REMEDIAL ACTION WORK PLAN

Congress Street Plant
Schenectady International Inc.
Schenectady, New York

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CONESTOGA-ROVERS & ASSOCIATES

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1.0 INTRODUCTION

The Schenectady International Inc. (SII) Congress Street Plant (Site) is located at Congress Street and Tenth Avenue in Schenectady, New York. The Site location and Site plan are presented on Figures 1.1 and 1.2, respectively. The facility has operated at this location since 1910, primarily producing industrial coatings.

An Order on Consent between the New York State Department of Environmental Conservation (NYSDEC) and SII was executed in December 1990 and modified in September 1993 and December 1994. The Order on Consent required SII to develop and implement a Remedial Investigation/Feasibility Study (RI/FS) at the Site.

The results of the RI were presented in the report entitled "Remedial Investigation Report" (RI Report) dated January 16, 1996. The RI Report was approved by the NYSDEC in their letter of March 5, 1996.

The information presented and evaluated in the RI Report was used as the basis for the FS. The results of the FS were presented in the report entitled "Feasibility Study Report" (FS Report) that was submitted to NYSDEC on July 5, 1996. Upon review of the FS, the NYSDEC provided comments in a letter dated September 18, 1996 and a meeting was held with NYSDEC, SII, and CRA on October 2, 1996 to discuss the comments. As a result of the October 2, 1996 meeting, SII prepared a report entitled "Addendum I, Feasibility Study Report" (Addendum I).

The recommended remedial alternative (Modified Alternative 3) for the Site consists of the following components:

- Groundwater Hydraulic Containment/On-Site Treatment;
- LNAPL Collection/ Off-Site Treatment; and
- Clay Liner and erosion protection along the swale

The FS and Addendum 1 were approved by NYSDEC in a letter dated February 28, 1997.

This report, entitled Remedial Action Work Plan (RA Work Plan), presents a program for the design and implementation of the selected Remedial Action. The RA Work Plan is organized as follows;

- Section 1.0 presents the introduction;
- Section 2.0 presents descriptions of the RA components;
- Section 3.0 outlines the pre-design data collection activities;
- Section 4.0 presents the remedial design activities; and
- Section 5.0 presents the project schedule.

In accordance with Addendum 1, additional study will be undertaken concurrent with implementation of Modified Alternative 3 to further define the extent of contamination in the vicinity of the existing buildings. The proposed scope of work for this additional investigation is presented in a separate work plan.

2.0 REMEDIAL ACTION COMPONENTS

The selected Remedial Action for the Site (i.e. Modified Alternative 3) consists of the following components:

- groundwater collection system along the western side of the Site;
- groundwater treatment system;
- LNAPL collection and off-Site treatment;
- clay liner along the swale and the adjacent embankment to prevent seeps and potential contamination of surface water drainage; and
- erosion control (e.g. riprap), as necessary, along the slopes of the swale.

The general layout for the proposed Remedial Action is presented in Figure 2.1.

A description of each of the components is presented in the following subsections.

2.1 GROUNDWATER COLLECTION SYSTEM

Data obtained during the RI indicate that the shallow groundwater along the western property boundary has been impacted by Site operations. A groundwater collection system will be installed downgradient of the Site operations, along the western property boundary, to minimize off-Site migration of contaminants via groundwater flow. The groundwater collection system will also be extended to intercept seeps at the northwest corner of the Site.

The groundwater collection system will consist of a collection drain located along the western side of the Site and an extraction well(s) located in the vicinity of observation well OW7. The approximate alignment for the groundwater collection system is presented on Figure 2.1.

The groundwater collection drain will consist of a pipe and media drain installed to a suitable depth and of sufficient size to minimize the buildup and off-Site migration of contaminated groundwater. The collection drain will be sloped towards a wet well(s) or pumping station(s) from which the collected groundwater will be extracted. A typical cross section of the proposed groundwater collection drain is presented on Figure 2.2.

A groundwater extraction well(s) will be installed in the vicinity of well nest OW7 to collect contaminated groundwater from this area.

2.2 GROUNDWATER TREATMENT SYSTEM

The collected groundwater will be pumped via a forcemain to an on-Site groundwater treatment system. Based on the preliminary evaluation presented in the FS, it is estimated that the total groundwater extraction rate will be less than 5 gpm and the most cost effective on-Site treatment method would consist of the following components:

- LNAPL separation;
- pretreatment for solids/metals removal;
- chemical oxidation (for treatment of organic parameters); and
- off-gas treatment.

The collected groundwater will be treated to acceptable levels for discharge to Cowhorn Creek via a SPDES permitted outfall or to the POTW.

Other potential options for groundwater treatment include discharge to the local POTW and off-Site treatment at SII's Rotterdam Junction wastewater treatment facility.

The design of the groundwater treatment system will be based on the anticipated flow rates and the influent chemistry determined during the pumping test to be performed as a pre-design data collection activity (see Section 3.3).

2.3 LNAPL COLLECTION/ OFF-SITE DISPOSAL

LNAPL was detected in observation well OW10-94 during the RI. SII has since implemented an interim corrective action at this location and installed a belt skimmer in well OW10-94 to extract LNAPL.

The full areal extent of recoverable LNAPL is not well defined, however, sheens and discolored or oily soils have been identified at other sampling locations indicating LNAPL presence at these locations.

LNAPL will be removed to the extent possible prior to full operation of the groundwater collection system to prevent potential smearing of the LNAPL on the soils by drawing down the water table. Collected LNAPL will be accumulated for less than 90 days on Site prior to being transported to an appropriate off-Site treatment disposal facility.

It is currently anticipated that LNAPL will be collected via a shallow collection drain placed along the swale alignment. Details of the LNAPL collection system will be developed concurrent with the design of the groundwater collection system.

2.4 CLAY LINER

A clay liner will be placed along the existing swale located at the western edge of the Site and the embankment located adjacent to the swale. The purpose of the liner is to minimize infiltration of surface water runoff into the groundwater collection system, prevent potential exposure to chemicals present in the surface soils along the swale, and prevent seeps from discharging to the swale from the embankment.

A synthetic drainage net or french drain will be extended up the embankment and beneath the clay liner at any existing seep location(s) to provide a hydraulic connection to the groundwater collection system.

2.5 EROSION PROTECTION

Erosion protection (e.g. riprap) will be placed along the slopes of the swale as necessary to protect against erosion of the clay liner.

3.0 PRE-DESIGN DATA COLLECTION

Pre-design data collection activities will be undertaken to obtain sufficient detailed information necessary to complete the Remedial Action Design. Descriptions of the proposed pre-design data collection activities are presented in the following subsections. All pre-design data collection activities will be performed in accordance with the Health and Safety Plan presented in Appendix A.

3.1 VERTICAL AQUIFER PROFILING

During the RI, observation wells were installed at several locations and at various depths to define the areal and vertical extent of impacted groundwater at the Site. Based on the groundwater monitoring data presented in the RI, it was determined that the shallow groundwater samples along the western edge of the Site had the highest parameter concentrations. At locations where both shallow and deep observation wells were sampled, parameter concentrations in the deeper wells were either found to be significantly lower or were not detected. At other locations such as OW11-94 and OW10-94 where only a shallow well is present, the vertical distribution of chemical concentrations is not known.

It is important to define the vertical distribution of chemical concentrations in the area of the proposed groundwater collection system to determine the appropriate installation depth. The collection system will be installed to a depth that will intercept contaminated groundwater migration from the Site. The depth of the groundwater collection system could have a significant impact on the design, cost and installation method and an appropriate design will be offered.

In order to determine the vertical distribution of contaminants in the groundwater in the area of the groundwater collection system, it is proposed to drill four boreholes at the locations shown on Figure 3.2. At each location, the borehole will be advanced using hollow stem auger techniques. Continuous split spoon soil samples will be collected and screened with an OVA meter. A hydropunch or equivalent sampling device will be used to collect groundwater samples from depths of 5, 10, and 15 feet below the water table. Groundwater samples will be analyzed for VOCs and SVOCs in accordance with the Quality Assurance Project Plan (QAPP) presented in Appendix B.

In addition, soil samples will be collected at 5 ft intervals, and at any changes in stratigraphy, and tested for grain size distribution. These data will be used in the design of the granular filter material/sand pack and slot size for the collection pipe/well screen to prevent siltation.

