to create site maps.
- Operated and maintained remediation systems at selected sites.
- Use of Autocad ver.12 to produce environmental site maps.

Site and Subsurface Investigations

- Phase 2 ESA at Bell Canada located in London, Ontario.
- Phase 2 ESA at a manufacturing plant located in Kitchener, Ontario. Investigating with deep and intermediate wells for presence of Dense Non-Aqueous Phase Liquids (DNAPLs).
- Phase 2 ESA at a footwear plant located in Kitchener, Ontario.
- The subsurface investigation involved the delineation of Light Non-Aqueous Phase Liquids (LNAPLs).
- Phase 2 ESA at an aluminum alloy recycling plant located in Guelph, Ontario.
- The investigation involved various sampling techniques including: Test pitting, shallow surface sampling, and shallow groundwater sampling.
- Phase 2 ESA UST tank removal at a Bedding plant in Waterloo, Ontario.
- Phase 2 ESA at a trucking disbursement facility located in Chatham, Ontario.
- Site work included boreholes inside and outside the disbursement facility.

Site Remediation

- Phase 3 ESA soil removal and restoration at 2 Bell Canada locations in Stratford, and London.
- Phase 3 soil remediation for a large Insurance Company in Waterloo, Ontario.
  Site work included: Stockpiling of impacted soil, completing waste manifests and verification sampling of impacted area.
- Phase 3 solvent recovery system operation and maintenance for a footwear plant located in Kitchener, Ontario. The system involves the recovery of naphtha for reuse.

Civil Engineering (Conestoga College)

- Surveying and grading of greens and practice tee areas at The Waterloo Golf Academy.
- Experience with Sokisha Total Station. Surveying of groundwater sampling wells.
- Familiar with benchmark levelling, profile levelling, stadia calculations, and curve layout.
- Familiar with wastewater and water treatment plants and their operations.

Regional Municipality of Waterloo

- Inspector for Regional Pavement Evaluation Program.
- Working knowledge of Mapinfo 2.1 Partial (GIS) Software Package.

Environmental Engineering Technology post diploma (Conestogo College)

- Understanding of waste registration/manifest documents and waste class identification.
- Familiar with Environmental Legislations and Auditing procedures.
- Working knowledge of Aqetsolv and Quickflow Environmental Modeling Programs.

EDUCATION

Graduate of 3 Year Civil Engineering Program, Conestoga College (1992-1995)
1 Year Post Diploma, Environmental Engineering Technology, Conestoga College (1996)
Graduate, Kitchener Collegiate Institute (1990), OSSGD Diploma (includes 6 OAC's/Grade 13)

TRAINING

Completed OSHA 40-hour health and safety training course (Conestogo College 1996)

REPORTS

1995 Transportation Program Update (Regional Municipality of Waterloo)
Chilligo Estates Subdivision Design (Conestoga College)
Phase II Environmental Assessment of the Town of Spillsville Fleet Maintenance Yard (Conestoga College)
Biofilter Design for the Ottawa Street Landfill Waste Gas Stream (Environmental Engineering)

D. GRANT WALSOM, B.A.Sc., P.Eng.
Environmental Engineer

XCG

SUMMARY

Mr. Walsom is a Professional Engineer with over five years of post-graduate experience in the environmental engineering and consulting field (over twelve years of experience). His recent experience includes conducting and co-ordinating Corporate Compliance Pre-Acquisition Audits (Canada and the U.S.), Phase 1 Environmental Site Assessments, Phase 2 Site Investigations, Underground Storage Tank (UST) and Property Decommissioning, Site Remediation Activities, Hydrogeological Studies, and Designated Substances Surveys. Mr. Walsom has been with XCG since April of 1994.

EXPERIENCE

A summary of recent projects with which Mr. Walsom has been involved are briefly described below:

Peer Review

- Review and comment of Environmental Site Assessment and Remedial Action Plan Reports for a petroleum contaminated commercial property for a prospective purchaser.
- Provided peer review and professional opinion of eight existing assessment reports for a US based law firm in legal defence of a potential groundwater contamination law suit of a Toronto Area industrial facility. Included a full operational review and a detailed review of over 100 MSDS sheets.
- Provided a full peer review and professional opinion of three property assessment reports in support of a potential purchase of a 1.8 hectare former rail property, contaminated with heavy metals and petroleum by-products, in Hamilton, Ontario.
- Provided a peer review of ten assessment and remediation reports in support of a potential purchase of a former appliance manufacturing facility in Cambridge, Ontario. Included a scope of work for detailed Phase 2 investigations.
- Peer review of existing MOE Phase 2 investigation reports of a property with TCE impacted groundwater, in support of a legal defence against an MOE control order.
- Review and cost estimation of Remedial Action Plan for a PAHs and metals (lead) contaminated property for the purpose of providing cost cap insurance.

Phase 1 Environmental Site Assessments and Compliance Audits

- Phase 1 Environmental Site Assessment (ESA) of over 70 different industrial and commercial properties; including secondary lead smelter, former jewellery manufacturer, office furniture manufacturer, metal fabricator, liquid waste transfer station, bulk fuel facility, automotive repair and service stations, automotive dealerships, Bell Canada work centres, film post production facilities, printing shop, numerous fertilizer handling facilities, plating shops, vacant and agricultural properties, shopping plazas, warehouses, etc.
- Compliance Audits in both Canada and the U.S. including an airport, hazardous waste transfer stations, hazardous liquid processing facilities, a waste incinerator, a low temperature thermal desorber, and industrial/commercial waste handling facilities. Each audit consisted of a full site and records inspection, review of operations and related compliance with applicable regulations and approval certificates (permits, licenses, etc.), evaluation of environmental controls and management systems, a review of correspondence with regulatory authorities, and peer review of existing information and historic studies conducted by others.

- Due Diligence Compliance Audits of seven different meat and food processing plants across Canada.

- Project Auditor and Co-ordinator for pre-acquisition environmental compliance audits of a secondary lead smelting facility, a secondary aluminum smelting facility, a copper reclamation facility, two hazardous liquid waste TSD facilities, three solid waste transfer/recycling facilities, a steel pipe manufacturer, and four scrap yards (steel mill services). Each audit was conducted in detail to identify environmental conditions and regulatory compliance for the prospective purchasers.

Phase 2 Site Investigations

- Project Co-ordinator and Field Investigator for over 75 Phase 2 Site Assessments and delineation of hydrocarbon contaminated sites at automotive service stations, automotive dealerships and transportation depots, bulk fuel facilities, various industrial properties, and concrete manufacturing facilities.

- Project Manager for pre-purchase Phase 2 Site Investigations at two historic U.S. scrap yards in Pennsylvania.

- Project Manager for detailed Phase 2 investigations at an inactive property in Pennsylvania that was historically used for dismantling railway engines. This study became a detailed investigation into evaluating the impacts of and cost implications of soil, groundwater, and surface water impacts of PCBs, PAHs, and heavy metals on the property.

- Project Co-ordinator and Chief Field Investigator for a former dry cleaning property.

- Project Manager and Field Investigator for Phase 2 Site Assessments and delineation of impacted soils at a TCE contaminated site and two bulk fertilizer handling facilities.

- Project Manager for spill investigations at a bulk liquid fertilizer production facility.

- Project Manager and Chief Field Investigator for a Phase 2 Site Assessment at CN Rail Bulk Fuel Facility and Maintenance Yard in Hornepayne, Ontario.

- Project Co-ordinator and on-site observer for investigations of coal tar impacts into bedrock and area water supply in Wellington County.

- Project Co-ordinator for an air quality/subsurface investigation at a public school in Guelph, Ontario, and a coal tar impacted site in Kitchener, Ontario.

- Project Co-ordinator for Phase 2 Site Assessments of three Bell Canada Work Centre facilities and numerous active and inactive commercial fuel outlets.

Decommissioning and Site Remediation Activities

- Project Co-ordinator for a pilot-scale demonstration of a multi-phase extraction system for a naphtha plume in groundwater in Kitchener, Ontario.

- Project Manager for the decommissioning of a hinge plating shop in Kitchener, Ontario.

- Site Co-ordinator for UST removal and decommissioning at commercial fuel facilities and abandoned properties in Stouffville, Holland Landing, Glen Alan, Uxbridge, and Tottenham, Ontario.