All boreholes will be grouted to the ground surface upon completion except the borehole near OW7 which will be completed with a water level piezometer to measure water levels during the pumping test (see Section 3.2)

3.2 PUMPING TEST

In order to obtain the data necessary for the design of the groundwater extraction system and the groundwater treatment system, a 48-hour pumping test will be conducted on well OW7A-92. Two water table piezometers will be installed approximately 25 feet from OW7A-92 to measure drawdown during the pumping test. The proposed locations for the piezometers are presented on Figure 3.2 and typical piezometer construction details are presented on Figure 3.3. Water levels will also be obtained at the following locations during the pumping test:

- OW7A-92
- OW7B-92
- OW-3
- OW3B-87
- OW14-94
- OW13-94
- OW12-94 (background well)
- Cowhorn Creek both upstream and downstream of the culvert.

The proposed water level monitoring locations are presented on Figure 3.2. Detailed protocols for the pumping test are presented in Appendix C. Prior to conducting the pumping test, water levels will be obtained at all proposed monitoring locations twice a day, at approximately 9:00 to 10:00 a.m. and 4:00 to 5:00 p.m., for a period of three days to establish baseline conditions.

All water extracted during the pumping test will be collected and temporarily stored on-Site in polyethylene storage tanks pending off-Site disposal.

During the pumping test, samples of the extracted water will be collected at defined intervals (i.e., beginning, middle, and end of pumping test) and analyzed for the parameters presented on Table 3.1. These data will be used to evaluate the various treatment/disposal alternatives as presented in Section 2.3 and also to aid in the design of an on-Site groundwater treatment system, if that option is selected. Depending upon the results of this evaluation, bench scale treatability analyses may be necessary and are planned to be performed during the Preliminary Design phase. SII will advise NYSDEC prior to initiating such tests.

3.4 WASTE HANDLING

All soil cuttings brought to the ground surface will be collected in 55-gallon drums and temporarily stored on Site. Extracted groundwater will be stored in polyethylene tanks and/or 55-gallon drums. All wastes will be sampled, analyzed and disposed of in accordance with State and Federal regulations.

3.5 EQUIPMENT CLEANING

Prior to mobilization of the drill rig, it shall be thoroughly cleaned to remove oil, grease, mud and other foreign matter. Subsequently, before initiating drilling at each borehole, the augers, cutting bits, samplers, drill steel, and associated equipment will be cleaned to prevent cross-contamination from the previous drilling location. All cleaning will be conducted at an on-Site decontamination pad. Cleaning will be accomplished by flushing and wiping the components to remove all visible sediments followed by thorough high pressure water wash. Special attention will be given to the threaded sections of the drill rods and split spoons.

The required decontamination procedure for all sampling equipment is:

a. wash and scrub with tap water and low phosphate detergent,
b. tap water rinse,
c. rinse with 10% HNO_3, ultrapure (dilute to 1% HNO_3 if carbon split spoon samplers utilized or omit if metals are not being analyzed),
d. tap water rinse,
e. methanol rinse,
f. thorough rinse with deionized demonstrated analyte-free water. The volume of water used must be at least five times the volume of solvent used in step e, and
f. air dry.

All cleaned equipment will be placed on polyethylene sheeting or aluminum foil in order to avoid contacting a contaminated surface prior to use.

4.0 REMEDIAL DESIGN ACTIVITIES

4.1 DESIGN ELEMENTS

As presented in Section 3.0, the Remedial Action consists of several components. The design elements associated with each component are listed below:

Groundwater Extraction System

- groundwater collection trench;
- groundwater extraction well(s);
- pumps and associated equipment; and
- forcemain.

Groundwater Treatment System

- oil/water separator;
- process piping and tanks;
- pumps and associated equipment;
- pretreatment for solids and metals removal, if necessary;
- treatment for organics removal (e.g chemical oxidation);
- treatment building;
- off-gas treatment system, if necessary; and
- discharge piping and outfall.

LNAPL Collection System

- LNAPL extraction system;
- piping and associated equipment; and
- holding tank.

Clay Liner

- grading plan;
- french drains/synthetic drainage net to prevent seeps along embankment;

- clay liner;
- liner protective covering (e.g. topsoil and vegetation); and
- provision for SPDES compliance monitoring of surface water runoff.

Erosion Protection

- riprap

4.2 DESIGN SUBMITTALS

Submittals will be made to NYSDEC upon completion of the Preliminary (30%) Design and the Final (100%) Design. A description of the deliverables for each submittal is provided in the following subsections.

4.2.1 Preliminary Design

The Preliminary Design will be comprised of a report and drawings that confirm the direction and scope of the design that is to be prepared. The Preliminary Design will detail the nature and elements of the Remedial Action. All of the field investigations and pre-design data acquisition activities will be reported at this stage. This submission will include a Preliminary Remedial Design Report that presents the following:

- a detailed presentation and rationale for all specific elements of the Remedial Action. The submission will demonstrate how the proposed design will meet the Remedial Action objectives;

- a detailed description of the proposed components of the design to demonstrate the relationship, compatibility and performance of all components;

- all primary design criteria and performance objectives for the detailed design will be established along the supporting technical information;

- the process design/treatment elements will be fully developed, the influent characterization defined, the effluent discharge criteria and a process flow diagram that includes expected loadings and flows will be provided; and

- the nature of any major equipment items will be identified along with the criteria that will be used in the final equipment selection process.

Some of the drawings that will form part of the bid package will also be provided, e.g.:

1) Existing Conditions Plan(s)
2) Site Plan showing the location and layout of all proposed facilities and works
3) Typical Cross Sections
4) Process Flow Diagram (if on-Site treatment plant is applicable)
5) Typical Details

4.2.2 Final Design

The Final Design deliverables will include the following:

- Final Remedial Design Report;
- complete set of drawings;
- complete specification package;
- design binder that provides all design calculations, equipment and materials selection information;
- updated construction schedule; and
- project support plans:
  - Operation and Maintenance Plan;
  - Long Term Monitoring Plan;
  - Health and Safety Plan;
  - CQAPP; and
  - Soil Management Plan.

5.0 PROJECT SCHEDULE

The proposed project schedule is presented on Figure 5.1. This schedule identifies all major tasks and the associated task durations. This schedule would commence upon NYSDEC approval of the RA Work Plan. It should be noted that the construction schedule would be updated, if necessary, in the Final Design submittal to reflect the actual construction activities.

figure 1.1

SOURCE:

U.S.G.S. SCHENECTADY, N.Y.
SW/4 SCHENECTADY 15' QUADRANGLE

SITE LOCATION
REMEDIAL ACTION WORK PLAN
CONGRESS STREET PLANT
Schenectady International Inc.

CRA

1312 (30) APR 17/97(W) REV.0

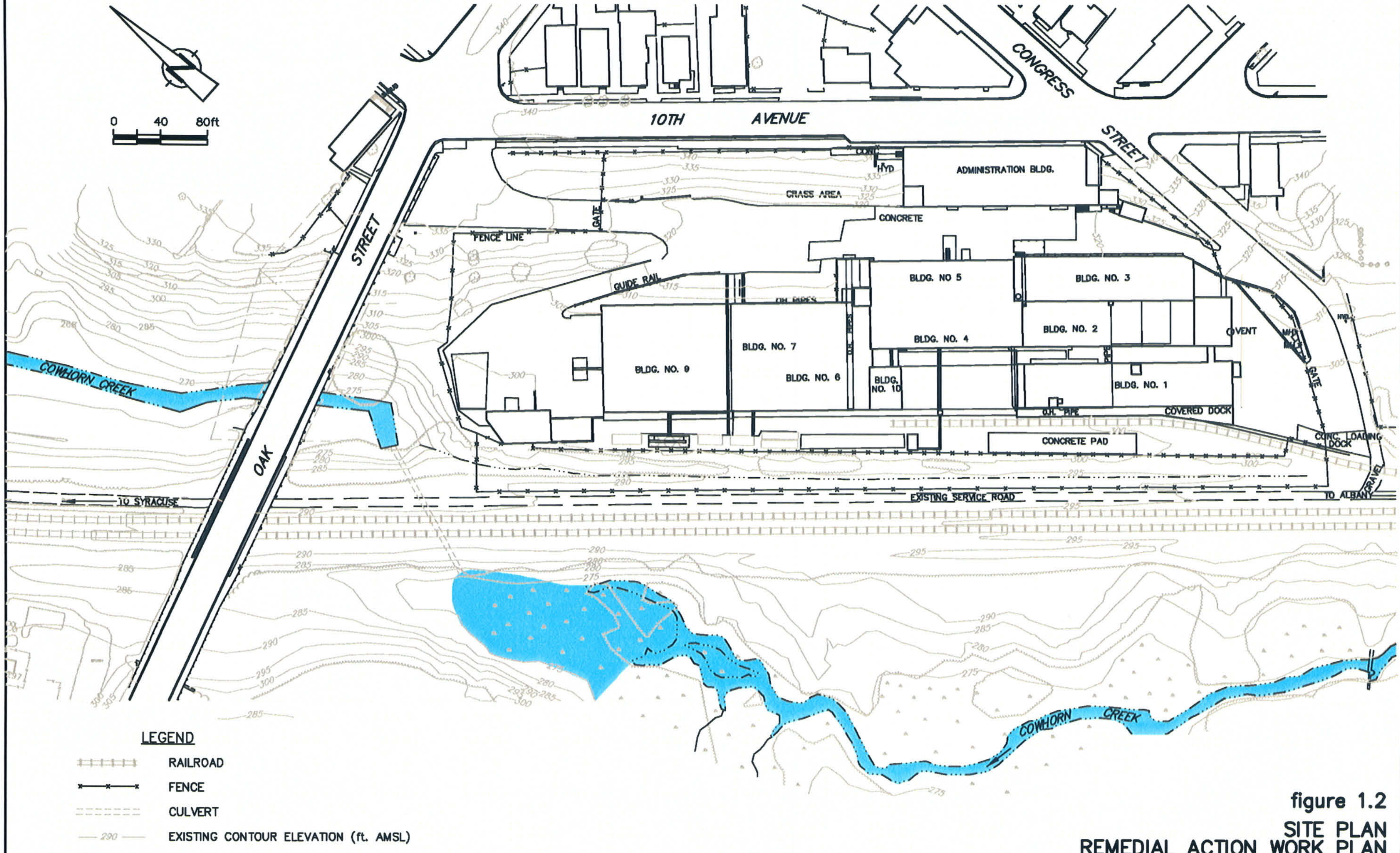


figure 1.2

SITE PLAN
REMEDIAL ACTION WORK PLAN
CONGRESS STREET PLANT
Schenectady International Inc.

CRA

1312 (30) APR 17/97(W) REV.0 (P-93)

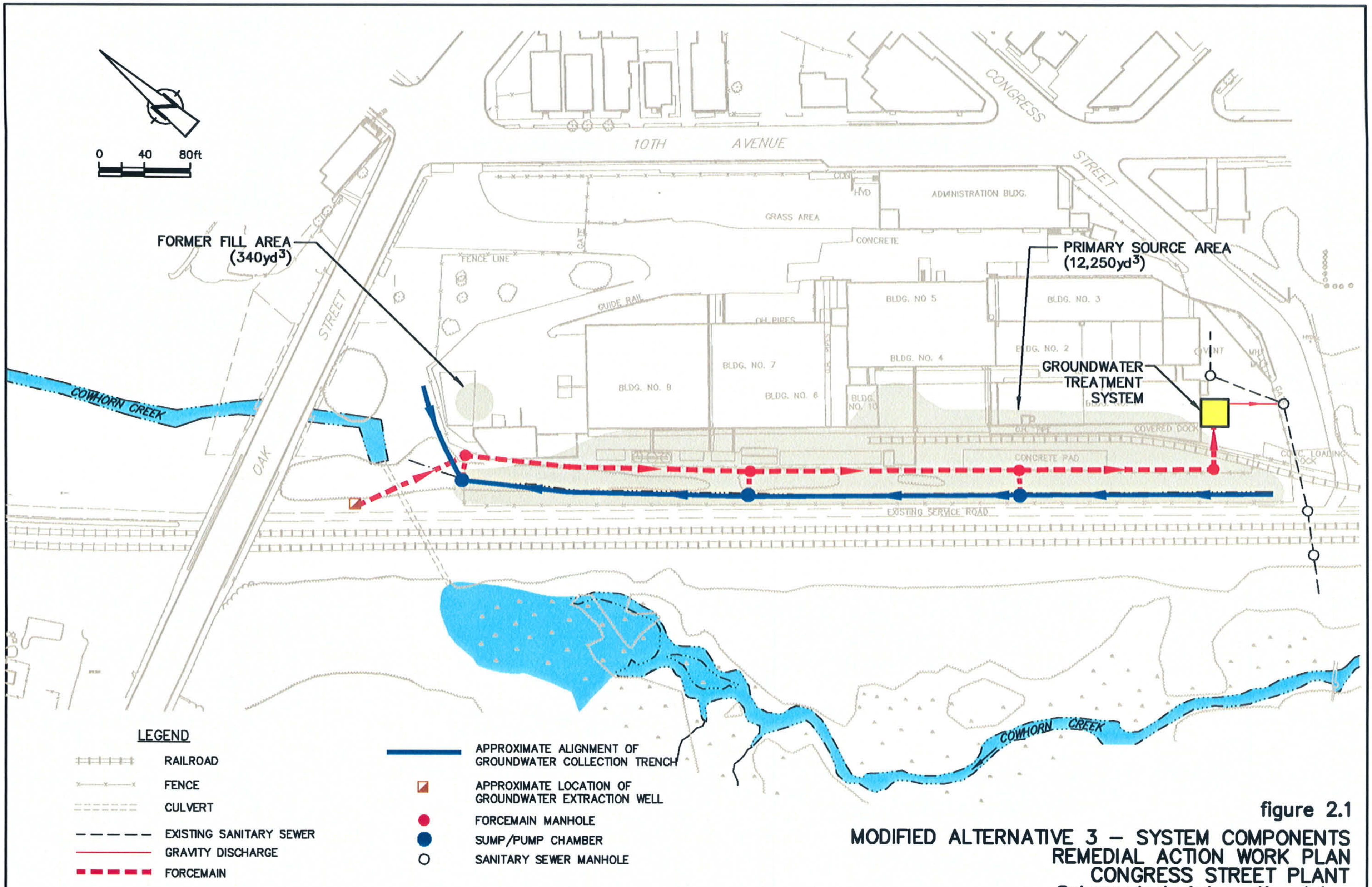
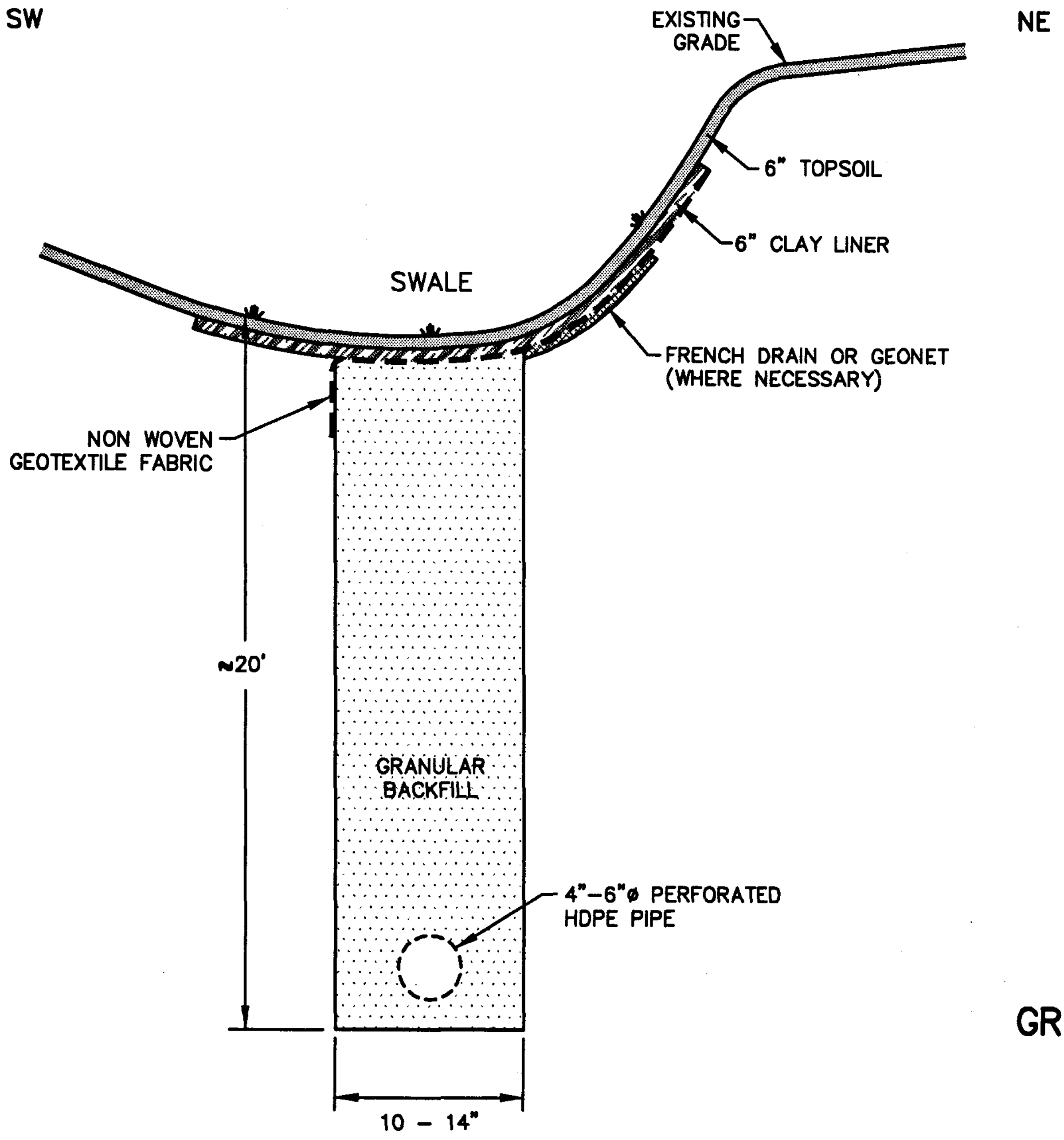


figure 2.1

MODIFIED ALTERNATIVE 3 – SYSTEM COMPONENTS
REMEDIAL ACTION WORK PLAN
CONGRESS STREET PLANT
Schenectady International Inc.