- Project Manager and Site Co-ordinator for decommissioning and/or site remediation activities at leaking UST sites in London, Hamilton, Richmond Hill, Stouffville, Holland Landing, and Comber, Ontario.

Hydrogeological Studies

- Project Manager for a semi-annual monitoring program for PCBs in shallow soil and bedrock aquifer units at a property in Etobicoke, Ontario.
- Project Manager for a TCE groundwater plume investigation in Richmond, Virginia.
- Project manager for a TCA/DCE groundwater plume delineation investigation in Waterloo, Ontario.
- Project Co-ordinator and Field Investigator for groundwater and leachate monitoring at CN Solid Waste Disposal Site in Paris, Ontario from 1992 to present.
- Project Manager for a due diligence groundwater monitoring program at an industrial facility and annual monitoring programs at four hazardous liquid waste TSD facilities.
- Project Manager for a groundwater pumping system at an active commercial fuel station in Burlington, Ontario through 1994.
- Field Investigator and Data Collector in the mapping and monitoring of groundwater trends in the NDMA study in Elmira, Ontario.
- Field Investigator and Data Collector for a groundwater impact study at a fertilizer manufacturing plant in Corunna, Ontario.

Designated Substance Surveys

- Project Manager for a Designated Substances and Hazardous Materials survey of thirty-one (31) buildings at the Bath Medium Security Institution just west of Millhaven, Ontario. The project involved extensive sampling, analyses, and quantification of Designated Substances as defined under the Ontario Occupational Health and Safety Act, as well as the following hazardous substances: PCBs, ozone-depleting substances, and urea formaldehyde foam insulation. Recommendations for the appropriate management of the substances identified were provided in the report that was generated for this project.
- Project Co-ordinator and Site Inspector for over 20 different designated substance surveys at various industrial and commercial properties including hotels, a furniture manufacturing plant, a meat processing plant, an abandoned municipal maintenance facility, small office buildings, vehicle repair facilities and warehouses.

EDUCATION AND TRAINING

Bachelors of Applied Sciences in Civil Engineering with Options in Environmental Engineering and Water Resources Engineering, University of Waterloo, 1994.

Part-Time Studies at Wilfred Laurier University - currently working towards a Diploma in Business Administration.

OSHA 40 hour Health and Safety Training, February 1996 (8 hour update January 1997).

PROFESSIONAL ORGANIZATIONS

Professional Engineers of Ontario
Canadian Society for Civil Engineers
Canadian Environmental Auditing Association
CCIM-Central Canada Chapter (Affiliate Member)

APPENDIX C

EXAMPLE CHAIN-OF-CUSTODY FORM

NOV-12-99 FRI 09:22 AM XCG CONSULTANTS FAX NO. 9058912554 P. 03/03

PHILIP SERVICES

PHILIP ANALYTICAL SERVICES CORPORATION

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: ______

Comments: ______

CHAIN OF CUSTODY RECORD

Page ____ of ____

Client: ______

PASC Quote # : ______

Client P.O. # : ______

Client Project # : ______

Sampled by: ______

Contact: ______

Please specify Guideline (if applicable) ______

Phone: ______ Fax: ______

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date ______

Time ______

Invoice to (if other than above): ______

Analysis Required:

Sample #	Client Sample I.D.	Date Sampled															Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Samples Relinquished by: (Client Signature): ______ Date: ______ Time: ______ Condition of samples upon receipt at lab: ______

Samples Received in lab by: ______

White: ... Yellow: Mail Pink: Receiver Goldenrod: Client

APPENDIX B

FIELD SAMPLING PLAN

XCG

DRAFT

EXCELLENCE IN ENVIRONMENTAL CONSULTING SERVICES

XCG File #5-997-02-01

November 12, 1999

DRAFT

FIELD SAMPLING PLAN
3241 WALDEN AVENUE
DEPEW, NEW YORK

Mr. Claude Audet
Director of Environment
NORAMPAC, INC.
471 Rue Marie-Victorin
Kingsey Falls, Quebec
J0A 1B0

DRAFT

Richard J. Rush, M.A.Sc., P.Eng., CEA
Partner

DRAFT

Basil Wong, M.Eng., P.Eng.
Project Manager

XCG Consultants Ltd.
Suite 904
50 Queen St. N.
Kitchener, ON
Canada
N2H 6P4
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E-mail: kitchener@xcg.com

5-997-02-01
5997-02\R997020B.DOC

TABLE OF CONTENTS

FIGURE

1. INTRODUCTION

1.1 Site Background

A majority of the fill material at the subject property contains metals, and lead in particular, at concentrations that exceed the TAGM 4046 Cleanup Objectives or Eastern UST/New York State Background Values. The TCLP results indicate that much of the metals impacted fill exceeds the regulatory limit for lead. The primary contaminant of concern appears to be lead in soil. The underlying very stiff to hard silty clay is acting as an effective barrier to vertical migration of contaminants. Residual petroleum impacts detected at the site were limited to the rail siding, former lagoon/marsh area, and south part of the trucking area. This RI/FS is being conducted to complete the site characterization and to develop a preferred remedial option.

1.2 Sampling Objectives

The objective of this Remedial Investigation is as follows:

1. Determine the concentrations of metals in the fill material underlying the building floor slab.

1.3 Sample Location and Frequency

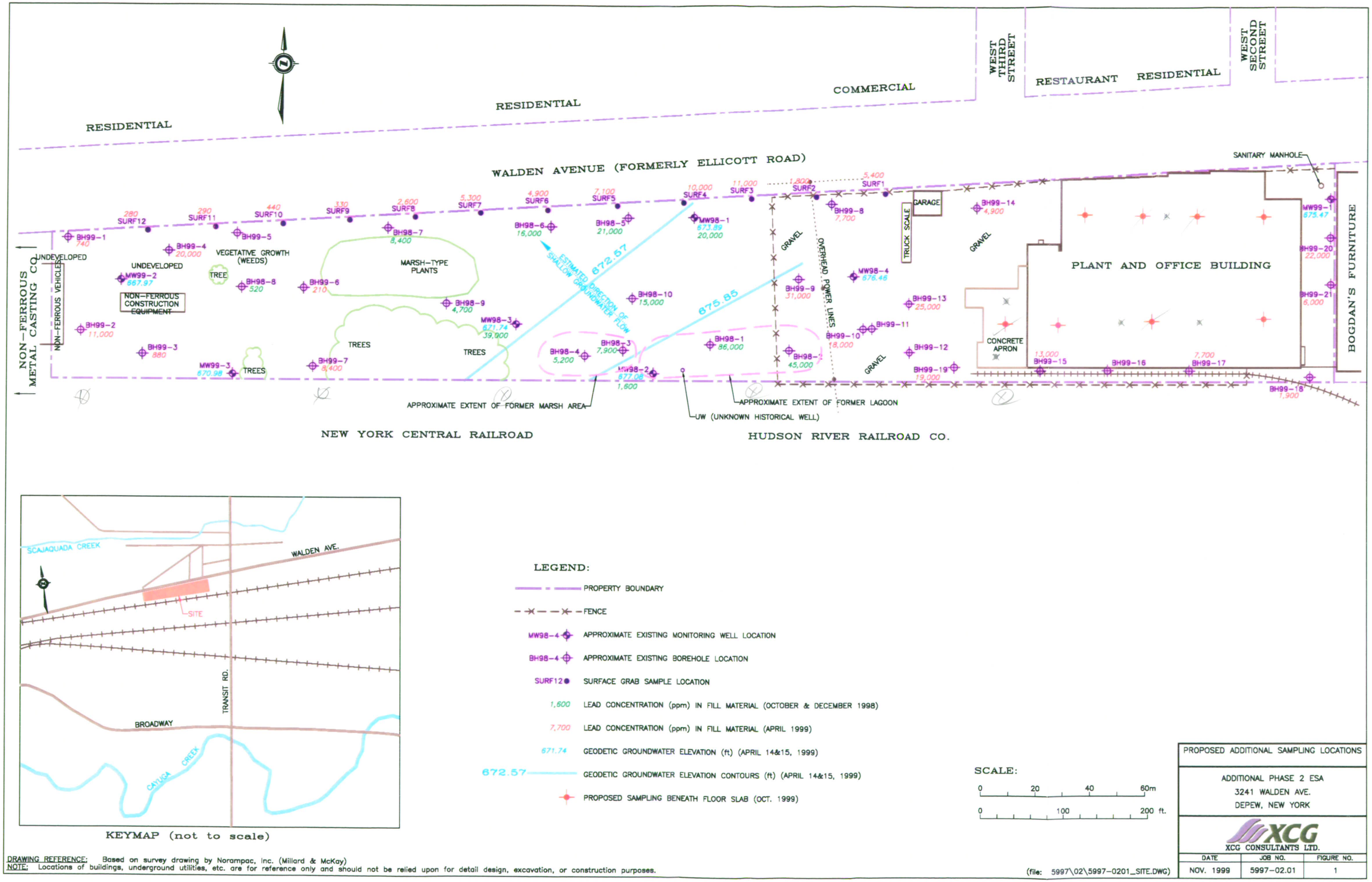
Figure 1 shows the proposed sample locations at the subject property. Soil samples shall be collected for laboratory analyses of metals at each location. One field duplicate will be collected for the samples obtained beneath the floor slab.