CRA

1312 (30) APR 17/97(W) REV.0 (P–94)

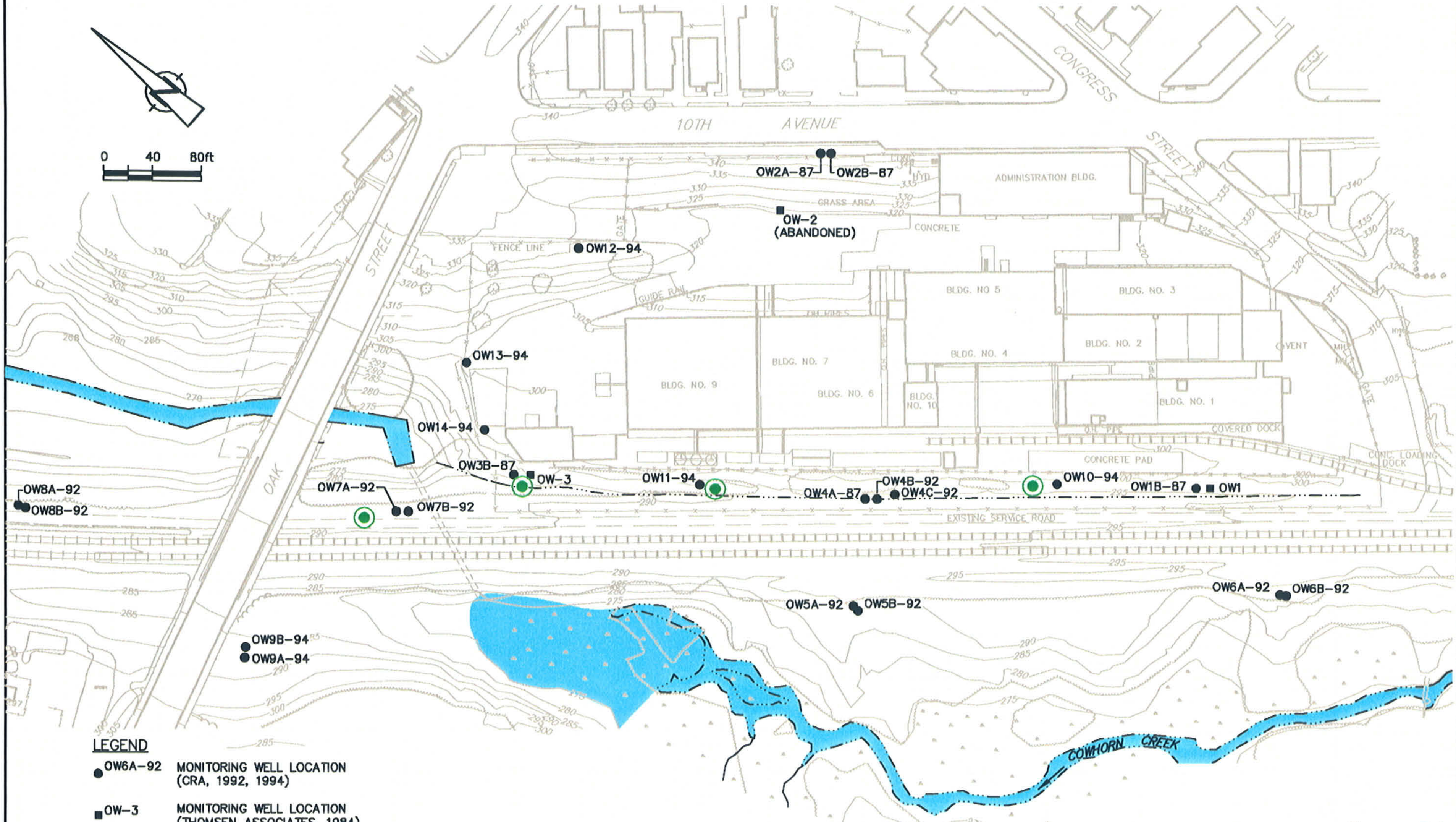


GROUNDWATER COLLECTION DRAIN

figure 2.2

GROUNDWATER COLLECTION DRAIN
TYPICAL CROSS–SECTION
REMEDIAL ACTION WORK PLAN
CONGRESS STREET PLANT
Schenectady International Inc.

CRA



LEGEND

● OW6A-92 MONITORING WELL LOCATION (CRA, 1992, 1994)

■ OW-3 MONITORING WELL LOCATION (THOMSEN ASSOCIATES, 1984)

◉ PROPOSED VERTICAL AQUIFER SAMPLING LOCATIONS

RAILROAD

FENCE

CULVERT

figure 3.1

PROPOSED VERTICAL AQUIFER SAMPLING LOCATIONS
REMEDIAL ACTION WORK PLAN
CONGRESS STREET PLANT
Schenectady International Inc.

CRA

1312 (30) APR 17/97(W) REV.0 (P-95)

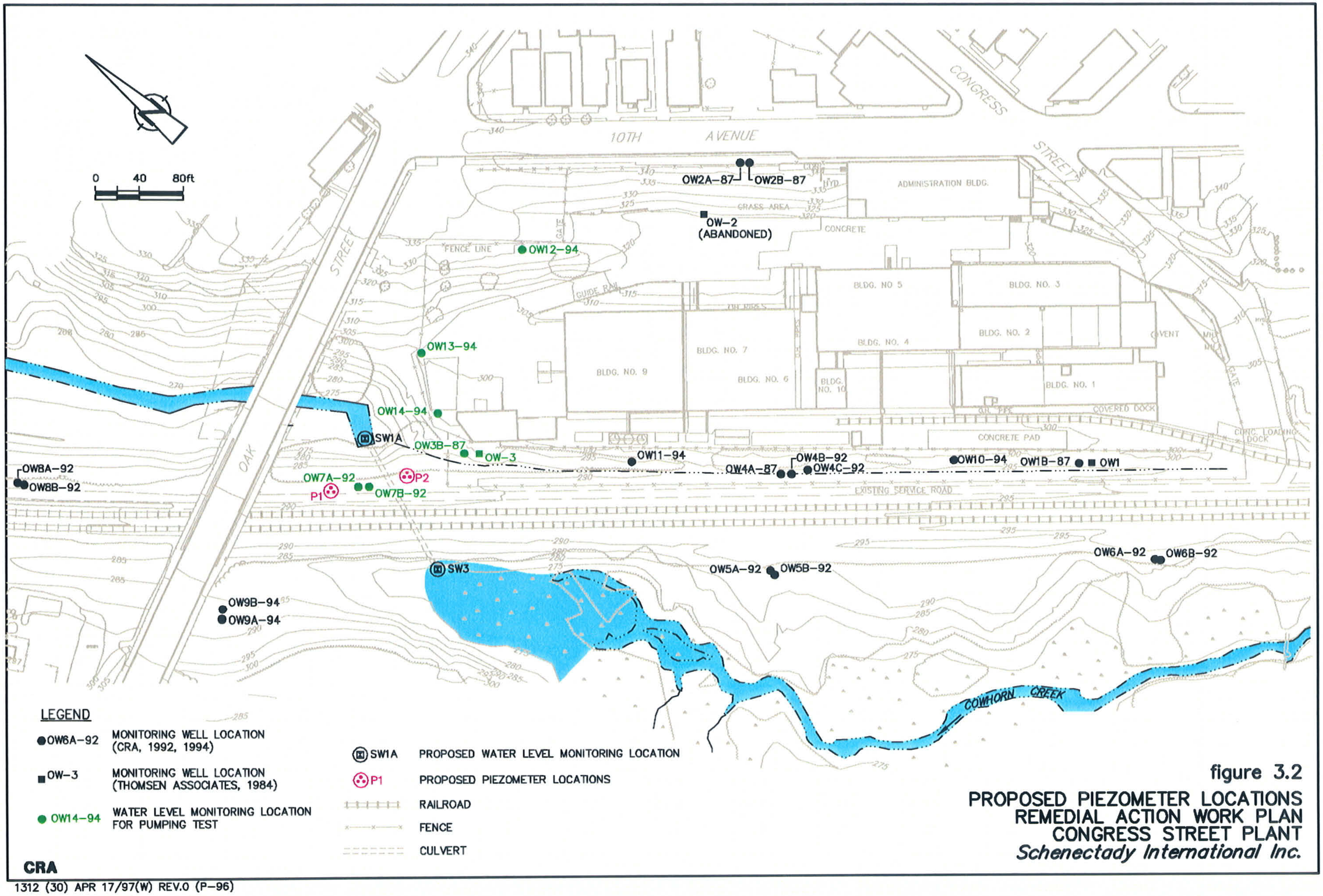


figure 3.2

PROPOSED PIEZOMETER LOCATIONS
REMEDIAL ACTION WORK PLAN
CONGRESS STREET PLANT
Schenectady International Inc.