1.4 Sample Designation

All soil sampling locations will be assigned a unique sample designation. Samples will be identified with a alphanumeric prefix as follows:

- BH99 – Borehole samples (99 identifies the year)

All samples will be individually labelled with the site name, depth, matrix, sample location, date, and time of sampling noted on the labels. Chain-of-custody forms and field log books will be completed and refer to the unique identification number.



RESIDENTIAL
RESIDENTIAL
COMMERCIAL
WEST THIRD STREET
RESTAURANT
RESIDENTIAL
WEST SECOND STREET
WALDEN AVENUE (FORMERLY ELLICOTT ROAD)
SANITARY MANHOLE
NON-FERROUS METAL CASTING CO.
NON-FERROUS VEHICLES
UNDEVELOPED
UNDEVELOPED
NON-FERROUS CONSTRUCTION EQUIPMENT
TREE
VEGETATIVE GROWTH (WEEDS)
MARSH-TYPE PLANTS
TREES
TREES
TREES
ESTIMATED SHALLOW GROUNDWATER DIRECTION OF FLOW
672.57
675.85
GRAVEL
OVERHEAD POWER LINES
TRUCK SCALE
GARAGE
GRAVEL
GRAVEL
PLANT AND OFFICE BUILDING
CONCRETE APRON
BOGDAN'S FURNITURE
APPROXIMATE EXTENT OF FORMER MARSH AREA
APPROXIMATE EXTENT OF FORMER LAGOON
UW (UNKNOWN HISTORICAL WELL)
NEW YORK CENTRAL RAILROAD
HUDSON RIVER RAILROAD CO.
SURF12 280
SURF11 290
SURF10 440
SURF9 330
SURF8 2,600
SURF7 5,300
SURF6 4,900
SURF5 7,100
SURF4 10,000
SURF3 11,000
SURF2 1,800
SURF1 5,400
BH99-1 740
BH99-2 11,000
BH99-3 880
BH99-4 20,000
BH99-5
BH99-6 210
BH99-7 8,400
BH98-7 8,400
BH98-8 520
BH98-9 4,700
BH98-6 16,000
BH98-5 21,000
BH98-10 15,000
BH98-4 5,200
BH98-3 7,900
BH98-1 86,000
BH98-2 45,000
MW99-2 667.97
MW99-3 670.98
MW98-3 671.74 39,000
MW98-2 677.08 1,600
MW98-1 673.89 20,000
MW98-4 676.46
BH99-8 7,700
BH99-9 31,000
BH99-10 18,000
BH99-11
BH99-12
BH99-13 25,000
BH99-14 4,900
BH99-15 13,000
BH99-16
BH99-17 7,700
BH99-18 1,900
BH99-19 19,000
BH99-20 22,000
BH99-21 6,000
MW99-1 675.47
SCAJAQUADA CREEK
WALDEN AVE.
SITE
TRANSIT RD.
BROADWAY
CAYUGA CREEK
KEYMAP (not to scale)
LEGEND:
PROPERTY BOUNDARY
FENCE
MW98-4 APPROXIMATE EXISTING MONITORING WELL LOCATION
BH98-4 APPROXIMATE EXISTING BOREHOLE LOCATION
SURF12 SURFACE GRAB SAMPLE LOCATION
1,600 LEAD CONCENTRATION (ppm) IN FILL MATERIAL (OCTOBER & DECEMBER 1998)
7,700 LEAD CONCENTRATION (ppm) IN FILL MATERIAL (APRIL 1999)
671.74 GEODETIC GROUNDWATER ELEVATION (ft) (APRIL 14&15, 1999)
672.57 GEODETIC GROUNDWATER ELEVATION CONTOURS (ft) (APRIL 14&15, 1999)
PROPOSED SAMPLING BENEATH FLOOR SLAB (OCT. 1999)
SCALE:
0 20 40 60m
0 100 200 ft.
PROPOSED ADDITIONAL SAMPLING LOCATIONS
ADDITIONAL PHASE 2 ESA
3241 WALDEN AVE.
DEPEW, NEW YORK
XCG CONSULTANTS LTD.
DATE NOV. 1999
JOB NO. 5997-02.01
FIGURE NO. 1
DRAWING REFERENCE: Based on survey drawing by Norampac, Inc. (Millard & McKay)
NOTE: Locations of buildings, underground utilities, etc. are for reference only and should not be relied upon for detail design, excavation, or construction purposes.
(file: 5997\02\5997-0201_SITE.DWG)

2. SAMPLING EQUIPMENT AND PROCEDURES

2.1 Drilling Inside Building

Assuming that the Geoprobe is suitable for inside drilling, the soil samples from beneath the building floor slab are to be collected as follows:

1. Break through the concrete with the Geoprobe drill bit. If necessary, use a concrete coring machine.
2. Put on a new pair of disposable PVC gloves.
3. Place new plastic sleeve inside the 1.2 metre (4 feet) long cylindrical sampler.
4. Drive the sampler the full length of the sampler
5. Remove the plastic sleeve and cut in half.
6. Log the soil stratigraphy and any evidence of contamination.
7. Transfer soil to sample bottle.
8. Label bottle and dispose of PVC gloves in the on-site waste bin.
9. Although the samples are to be analyzed for metals, screen the soil for total organic vapours (TOVs) using a field photoionization detector (e.g. HNu).
10. If the sampler has penetrated into the native silty clay, stop the sampling at this particular location. Retain a sample of the native soil for potential future testing. If the initial sampler is full of fill material, drive a second sampler through the next depth interval until the native soil is encountered.
11. Decontaminate the sampler and use a new plastic sleeve before the next sample depth or drilling location.

2.2 Decontamination

Decontamination must be conducted between sampling depths and sampling locations to avoid cross-contamination. The following materials and procedures are to be used to decontaminate sampling equipment.

Material:

- Distilled water;
- Spray bottle;
- Detergent;
- Bristle scrub brush;

- Wire brush;
- Two 5 gallon buckets;
- PVC gloves; and
- Paper towels.

Procedure for Drilling Inside Building: — ?

1. Geoprobe sampler is to be placed in a bucket with soapy water. The outside of the sampler will be scrubbed with a bristle scrub brush while the inside is to be cleaned with a wire brush.
2. Rinse in second bucket with clean tap water.
3. Rinse with distilled water.
4. Transfer and store wash water in a 45 gallon drum for future disposal.

3. SAMPLE HANDLING AND ANALYSIS

The procedures for packaging and shipping once all samples have been collected are described below.

3.1 Packaging

1. Samples are to be packaged in study plastic coolers. Cardboard or styrofoam containers are not to be used.
2. Remove any labels and tape that may be attached to the cooler from previous usage.
3. Check that the caps are secured tightly on the bottles.
4. Check that all bottles are properly and completely labelled.
5. Wrap sample bottles with bubble wrap and place in cooler.
6. Complete the chain-of-custody form while placing each bottle in the cooler.
7. Provide additional bottle protection in the cooler with extra bubble wrap or styrofoam "peanuts."
8. Keep samples refrigerated to approximately 4°C using ice or frozen cold packs.
9. Remove sampler's copy of chain-of-custody and keep with field notes.
10. Place chain-of-custody in zip-lock bag and place inside cooler.
11. Close cooler and wrap with packing or duct tape.

3.2 Shipping

Soil samples are to be shipped to the laboratory as soon as possible. The following shipping procedures are to be used for this particular project.