1312 (30) APR 17/97(W) REV.0 (P-96)

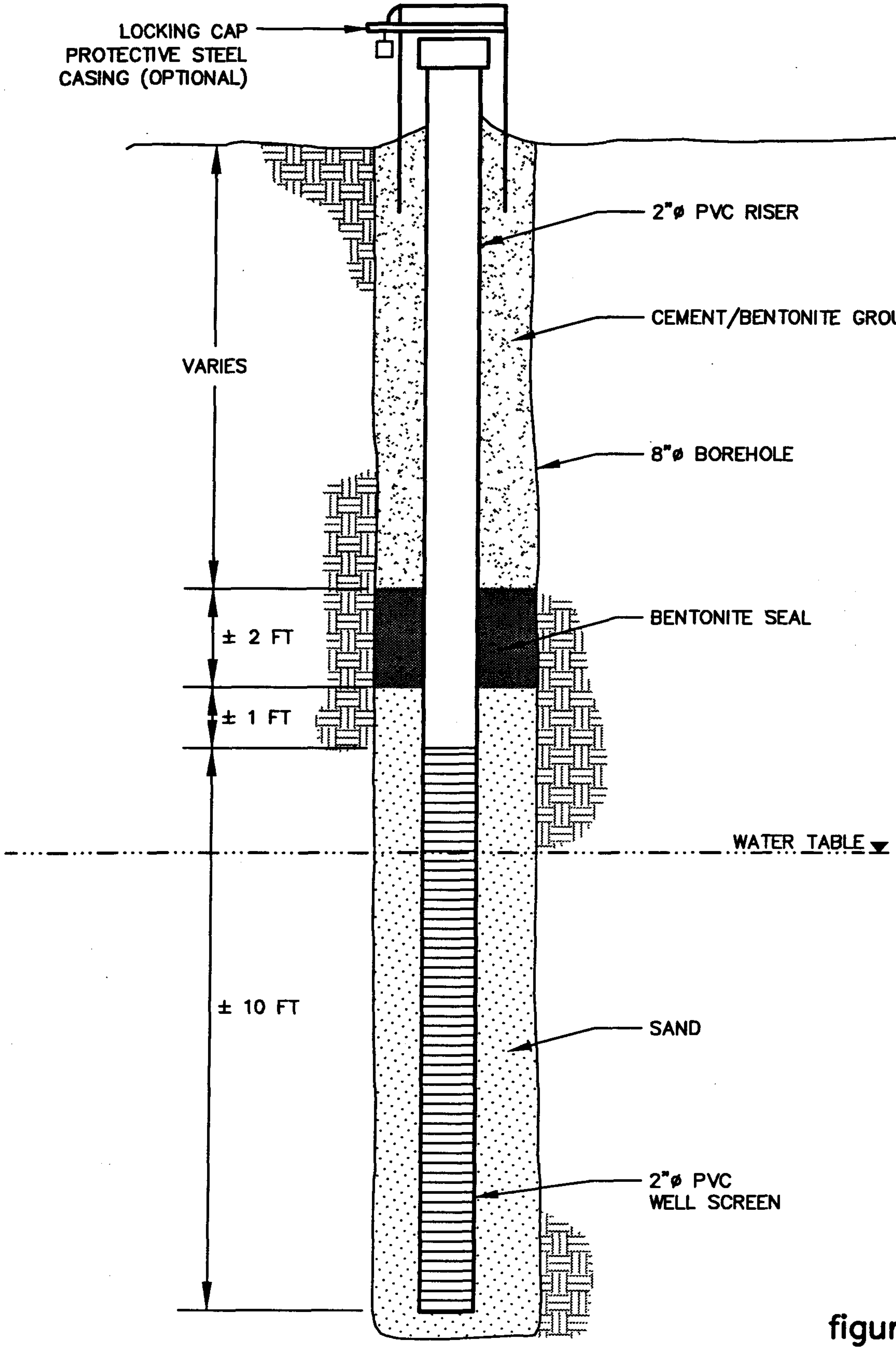


figure 3.3

TYPICAL PIEZOMETER INSTALLATION
REMEDIAL ACTION WORK PLAN
CONGRESS STREET PLANT
Schenectady Chemicals Inc.

CRA

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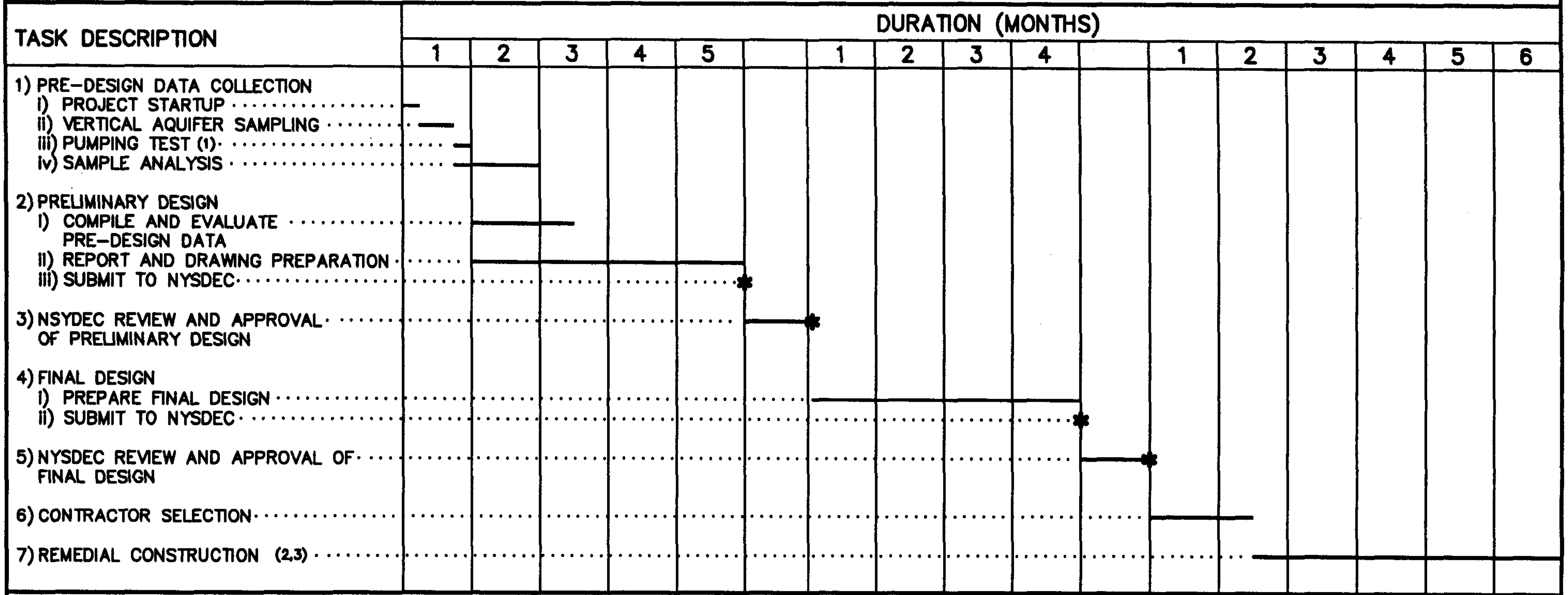

(1) SCHEDULE CONTINGENT UPON OBTAINING ACCESS TO CONRAIL PROPERTY

(2) SCHEDULE CONTINGENT UPON FAVORABLE WEATHER CONDITIONS FOR CONSTRUCTION

(3) CONSTRUCTION SCHEDULE TO BE FINALIZED IN FINAL DESIGN SUBMITTAL

figure 5.1

PROJECT SCHEDULE
REMEDIAL ACTION WORK PLAN
Schenectady International Inc.