1. Call Philip Analytical Services Corporation (PASC) at approximately mid-day and request for a courier pick-up the next morning. PASC has a daily pick-up in Buffalo and only occurs in the morning.
2. The telephone number is 905-332-8788. The courier pick-up co-ordinator is Mr. Petro Oh (extension 251).
3. Indicate whether the samples are to be picked-up at the subject property or at the hotel.
4. Call the laboratory the day following the shipment to ensure that all samples arrived intact.

APPENDIX C

EXAMPLE SITE-SPECIFIC HEALTH AND SAFETY PLAN

XCG

EXCELLENCE IN
ENVIRONMENTAL
CONSULTING
SERVICES

XCG File #5-997-01-10

July 9, 1999

SITE SPECIFIC HEALTH AND SAFETY PLAN ASSOCIATED WITH THE INTERIM REMEDIAL MEASURES AT THE NORAMPAC INDUSTRIES, INC. SITE 3241 WALDEN AVENUE DEPEW, NEW YORK

Prepared for:

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TABLE OF CONTENTS

FIGURE

TABLE OF CONTENTS (CONT'D)

TABLES

APPENDICES

SITE SPECIFIC HEALTH AND SAFETY PLAN ASSOCIATED WITH THE INTERIM REMEDIAL MEASURES AT THE NORAMPAC INDUSTRIES, INC. SITE 3241 WALDEN AVENUE, DEPEW, NEW YORK

1. *PURPOSE*

The purpose of this plan is to assign responsibilities, establish personnel protection standards, mandatory safety practices and procedures, and provide for contingencies that may arise while the IRM activities are being performed at the Metro Waste Paper Recovery (Norampac Inc.) site in Depew, New York.

2. *APPLICABILITY*

The provisions of the Plan are mandatory for all on-site employees, consultants, contractors and subcontractors engaged in on-site operations who will be exposed or have the potential to be exposed to on-site hazardous substances.

Each on-site employee, consultant, contractor and subcontractor involved with this project may choose to use this Health and Safety Plan as a guide in developing its own plan, or may choose to adopt, in full, this plan. However, activities and their associated hazards may vary with each employee's, consultant's, contractor's or subcontractor's work; the responsibility to recognize and plan for individual hazards rests with each employee, consultant, contractor and subcontractor alone. Each on-site employee, consultant, contractor and subcontractor will be responsible for its own employees and operating in accordance with the current Occupational Safety and Health Administration (OSHA) regulations 29 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response. These regulations include the following provisions for employees exposed to hazardous substances, health hazards or safety hazards: training as described in 120 (e); medical surveillance as described in 120 (f); and personal protection equipment described in 120 (g).

Please note that Norampac policy states that all contractors and subcontractors shall provide a Health and Safety Plan for its employees covering any exposure to hazardous materials and shall complete all work in accordance with that plan. The subcontractor may choose to use Norampac's Health and Safety Plan as a guide in developing its own plan, or may choose to adopt, in full the following plan. All contractors and subcontractors will, at a minimum, follow all provisions of the Norampac Health and Safety Plan. Inadequate Health and Safety precautions on the part of a contractor or subcontractor, or the belief that the contractor or subcontractor's personnel are or may be exposed to an immediate health hazard, can be cause for Norampac to suspend the contractor or subcontractor's site work and ask the personnel to evacuate the hazard area. This site may also be subject to occasional Health and Safety audits by Norampac staff for IRM work tasks. Any person found to be out of compliance with this plan may be subject to dismissal from the project.

3. SITE DESCRIPTION

3.1 General Information

Site:	Metro Waste Paper Recovery leases Norampac Industries, Inc owners 3241 Walden Avenue, Depew, New York		
Objectives:	To conduct work tasks outlined in the Interim Remedial Measures Work Plan - 3241 Walden Avenue, Depew, New York. Activities will include brush clearing, soil grading, capping with topsoil and hydro-seeding for vegetative erosion control as well as installation of barrier fencing.		
Proposed Date of Implementation:	July 1999		
Background Review of the Site:	Complete: X	Preliminary:	___
Documentation/Summary:	Overall Hazards:	Serious:	___
		Moderate:	___
		Low:	X
		Unknown:	___

3.2 Site History

This project will be conducted at the Norampac facility located at 3241 Walden Avenue, Depew, New York. The site is situated on the south side of Walden Avenue, approximately 178.1 metres (584.42 feet) west of the centre line of Transit Road. The size of the property is approximately 3.04 hectares (7.5 acres), of which approximately the east half is developed The vacant portion of the site consists of two distinct areas. The central portion of the property extends from the chain-link fence to the west edge of the wooded area and is sparsely vegetated. The west portion of the property extends from the wooded area to the west property line. This area is also vacant, with some parked vehicles and heavy equipment from the adjacent neighbour to the west, and contains some vegetation (i.e. sporadic amount of grass and weeds).

The fill throughout the property consists of varying materials (silty sand, sandy silt, sand and gravel, silty clay, and construction debris) much of which has been mixed with waste containing heavy metals. The fill depth was encountered between approximately 0.6 and 1.8 metres (2 to 6 feet). The site is relatively flat while the general surrounding area slopes towards the south. Water level measurements in monitoring wells installed on-site suggests that the shallow groundwater flows towards the northwest.

XCG's Phase 2 Environmental Site Assessments (ESAs) indicate that elevated concentrations of select metals, including lead, were detected in the fill zone at the central portion of the property.

3.3 Site Activities

Remedial activities to be performed generally include the following:

- Clearing brush and established vegetation,
- Grading existing soils and fill materials,
- Capping the subject area with topsoil and hydroseeding, and
- Constructing a six-foot high barrier fence.

Specific site activities are addressed in the IRM Work Plan text and in the schedule of daily work to be performed. Other activities may be added as necessary to conform to individual needs of the consultant, contractor, or subcontractor. The Health and Safety Plan will be updated accordingly if other activities are added to the IRM.

3.4 Facility Description

Waste Types:	Liquid ___	Solid _X_	Sludge ___	Gas ___
Characteristics:	Corrosive ___	Ignitable ___	Radioactive ___	
	Volatile ___	Toxic _X_	Reactive ___	
	Unknown ___			

Status (active, inactive, unknown): actively used for waste paper processing by Metro Waste Paper Recycling.

3.5 Hazard Evaluation

Based on the results of the environmental investigations conducted by XCG, site compounds of concern that may be encountered during IRM activities consist of:

- Lead (leachable and toxic)

The exposure limit, recognition qualities, acute and chronic effects, and first-aid treatment for lead is presented in Tables A-1 and A-2.

Routes of exposure associated with contaminated dusts are via skin contact or inhalation, if dry or dusty conditions exist. Therefore, a minimum of Level D protection plus air purifying respirator availability is recommended to perform work on-site. If dry or dusty conditions exist, dust suppression methods will be implemented. A reassessment and re-evaluation of site conditions and personal protective equipment will occur prior to commencing work. Table A-3 and A-4 provide hazard monitoring methods, action levels, and protective equipment required for on-site activities.

Standard Safe Work Practices employed by XCG are listed in Appendix A-A and must be adhered to at all times. Entry into the site area must be co-ordinated with the appropriate XCG, Metro Waste Paper Recovery, or Norampac Inc. site contacts.

4. EMERGENCY INFORMATION

Should an emergency develop on-site, the procedures listed in Appendix A-B should be utilized. Should the situation require outside support services, Metro Waste Paper Recovery (Norampac Inc.) will be notified along with the appropriate contact from the following list:

4.1 Emergency Contacts

Contact	Person or Agency		Telephone
Police	Police Department		9-1-1
Fire	Police Emergency Line		9-1-1
Ambulance	Police Emergency Line		9-1-1
Hospital*	St. Joseph's Hospital 2605 Harlem Road Cheektowaga, New York	Emergency: General:	716-891-2450 716-891-2400
Poison Information Centre			716-878-7654 or 1-800-888-7655
Gas			1-800-444-3130
Hydro			716-681-3818
New York State Department of Environmental Conservation			716-851-7220
XCG, Project Advisor and Health & Safety Reference	Basil Wong XCG Consultants	Work: Home: Cell:	905-891-2400 905-884-0272 416-804-0763
Client Contact Project Co-ordinator	Paul Stokes-Rees Norampac Inc.	On-Site: Cell: Work:	716-681-1560 (ext. 0) 905-301-1890 905-678-8211
On-Site H&S Rep	Bob Staples R&J Staples	Work: Cell:	716-570-5322 716-537-4956

* see Hospital Route on attached map (Figure A-1).

In an injury occurs, notify the injured person's personnel office as soon as possible after obtained medical attention for the injured.

4.2 Location of Site Resources (for emergency use)

The location of site resources for emergency use will be identified by the on-site field representative prior to initiation of on-site activities.

Water supply: available on-site

Telephone: available on-site

4.3 Emergency Routes to Hospital

Directions to the nearest hospital (St. Joseph's Hospital) are as follows (see also attached map):

- from site turn left onto Walden Avenue
- travel approximately 4 miles west bound on Walden Avenue to Harlem Road
- turn right on Harlem Road
- travel approximately 0.4 miles north bound on Harlem Road
- St. Joseph's Hospital is located on the right hand side (east side of road).

4.4 Additional Articles to be Taken into Field

- First aid kit
- Disposable eye wash
- Cellular phone

5. SITE SAFE – WORK PLAN

5.1 Monitoring

5.1.1 Monitoring Requirements

Designated field personnel will conduct air monitoring for the compounds presented in Table A-1. Equipment necessary for air monitoring at this site consists of respirable dust monitor. Health and safety exposure thresholds (PELs, LELs, etc.) are listed in Table A-2. The type of monitoring instruments specified by the hazard and the action levels to upgrade personal protection are shown in Table A-3. All monitoring equipment shall be maintained following procedures outlined in the owner's manual for the specified Monitoring Equipment.

5.1.2 Monitoring Schedule

5.1.2.1 Instrument Calibration

All applicable instruments shall be calibrated daily. Readings shall be recorded on an Instrument Calibration Check-Out Sheet maintained with each instrument.

5.1.2.2 Background Readings

Before any field activities commence, the background levels of the site will be read and noted on air monitoring forms or in the field personnel exploration logs or notebook. Daily background readings shall take place away from areas of potential contamination to obtain accurate results.

5.1.2.3 Air Monitoring Frequency

All site readings will be noted as indicated above along with the date, time, weather conditions, wind direction and speed, if possible, and location where the background level was recorded.

Continuous air monitoring will be performed during the activities for which inhalation has been identified as a potential exposure route.

Particulates

Carry out continuous air monitoring for particulates upwind, downwind, and within the work area as some soil excavation and grading work will be conducted. Dust suppression techniques (e.g. spraying of water) will be employed if particulate levels exceed a specified value (e.g. 150 $\mu g/m^3$) above the upwind levels. XCG and Norampac will consult with the NYSDEC on the acceptable particulate level.

5.2 Personnel Protective Equipment

The minimum level of personnel protection to be implemented at the site will be Level D as described in "Standard Operating Safety Guideline" (United States Environmental Protection Act (US EPA), November 1984). The required equipment includes:

- Leather or chemical resistant boots/shoes
- Hard hat
- Safety glasses.

For the site soil grading and capping or other activities which may potentially expose workers to contaminated soil, the Level D program will be modified to include, in addition to the items listed above, the following:

- Chemical resistant gloves (inner vinyl and outer Bayprene for sampling activities).
- Chemical resistant clothing (Tyvex or Saranex suit).
- Respirator availability

Hearing protection will be included in noisy environments.

5.3 Respiratory Protection

The decision to don respirators during a particular activity will be based on the results of the continuous air monitoring performed during the site activity. Detection of respirable dusts in excess of 0.05 mg/m^3 concentrations monitored in the breathing zone during the site activity will trigger donning of air purifying respirators (APR). Table A-3 lists hazard guidelines and action response levels. Engineering controls such as dust suppression shall be performed to eliminate the need for APRs, if possible.

Contingency Plan

If required, the Health and Safety Plan will be modified to provide the level of protection necessary to protect the health and safety of the workers prior to the resumption of site activities. Such conditions may necessitate a modification of the IRM procedure in progress, or increase the level of protection. The final decision to modify will be made on a case by case basis. The appropriate parties will be advised of any necessary changes.

5.4 Work Limitations

In general, field work will be conducted during daylight hours only. Norampac personnel will be in the field during site operations. The Project Co-ordinator must grant special permission for any field activities conducted beyond daylight hours. Field personnel have been declared medically fit for duty and, where respiratory protection is necessary, have been properly trained, fit tested, and declared fit for respirator use.

Employees of other consultants, contractors, or subcontractors must be similarly cleared for work on the site, prior to commencing site activities.

5.5 Field Personnel

The responsibility of the Project Manager, the Health and Safety Representative, and project personnel are listed in Appendix A-C and must be adhered to at all times.

5.6 Heat Stress/Cold Stress

If on-site activities are conducted during extreme weather conditions, instructions for minimizing heat stress/cold stress are in Appendix A-D.

6. DECONTAMINATION PROCEDURES

Personnel should follow the general decontamination procedures outlined below:

1. Proceed to the designated decontamination area;
2. Establish a personnel decontamination station consisting of a basin with soapy water, a rinse basin with plain water, and a can with a plastic bag;
3. Wash and rinse boots;
4. Remove outside gloves and discard in plastic bag;
5. Remove disposable suit and discard in plastic bag;
6. Upon leaving the contamination area, all personnel will proceed through the appropriate Contamination Reduction Sequence as described above;
7. All protection gear should be left on-site during lunch break following decontamination procedures.

The decontamination layout is illustrated in Figure A-2. The maximum decontamination layout for Level C and Level B is shown on Figure A-3 in Appendix A-E. This layout may be adapted to specific work task and work area configurations as appropriate.

6.1 Minimal Decontamination

Less extensive procedures for decontamination can be subsequently or initially established when the type and degrees of contamination becomes known or the potential for cross-contamination is judged to be minimal. These procedures generally involve one or two wash downs only.

6.2 Closure of the Personnel Decontamination Station

All disposable clothing and plastic sheeting used during the operation should be double-bagged and either contained on-site or removed to an approved off-site disposal facility. Decon and rinse solution could be contained on-site or removed to an approved disposal facility. Reusable rubber clothing should be dried and prepared for future use. (If gross contamination had occurred, additional decontamination of these items may be required.) All wash tubs, pail containers, etc., should be thoroughly washed, rinsed, and dried prior to removal from the site.