CRA

1312 (30) APR 07/97(W) REV.0 (S–09)

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TABLE 3.1

PARAMETER LIST FOR GROUNDWATER TREATABILITY EVALUATION

Metals (total and soluble)(1)
VOCs
SVOCs
Total Organic Carbon (TOC)
Dissolved Organic Carbon (DOC)
BOD
Total and Soluble COD
Total Kjeldahl Nitrogen (TKN)
Ammonia
Nitrates
Nitrites
Alkalinity
Hardness
Total Dissolved Solids (TDS)
Total Suspended Solids (TSS)
Total and Soluble Phosphorous
pH
Oxidation-Reduction Potential (ORP)
Oil and Grease
Chlorides
Bromide
Fluoride
Sulfates
Cyanides

(1) metals include: aluminum, antimony, arsenic (III) and arsenic (V), barium, calcium, chromium, cobalt, copper, iron (II) and iron (III), lead, magnesium, manganese, mercury, nickel, potassium, sodium, selenium (IV) and selenium (VI), vanadium, and zinc.

A

APPENDIX A

HEALTH AND SAFETY PLAN

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FIGURE A.1.2 SITE PLAN

FIGURE A.11.1 EMERGENCY HOSPITAL ROUTE

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TABLE A.11.1 EMERGENCY CONTACTS

A.1.0 INTRODUCTION

The Schenectady International Inc. (SII) Congress Street Plant (Site) is located at Congress Street and Tenth Avenue in Schenectady, New York, as indicated on Figure A.1.1. The Site plan is presented on Figure A.1.2.

A program has been developed to collect pre-design data that will be used to prepare a Remedial Design for the Site. This program includes installation of piezometers, vertical aquifer sampling, and completion of a pumping test. Details of the program are presented in the report entitled "Remedial Action Work Plan".

This Health and Safety Plan has been designed to ensure:

i) that personnel working on Site are not exposed to any compounds that may be present at the Site;

ii) that the health and safety of the general public and the environment is not compromised by potential off-Site migration of contaminated materials due to this project; and

iii) compliance with applicable governmental and non-governmental (American Conference of Governmental Industrial Hygienists) regulations and guidelines.

All Site operations will be conducted in accordance with the provisions of the Health and Safety Plan. Cost and/or scheduling considerations will not be considered as justification for modifying this plan.

A.2.0 RESPONSIBILITIES AND ADMINISTRATION

A Site Representative will be assigned to this project and shall be responsible for all decisions regarding operations and work stoppage due to health and safety considerations.

The Site Representative's responsibilities include:

- supervision and enforcement of safety equipment usage, including the required use of extra equipment if appropriate,
- supervision and inspection of equipment cleaning,
- supervision of decontamination,
- supervision of air monitoring program,
- personnel training in safety equipment usage and emergency procedures,
- maintain Exclusion Zone (EZ) and Contaminant Reduction Zone (CRZ) work area,
- implementation of health and safety program,
- has authority to suspend work activity due to unsafe working conditions, and
- coordination of emergency procedures.

The implemented procedures will ensure safety to any visitors on Site as well as the general public. However, the Site Representative's responsibilities extend only to the employees of Conestoga-Rovers & Associates (CRA) and subcontractor employees.

A.3.0 WORKER TRAINING AND EDUCATION

Prior to commencing Site activities, a Health and Safety/Site Indoctrination Session will be presented by SII's plant safety staff and the Site Representative. Attendance is mandatory for all personnel who will be or are expected to be involved with the program.

The training program will ensure that each attendee understands the basic principles of personnel protection and safety, be able to perform their assigned job tasks in a safe and environmentally responsible manner and be prepared to respond in an appropriate manner to any emergency which may arise. The various components of the project Health and Safety Plan will be presented and an opportunity to ask questions will be provided to ensure that each attendee understands the Plan. Personnel not successfully completing this training program will not be permitted to enter or work in potentially contaminated areas of the Site.

This training will be given in addition to the basic training required under OSHA and is not intended itself to meet all of the requirements of 29 CFR 1910.120. Prior to working in or entering an Exclusion Zone Environment (as defined in Section A.4.0) <u>all</u> personnel will be required to provide documentation to the Site Representative indicating successful completion of the training requirements of 29 CFR 1910.120.

A copy of this Health and Safety Plan will be provided to all subcontractors involved in on-Site activities.

A.4.0 SITE OPERATION AND ORGANIZATION

The scope of work for this project involves installing monitoring piezometers, collecting groundwater samples, and completing a pumping test on an existing well. All active augering and sampling, as well as equipment cleaning, will require the use of the following types of Personal Protective Equipment (PPE):

i) Disposable, splash resistant Tyvek coveralls,
ii) Neoprene gloves,
iii) Hardhats (liners optional),
iv) Safety shoes with steel toes and shanks,
v) Rubber boots,
vi) Safety glasses with side shields, and
vii) Half-mask air purifying respirators equipped with cartridges suitable for organic vapors and acid gases (available in the event they are needed as discussed in Section A.7.0).

All respirator usage will be conducted in full compliance with the OSHA Respiratory Protection Standard in 29 CFR 1910.134.

PPE will be maintained in a clean sanitary condition and ready for use. Disposable coveralls shall be discarded when torn and as an employee leaves the contaminated work zone. A sufficient quantity of potable water shall be supplied for washing, cleaning PPE and drinking. A potable water supply for washing and cleaning PPE will be maintained adjacent to the decontamination area as described in Section A.5.0. Fresh potable water for drinking will be supplied on a daily basis and be maintained at a location removed from the active work area.

Designated work areas will be set up during all on-Site soil handling operations. The purpose of these procedures is to limit access to contaminated areas, and prevent the migration of hazardous materials into adjacent non-contaminated areas. These areas are as follows:

i) <u>The Exclusion Zone (EZ)</u> is the area immediately surrounding the drilling operation. Sufficient area will be provided for efficient movement of personnel and equipment as well as contaminant control. Boundaries are modifiable depending on operational requirements. The Site Representative will be responsible for maintaining the boundaries of this area. Personnel entering this area are required to wear the full PPE as defined above. Exclusion Zones shall be set up at each drilling location as appropriate. A wind direction indication device (i.e. flagging, windsock, etc.) will be mounted in the area of any Exclusion Zone.

In the event that unauthorized personnel enter the work area, work will stop and the Site Representative will remove the unauthorized personnel from the work area. Work will not resume until the unauthorized personnel have been removed from the work area. General access to the Site itself is controlled by SII's security department.

At the conclusion of each working day, all drill cuttings and spent protective equipment shall be secured in sealed drums at the drill site in the fenced area of the Site.

Sealed drums will be stored adjacent to the decontamination facility. The drum storage area will be designated as an EZ, and be signed, fenced and placed on appropriate protective material (e.g. polyethylene). Drums will be stored until a full truck load has accumulated or for a maximum of 90 days, whichever is less, at which time they will be hauled off Site for disposal in accordance with New York State regulations.

ii) <u>The Contaminant Reduction Zone (CRZ)</u> lies immediately upwind of the EZ. Personnel entering or leaving the EZ will use this area for donning and disposing of PPE. Labelled drums will be provided for disposal purposes. Supplemental safety equipment, such as fire extinguishers, portable eyewash and extra quantities of PPE may be stored in this area. The order in which safety equipment is to be donned is as follows:

- Tyvek suit
- rubber boot

- respirator, if required
- hard hat
- gloves

The following order applies when removing safety equipment:

- wash off boots prior to removal
- Tyvek suit
- gloves
- hard hat
- respirator, if appropriate

A CRZ will be set up in conjunction with each EZ.

iii) Additional PPE usage guidelines are as follows:

a. Prescription eyewear used on Site shall be safety glasses equipped with side shields. Contact lenses shall not be used.

b. All respiratory usage will be in accordance with the action levels presented in Section A.7.0. Written standard operating procedures governing the selection and use of respirators at the Site will be distributed to all workers at the initial Site meeting. These procedures will include information and guidance necessary for proper respirator selection, use and care. All EZ workers will have received training in the usage of self-contained breathing apparatus which may be required in an emergency.

c. Steel toed leather footwear shall be covered with neoprene overboots prior to entering the EZ and immediately upon entering the CRZ.

d. Safety footwear and hard hats are to be worn by Site personnel at all times.