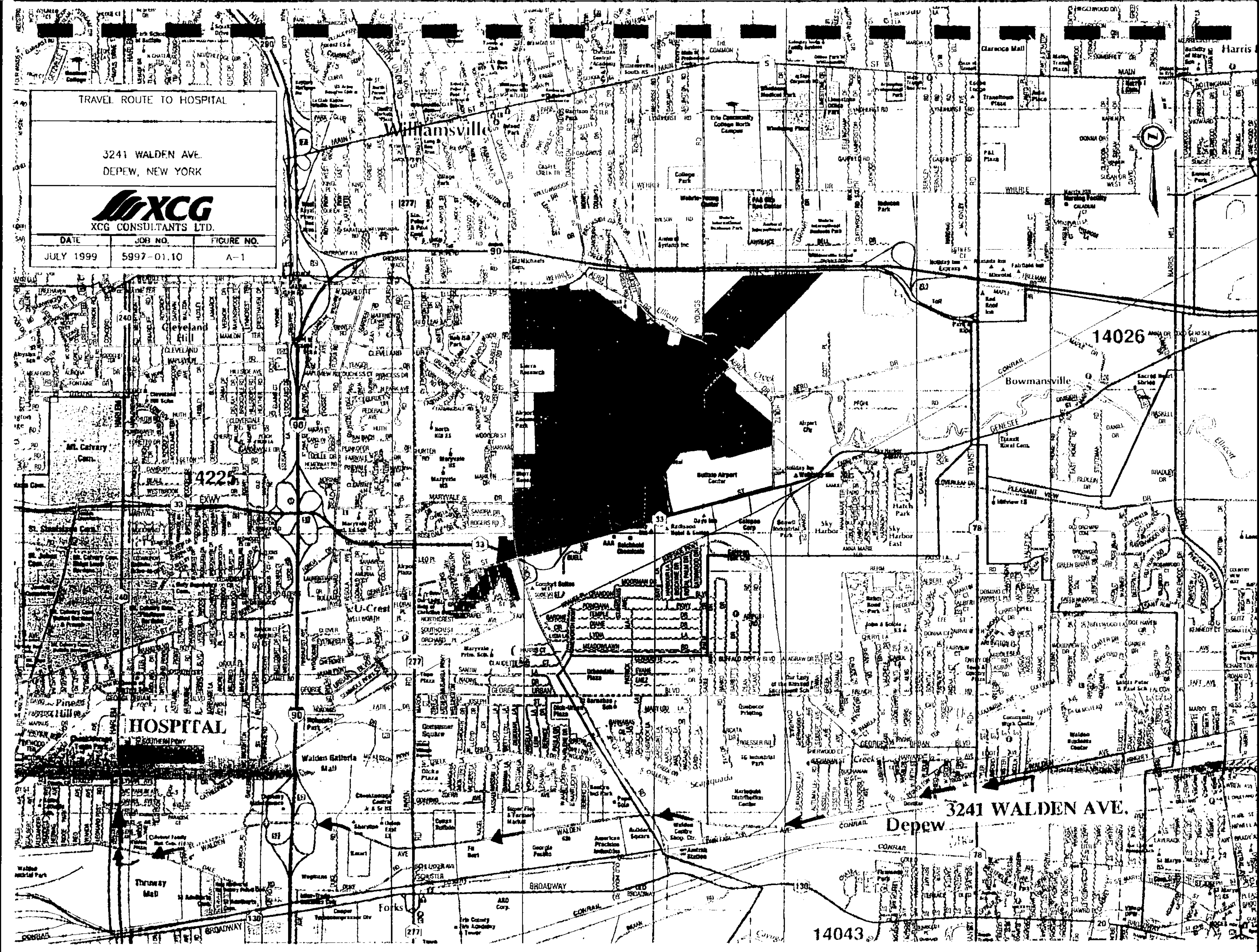

TRAVEL ROUTE TO HOSPITAL
3241 WALDEN AVE.
DEPEW, NEW YORK
XCG
XCG CONSULTANTS LTD.
DATE
JOB NO.
FIGURE NO.
JULY 1999
5997-01.10
A-1
HOSPITAL
[redacted]
3241 WALDEN AVE.
Depew
Williamsville
Cleveland Hill
Bowmansville
14026
14043
4225
Walden Galleria Mall
Buffalo Airport Center
Sky Harbor
WALDEN
BROADWAY
GENESEE
Forks

TABLE A-1
EXPOSURE LIMITED AND RECOGNITION QUALITIES

COMPOUND	OSHA PERMISSIBLE EXPOSURE LIMIT (a,1) mg/m^3	ACGIH TWATLV (a,2)	ODOUR	ODOUR WARNING CONCENTRATION (ppm)	LEL (c)	UEL (d)	IONIZATION POTENTIAL (eV)	MAXIMUM CONCENTRATION IDENTIFIED	
								Groundwater (e) $\mu g/L$	Soil (f) ppm
Lead (total)	0.05	0.15	Ca	(4)	NA	NC	NC	30	86,000

NOTES:

(a) OSHA Permissible Exposure Limit or American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value.
(b) Immediately Dangerous to Life or Health Level.
(c) Lower Explosive Limit (%).
(d) Upper Explosive Limit (%).
(e) Groundwater samples collected by XCG.
(f) Soil/sediment samples collected by XCG.
(1) OSHA Time Weighted Average.
(2) ACGIH Tim Weighted Average
Ca Potential Human Carcinogen
NC Not Combustible
NA Not Available

1. All values given mg/m3 unless otherwise indicated.
2. The odour warning concentrations given are generally odour thresholds with irritation thresholds given in parenthesis.
3. Ceil - Ceiling concentration not to be exceeded at any time.
4. Appearances and odour vary depending on specific compound.

TABLE A-2
ACUTE AND CHRONIC EFFECTS AND FIRST AID TREATMENT

COMPOUND	ROUTES OF ENTRY	EYE IRRITANT	ACUTE EFFECTS	CHRONIC EFFECTS
Lead	Inh, Ing	Yes	Commutative neurotoxin, stomach distress, vomiting, anaemia	Abdo pain/discomfort, constipation, diarrhoea, muscle weakness, dizzy, insomnia, CNS effects

Explanation:

Con Skin Contact
Ing Ingestion
Inh Inhalation
CNS Central Nervous System

General First Aid Treatment (a first-aid kit will be kept in the site vehicle).

Eye	Irrigate immediately (a portable eye-wash unit will be kept in the site vehicle), seek medical attention.
Skin	Soap wash promptly, seek medical attention.
Inhalation	Move to fresh air, seek medical attention.
Ingestion	Induce vomiting, get medical attention.

TABLE A-3
HAZARD GUIDELINES AND ACTION RESPONSE LEVELS

TYPE OF INSTRUMENT	TYPE OF HAZARD	ACTION RESPONSE LEVEL(1)	ACTION RESPONSE INSTRUMENT
Respirable Dust Monitor	Contaminated Particulates	0.05 mg/m^3	Upgrade to Level C protection immediately or evacuate site

NOTE:

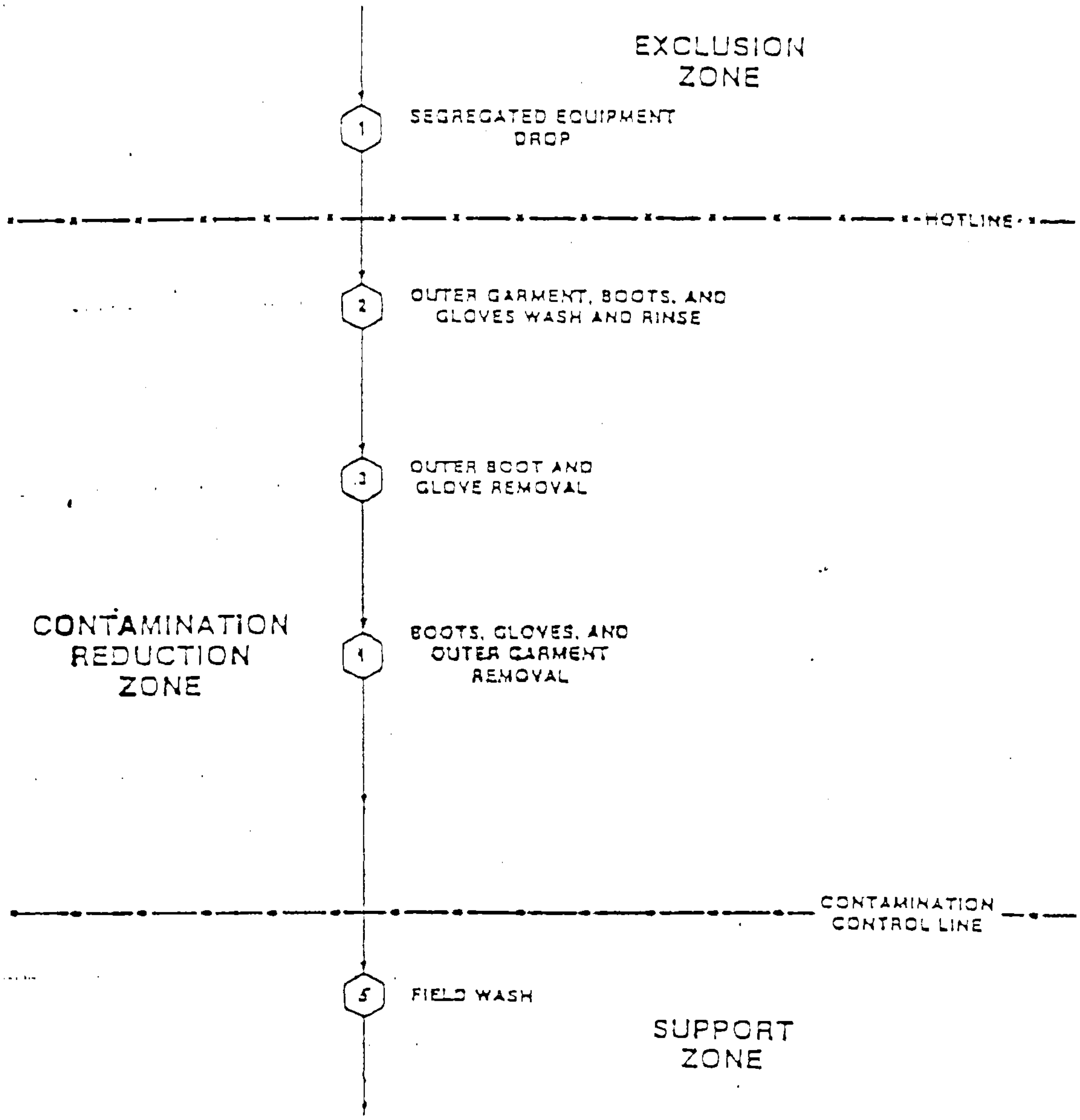
1. Monitored in breathing zone.