EZ personnel also carry certain responsibilities for their own health and safety, and are required to observe the following safe work practices:

i) Familiarize themselves with this Health and Safety Program.

ii) Use the "buddy system" when working in a contaminated operation.

iii) Use the safety equipment in accordance with training received, labelling instructions and common sense.

iv) Maintain safety equipment in good condition and proper working order.

v) Refrain from activities that would create additional hazards (i.e. smoking, eating, etc. in restricted areas, leaning against dirty, contaminated surfaces).

vi) Eating will be prohibited except in designated areas. These designated areas may change during the duration of the project to maintain adequate separation from the active work area(s). Designation of these areas will be the responsibility of the Site Representative.

vii) Soiled disposable outerwear shall be removed prior to washing hands and face, eating, using lavatory facilities or leaving the Site. Portable lavatory facilities will be provided adjacent to the Decon area.

A.5.0 DECONTAMINATION/EQUIPMENT CLEANING

The existing on-Site decontamination pad (Decon area) will be used for cleaning equipment on Site. The area will be classified as an Exclusion Zone with all EZ requirements as presented in Section A.4.0.

Prior to mobilization, the drilling rig and all associated equipment will be thoroughly cleaned using a pressurized low volume water wash or steam clean to remove oil, grease, mud and other foreign matter. Subsequently, before initiating drilling at each location, the augers, cutting bits, samplers, drill steel and associated equipment will be thoroughly cleaned, at the Decon area, to prevent potential cross-contamination from the previous drilling location. The equipment will be inspected by the Site Representative after cleaning, prior to initiation of drilling. Cleaning will be accomplished by flushing and wiping the components to remove all visible sediments followed by a thorough pressurized wash. Special attention will be given to the threaded sections of the drill rods and split spoon samplers.

Sampling equipment decontamination will be conducted in accordance with the protocols presented in Section 3.5 of the RA Work Plan.

A.6.0 GENERAL SAFETY

i) Eating at the Site is prohibited except in specifically designated areas. Designation of eating areas will be the responsibility of the Site Representative. The location of these areas may change during the duration of the project to maintain adequate separation from the active work area(s).

ii) Smoking at the Site is prohibited.

iii) Individuals getting wet to the skin with purged groundwater or effluent from the washing operation must wash the affected area immediately. If clothes in touch with skin are wet, then these must be changed.

iv) Hands must be washed before eating and drinking, and before using toilets at the facilities provided.

v) All disposable coveralls and soiled gloves will be disposed of in 55-gallon drums at the end of every shift or sooner, if deemed necessary by the Site Representative. Drums will be stored at the interim drum staging area.

vi) All decontamination fluids should be collected on Site and disposed in accordance with New York State and Federal Regulations.

vii) Facial hair such as beards and long sideburns which interfere with respirator fit are prohibited.

A.7.0 RESPIRATOR PROGRAM

All on-Site personnel will receive training in the use of, and be fit tested for both half- and full-facepiece respirators. All on-Site personnel requested to work within the Exclusion Zones will also receive training in supplied air breathing apparatus.

Levels of respiratory protection have been chosen to be consistent with the Site-specific potential airborne hazards associated with the Site. The selection of appropriate protection is based upon the potential airborne presence of compounds with the lowest recommended threshold limit value, their concentration levels in on-Site media, and upon the type of work activity being conducted. The two types of activity potentially requiring the use of respiratory protection include drilling and associated handling of contaminated materials. Table A.7.1 summarizes compounds identified on Site and available respiratory criteria.

Prior to commencing drilling and regularly during the active drilling, both the Contaminant Reduction Zones and the Exclusion Zones will be monitored with appropriate monitoring equipment to determine the level of respiratory protection required. Since all of the potential volatile organic constituents identified at the Site, with the exception of several less volatile base/neutral organic compounds have eight-hour time weighted average (TWA) threshold limit values (TLVs), it is not necessary to have personnel working in the Exclusion Zones continuously use respiratory protection. If air monitoring indicates a need for respiratory protection, personnel in the Exclusion Zones would have the necessary time to don the appropriate respiratory equipment which would be available within the immediate area of active work locations. The donned respiratory equipment may not be removed until approval is given by the Site Representative based on the real time air monitoring.

In the absence of additional air monitoring information, the following action levels, as determined by appropriate monitoring, an HNu plus a Drager® benzene tube, or equivalent equipment, will determine the level of respiratory protection if the air contaminants cannot be identified and other adequate personal protection measures are taken:

Benzene Concentration Above Background (ppm)	*Total Organic Vapor Concentration Above Background (ppm)*	*Level of Respiratory Protection Required*
0 - 1	0 - 5	Respiratory Protection not required but shall be immediately available
1 - 10	5 - 50	Half face air purifying respirator (APR)
10 - 50	50 - 250	Full-facepiece air purifying respirator (APR)
>50	>250	Supplied air system

Any personnel who are required to handle drums/containers of unknown content will be using supplied air until the contents and associated respiratory hazards, if any, are known. Any subsequent handling of characterized containerized materials will be performed under the appropriate level of respiratory protection to be determined by the Site Representative based on the characterization data in consultation with the Engineer. The handling of overpacked/repacked waste containers during on-Site transportation and at the staging cell (container closed) will require the use of APRs.

During drilling, an appropriate meter will be used to monitor total organic vapor readings immediately adjacent to the borehole, in the breathing zone and at the boundary of the Exclusion Zone. Monitoring will be at a regular frequency determined by the Site Representative.

Cartridges to be used in the full facepiece air purifying respirators will be made by the same manufacturer as the facepieces in accordance with OSHA regulations. All air purifying respirators will be provided with combination organic vapor, acid gases and high efficiency particulate cartridges.

Personal and perimeter air monitoring data will be collected as outlined in the air monitoring plan (see Section A.8.0). Data generated by this sampling will also be used to modify on-Site activities or to determine if the level of respiratory protection may require adjustment.

The Site Representative will be responsible for implementing, maintaining and enforcing the respirator program.

On-Site personnel unable to pass a respirator fit test will not enter or work in any Exclusion Zones or Contaminant Reduction Zones when hazardous wastes are exposed to the atmosphere.

Respiratory protection will be upgraded to a supplied air system if oxygen levels fall below 19.5 percent; if levels of toxic vapors are determined to be present at concentrations which present Immediate Danger to Life and Health (IDLH) conditions; or, if personnel must work in confined spaces which have not been demonstrated to be "free" of toxics.

A.8.0 AIR MONITORING

A.8.1 GENERAL

During the progress of drilling activities, the Site Representative will complete real-time air monitoring for on-Site air quality. Real-time air monitoring will be conducted for explosive gases, oxygen levels, carbon monoxide, and total volatile organic vapors. The Site Representative will review all of the air data collected during the course of the project on an ongoing basis and will modify those work practices as necessary.

A.8.2 BACKGROUND MONITORING

Background monitoring for total organic vapors using real-time monitoring will be conducted prior to initiating drilling activities and throughout the period of Site preparation.

During this period of time, background readings will also be collected with an explosimeter and oxygen meter to establish baseline conditions prior to drilling.

A.8.3 REAL-TIME AIR MONITORING

Real-time air monitoring with an appropriate instrument that has been appropriately calibrated will be conducted by the Site Representative once every two hours. Monitoring will be conducted at two Exclusion Zone perimeter locations downwind of drilling activities and at one Exclusion Zone perimeter location which is upwind of the drilling location.

If actual field operations reveal that bi-hourly sampling of the downwind Exclusion Zone perimeter locations is not practical or necessary, adjustments may be made after consultation between the Site Representative and the NYSDEC Representative. Any such modifications shall be memorialized in writing.

If, during the real-time monitoring, an unexplained meter reading of greater than 5 ppm above background ("background" shall mean the readings obtained at an upwind location which is not being impacted by Site activities) is sustained for a duration of thirty seconds at a downwind Exclusion Zone perimeter monitoring location, the Site Representative shall review and modify work procedures at the Site to minimize the potential of air emission levels greater than 5 ppm above background at the Exclusion Zone.

In addition to the Exclusion Zone perimeter monitoring the Site Representative shall monitor the immediate area of active work in the breathing zone to evaluate requirements for respiratory use guidelines. These data combined with the perimeter monitoring will be evaluated to determine when excavation activities need to be modified or shut-down due to poor air quality.

A.8.4 WIND DIRECTIONAL MONITORING

The Site Representative will furnish and maintain a wind circulation sock at the work area to provide information to assist in the determination of the direction of any potential emissions migrating from Site. Perimeter air monitoring locations may be adjusted based upon the wind directional monitoring.

A.8.5 ANALYSIS CALIBRATION AND DATA REPORTING

Calibrations of all monitoring equipment will be completed by the Site Representative on a daily basis.