TABLE A-4
PROTECTIVE EQUIPMENT FOR ON-SITE ACTIVITIES

ACTIVITY	LEVEL	PROTECTIVE EQUIPMENT
IRM - soil grading - capping - hydroseeding - fence construction	D+	• Hearing protection (foam earplugs or earmuffs) (1) • Hard Hat • Safety glasses with side shields • Tyvek coveralls • Inner latex gloves and out nitrile gloves • Safety boots with chemical resistant outer boots (nitrile or butyl rubber)

NOTE:

(1) Mandatory during noise-intensive activities.



DECONTAMINATION LAYOUT
LEVEL D PROTECTION

3241 WALDEN AVE.
DEPEW, NEW YORK

XCG CONSULTANTS LTD.

DATE	JOB NO.	FIGURE NO.
JULY 1999	5997-01.10	A-2

FIGURE A-2

APPENDIX A-A

STANDARD SAFE WORK PRACTICES

STANDARD SAFE WORK PRACTICES

A1. GENERAL

1. Eating, drinking, chewing gum or tobacco and smoking are prohibited in the contaminated or potentially contaminated area or where the possibility for the transfer of contamination exists.

2. Avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, etc. Avoid, whenever possible, kneeling on the ground, leaning or sitting on equipment or ground. Do not place monitoring equipment on potentially contaminated surface (i.e. ground, etc.).

3. Prevent, to the extend possible, spillage. In the event that a spillage occurs, contain liquid, if possible.

4. Prevent splashing of contaminated materials.

5. All field crew members shall make use of their senses (all senses) to alert them to potentially dangerous situations in which they should not become involved (i.e. presence of strong, irritating or nauseating odors).

6. Field crew members shall be familiar with the physical characteristics of investigations, including:

   - Wind direction in relation to the ground zero area;
   - Accessibility to associates, equipment, vehicles;
   - Communications;
   - Hot zone (areas of known or suspected contamination);
   - Site access;
   - Nearest water sources;
   - Emergency phone, shower, eye wash location.

7. The number of personnel and equipment in the contaminated area should be minimized, but only to the extent consistent with workforce requirements of safe site operation.

8. All wastes generated during IRM activities at the site will be disposed of as directly by the Project Manager (or Co-ordinator) in co-ordination with Norampac, Inc.

A2. EXCAVATION AND SAMPLING PROCEDURES

For all excavation and sampling activities, the following standard safety procedures shall be employed:

1. All excavation and sampling equipment shall be cleaned before proceeding to the site.

2. At the excavation or sampling site, sampling equipment shall be cleaned after each use.

3. Work in "cleaner" areas should be conducted first where practical.

4. The minimum number of personnel necessary to achieve the objectives shall be within 25 feet of the excavation or sampling activity.

5. If emergency and back-up subcontracted personnel are at the site, they should remain a minimum of 25 feet from the excavation or sampling activity, where practical.

6. Exclusion zones will be established within designated hot lines. Delineation of a hot line will reflect the interface between areas at or below a predetermined threshold contaminant concentration, based on available data including the results of monitoring and chemical analyses, information from site personnel regarding historical site activities, and general observations. This determination will be made by the PM in conjunction with the H&S Representative and site personnel.

APPENDIX A-B

CONTACTS AND PROCEDURES

CONTACTS AND PROCEDURES

B1. CONTACTS

Should any situation of unplanned occurrence require outside or support services, the appropriate contacts should be made. The list of appropriate contacts is listed in Section 4.1 of the Health and Safety Plan.

B2. PROCEDURES

In the event that an emergency develops on-site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- o Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on-site; or
- o A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

The following emergency procedures should be followed:

1. Personnel on-site should use the "buddy system" (pairs). Buddies should pre-arrange hand signals or other means of emergency signals for communication in case of lack of radios or radio breakdown (see the following item).
   - o Hand gripping throat: out or air, can't breathe.
   - o Grip partner's wrist or place both hands around waist: leave area immediately, no debate.
   - o Hands on top of head: need assistance.
   - o Thumbs up: okay, I'm alright, I understand.
   - o Thumbs down: no, negative.
2. Site work area entrance and exit routes should be planned, and emergency escape routes delineated before individual work tasks begin at the site.
3. Visual contact should be maintained between "pairs" on-site with the team remaining in close proximity in order to assist each other in case of emergencies.
4. In the event that any member of the field crew experiences any adverse effects of symptoms of exposure while on-site, the entire field crew should immediately halt work and act according to the instructions provided by the H&S representative.
5. The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team and re-evaluation of the hazard and the level of protection required.

6. In the event that an accident occurs, the PM is to complete an Accident Report Form for submittal to the H&S representative (HSR). The H&S representative is responsible for the follow-up action being taken to correct the situation that caused the accident.

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APPENDIX A-C

RESPONSIBILITIES

RESPONSIBILITIES

C1. PROJECT MANAGER

Each consultant, contractor or subcontractor Project Manager (PM) shall direct on-site investigations and operational efforts. The PM, assisted by the Health and Safety representative, has primary responsibility:

1. That appropriate personnel protective equipment and monitoring equipment is available and properly utilized by all on-site personnel;
2. That personnel receive this plan and are aware of the provisions of this plan, are instructed in the work practices necessary to ensure safety, and are familiar with planned procedures for dealing with emergencies;
3. That field personnel will comply with OSHA 29 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response.
4. That personnel are aware of the potential hazards associated with site operations;
5. Monitoring the safety performance of personnel so that the required work practices are employed;
6. Correcting work practices or conditions that may result in injury or exposure to hazardous substances;
7. Preparing accident/incident reports and routine job exposure records;

C2. ON-SITE SAFETY OFFICER

The On-Site Safety Officer (OSSO) shall:

1. Implement the project Health and Safety Plan and report to the Health and Safety Representative and the PM for action if any deviations from the anticipated conditions described in the plan has occurred and has the authorization to stop work at any time;
2. Calibrate relevant monitoring equipment on a daily basis and record results on the check sheet maintained with the instrument.
3. Ascertain that all monitoring equipment is operating correctly according to manufacturer's instructions and provide maintenance if it is not;
4. Confirm that personnel working on-site have the proper medical surveillance program and Health & Safety training which qualifies them to work at a hazardous waste site. Also be responsible for identifying site personnel with special medical problems (i.e. allergies) and planning for project health and safety of these personnel as required.

C3. PROJECT PERSONNEL

Project personnel involved in on-site investigations and operations are responsible for:

1. Taking responsible precautions to prevent injury to themselves and to their fellow employees;

2. Performing only those tasks that they believe they can do safely, and immediately reporting any accidents and/or unsafe conditions to the OSSO;

3. Notifying the PM and OSSO/Health and Safety Representative of any special medical problems (i.e. allergies) and making certain that on-site personnel are aware of any such problems.

APPENDIX A-D

HEAT STRESS/COLD STRESS

D1. HEAT STRESS

If site work is to be conducted during the summer or in other hot environments, heat stress is a concern in the health and safety of personnel. For workers wearing permeable clothing, follow recommendations for monitoring requirements and suggested work/rest schedules in the current American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for Heat Stress. For workers wearing semipermeable or impermeable clothing, the ACGIH standard cannot be used. For these situations, workers should be monitored when the temperature in the work area is above 70°F (21°C).

To monitor the work, measure:

1. Heart rate. Count the radial pulse during a 30-second period as early as possible in the rest period.

   - If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.

   - If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.

2. Oral temperature. Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).

   - If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period.

   - If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following work cycle by one-third.

   - Do not permit a worker to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6°F (38.1°C).

3. Body water loss, if possible. Measure weight on a scale accurate to +0.25 lb. at the beginning and end of each work day to see if enough fluids are being taken to prevent dehydration. Weights should be taken while the employee wears similar clothing or, ideally, is nude. The body water loss should not exceed 1.5 percent total body weight loss in a work day.

   Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (see following Table). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

-- dizziness

-- nausea

-- fainting

o Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms are:

-- red, hot, usually dry skin

-- lack of or reduced perspiration

-- nausea

-- dizziness and confusion

-- strong, rapid pulse

-- coma

D2. COLD STRESS

Frostbite

Frostbite is an injury from exposure to cold. The extremities of the body (fingers, toes) are most often affected. The signs of frostbite are:

o Skin turns white or grayish-yellow.

o Pain is sometimes felt early, but subsides later. Often there is no pain.

o The affected part feels intensely cold and numb.

Hypothermia

If site work is to be conducted during the winter, cold stress is a concern in the health and safety of the personnel. Additional insulated clothing should be worn by field personnel. Of special note for cold stress on this site is the wearing of tyvek suits. Disposable clothing does not breath; therefore, perspiration is not provided with a means of evaporation. During strenuous physical activity, an employee's clothes can become wet. Wet clothes combined with cold temperatures can lead to hypothermia. If the air temperature is less than 40°F and an employee becomes wet, the employee must change to dry clothes. The on-site heated facility or a personnel vehicle may be utilized as a change area.

Hypothermia is characterized by shivering, numbness, drowsiness, muscular weakness and a low internal body temperature when the body feels warm externally. This can lead to unconsciousness and death.

In either case (frostbite or hypothermia), seek immediate medical attention.

To prevent effects from occurring, persons working in cold environments should wear adequate clothing and reduce the time spent in the cold area.

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APPENDIX A-E

MAXIMUM MEASURES FOR LEVEL C AND B DECONTAMINATION

MAXIMUM MEASURES FOR LEVEL C AND B DECONTAMINATION

Station 1: ***Segregated Equipment Drop***

Deposit equipment used on-site (tools, sampling devices and container, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross-contamination. During hot weather operations, a cool-down station may be set up within this area.

Station 2 ***Boot Cover and Glove Wash***

Scrub outer boot covers and gloves with decon solution or detergent and water.

Station 3: ***Boot Cover and Glove Rinse***

Rinse off decon solution from Station 2 using copious amounts of water.

Station 4: ***Tape Removal***

Remove tape around boots and gloves and deposit in container with plastic liner.

Station 5: ***Boot Cover Removal***

Remove boot covers and deposit in containers with plastic liner.

Station 6: ***Outer Glove Removal***

Remove outer gloves and deposit in container with plastic liner.

Station 7: ***Suit and Boot Wash***

Wash splash suit, gloves, and safety boots. Scrub with long-handle scrub brush and decon solution.

Station 8: ***Suit, Boot, and Glove Rinse (including SCBA backpack, if applicable)***

Rinse off decon solution using water. Repeat as many times as necessary.

Station 9: *Cartridge or Mask Change, SCBA Tank Change*

If worker leaves exclusion zone to change cartridges, mask, or air tanks, this is the last step in the decontamination procedures. Worker's cartridges or other devices are exchanged, new outer gloves and boot covers donned, and joints taped. Worker returns to duty.

Station 10: *Safety Boot Removal*

Remove safety boots and deposit in container with plastic liner.

Station 11: *Splash Suit Removal*

With assistance of helper, remove splash suit. Deposit in container with plastic liner.

If worker is in Level B, the worker will remove the SCBA backpack whole keeping the facemask on. The hose from the mask to the tank will be disconnected at the regulator.

Station 12: *Inner Glove Rinse*

Rinse inner gloves with decon solution.

Station 13: *Inner Glove Wash*

Wash inner gloves with water.

Station 14: *Face Piece Removal*

Remove the face piece. Deposit in container with plastic liner. Avoid touching face with fingers.

Station 15: *Inner Glove Removal*

Remove inner gloves and deposit in lined container.

Station 16: *Inner Clothing Removal*

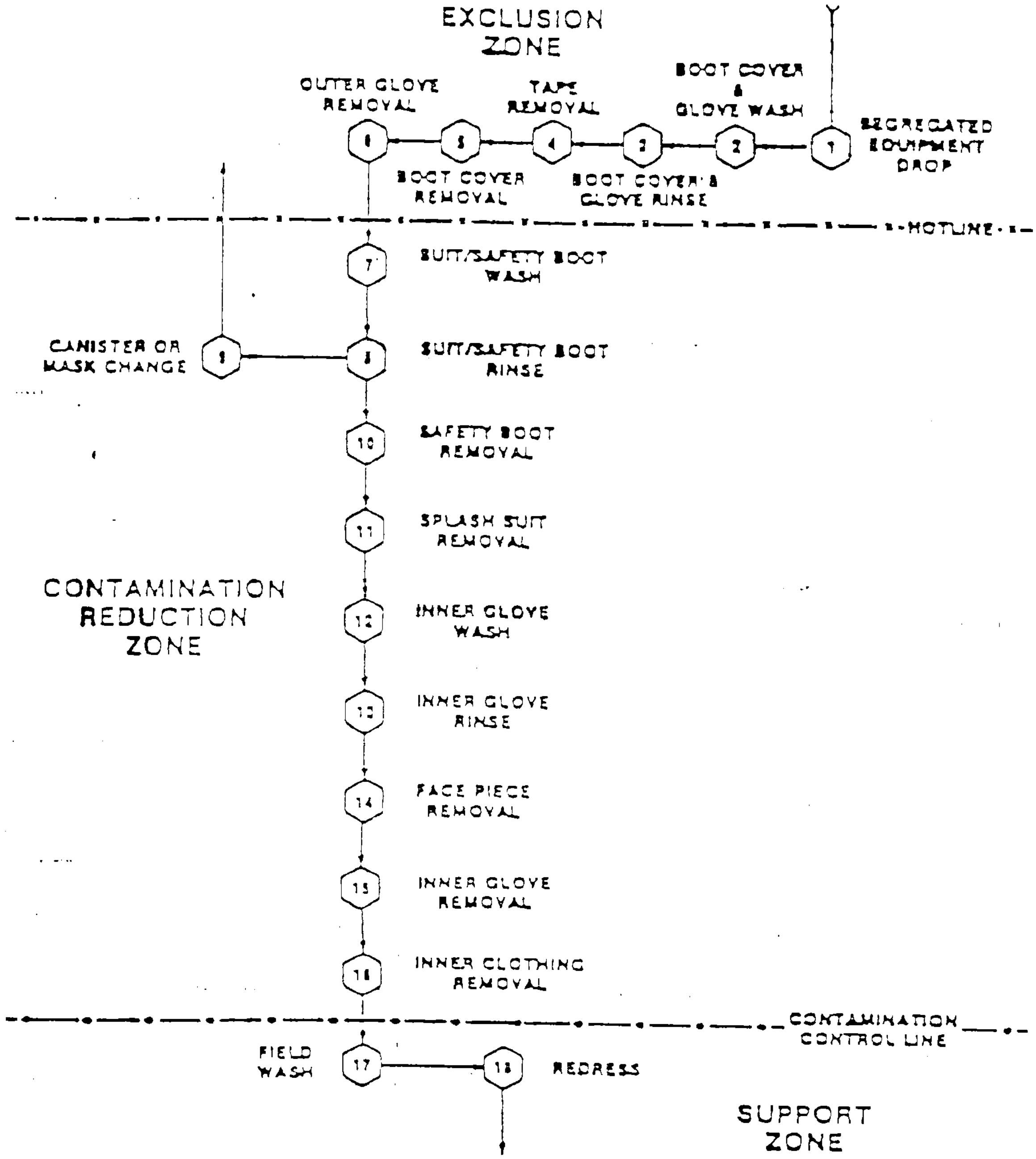
Remove clothing soaked with perspiration and place in lined container. Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants might have been transferred in removing the disposable coveralls.

Station 17: *Field Wash*

Shower if highly toxic, skin-corrosive, or skin-absorbable materials are known or suspected to be present. Wash hand and face if shower is not available.

Station 18: *Redress*

Put on clean clothes.



DECONTAMINATION LAYOUT
LEVEL C PROTECTION

3241 WALDEN AVE.
DEPEW, NEW YORK

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DATE	JOB NO.	FIGURE NO.
JULY 1999	5997-01.10	A-3

CHARRETTE

FIGURE A-3