Written data sheets detailing monitoring results will be maintained by the Site Representative. The air monitoring report forms will include the following information:

i) Site Location/Date

ii) Work Process/Operation Name
iii) Sampling Method Used
iv) Instrument Calibration Record at Sample Location
v) Temperature, Pressure, Humidity at Sample Location
vi) Area Sampling Location Diagram
vii) Area Sample Description/Location
viii) Field Notes
    - Description of Operations and Complaints/Symptoms
    - Chemicals/Materials/Equipment in Use
    - Engineering/Administration Controls in Effect
    - Personal Protective Equipment in Use
    - Sampling Observations/Comments

A.9.0 EMERGENCY AND FIRST AID EQUIPMENT AND SUPPLIES

The safety equipment listed below will be supplied for use by EZ personnel and will be located in close proximity to the work zone (i.e. in the CRZ).

i) 20-pound ABC type dry chemical fire extinguishers (one per drill rig).
ii) OSHA approved first aid kit sized for a minimum of five people.
iii) Emergency eyewash/shower.

A.10.0 MEDICAL EXAMINATION

Pre and post physical examinations will be required for all persons working on Site with the exception of persons who are already receiving suitable medical examinations on a regular basis. All subcontractors will assume responsibility for ensuring that their employees have received appropriate examinations. All contractors/subcontractors will provide certification that appropriate medical exams have been performed. This certification will be provided to the Site Representative prior to work commencing. All on-Site personnel, regardless of the length of employment, will be entitled to a follow up medical examination up to one year after such individual is no longer working at the Site. The results of the medical examination will be retained by the physician or physician group performing the examinations. The physician or physician group is required to make a report to the Site Representative if an individual has increased risks.

Employers will comply with OSHA regulations regarding the retention of medical or other records. Upon request to the examining physician or physician group, each on-Site personnel shall be furnished with a copy of such individual's examination.

A.11.0 EMERGENCY RESPONSE PLAN

A.11.1 EMERGENCY CONTINGENCY PLAN

In the event of serious injury to on-Site personnel or contact with hazardous materials requiring medical attention, the Site Representative will ensure that the following protocol will be followed:

i) in the event of an injury or chemical exposure, notify the Site Representative;

ii) notify the Plant entry gate security guard who will be responsible for contacting the necessary off-Site emergency facilities. Table A.11.1 contains a list of emergency telephone numbers;

iii) decontaminate personnel and administer appropriate first aid as required;

iv) transport personnel to the designated medical facility. The closest medical facilities to the Site are the Saint Clare's Hospital followed by the Ellis Hospital. The most direct route to the hospital is presented on Figure A.11.1.

The following directions describe the best route to Saint Claire's Hospital:

1) From the Site exit, turn right onto Tenth Avenue,
2) Turn right onto Crane Street,
3) Turn left onto Lakeview Rd,,
4) Turn right onto Chrisler Avenue,
5) Turn left onto Michigan Avenue,
6) Turn right onto State Street,
7) Turn left onto McClellan Street to Saint Clare's Hospital,
8) Follow signs to Emergency Room.

Fire fighting equipment (extinguishers) will be maintained in strategic locations within the Site to combat localized fires. The locations will be marked by an appropriate and highly visible sign.

In the event that an accident or some other incident such as an explosion or an exposure to toxic chemical levels occurs during the course of the project, the Site Representative shall notify the Plant security guard immediately and undertake corrective actions. The Site Representative shall sound the fire alarm should conditions warrant evacuation of the area of the incident. The Site Representative shall provide a written report, within 24 hours. The report will include the following items:

a) Name, organization, telephone number, and location of the subcontractor,
b) Name and title of the person(s) reporting the incident,
c) Date and time of accident/incident,
d) Location of accident/incident giving pertinent details,
e) Brief summary of accident/incident giving pertinent details including type of operation ongoing at time of accident,
f) Cause of accident/incident, if known,
g) Casualties (fatalities, disabling injuries),
h) Details of any existing chemical hazard of contamination,
i) Estimated property damage, if applicable,
j) Nature of damage and effect on contract schedule,
k) Action taken by the subcontractor to ensure safety and security, and
l) Other damage or injuries sustained (public or private).

An appropriate incident report will be completed by the Site Representative.

Following Site mobilization and prior to excavating, the Site Representative will establish designated meeting places for personnel in the event that on-Site work zone evacuation is required. The Site Representative will select these locations such that they are upwind of work zones based on wind directional monitoring.

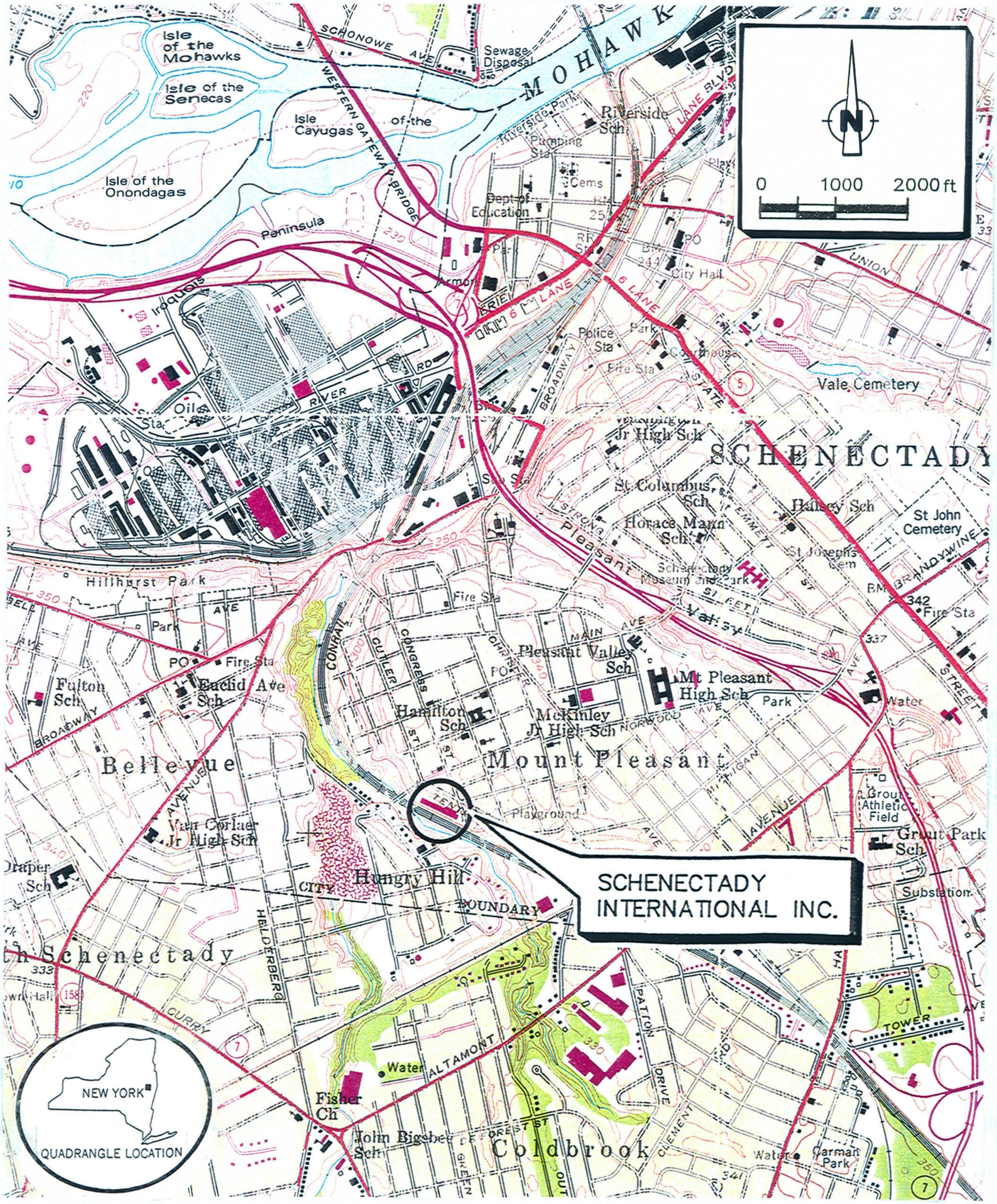


figure A.1.1

SITE LOCATION
REMEDIAL ACTION WORK PLAN
CONGRESS STREET PLANT
Schenectady International Inc.

SOURCE:

U.S.G.S. SCHENECTADY, N.Y.
SW/4 SCHENECTADY 15' QUADRANGLE

CRA

1312 (30) APR 17/97(W) REV.0

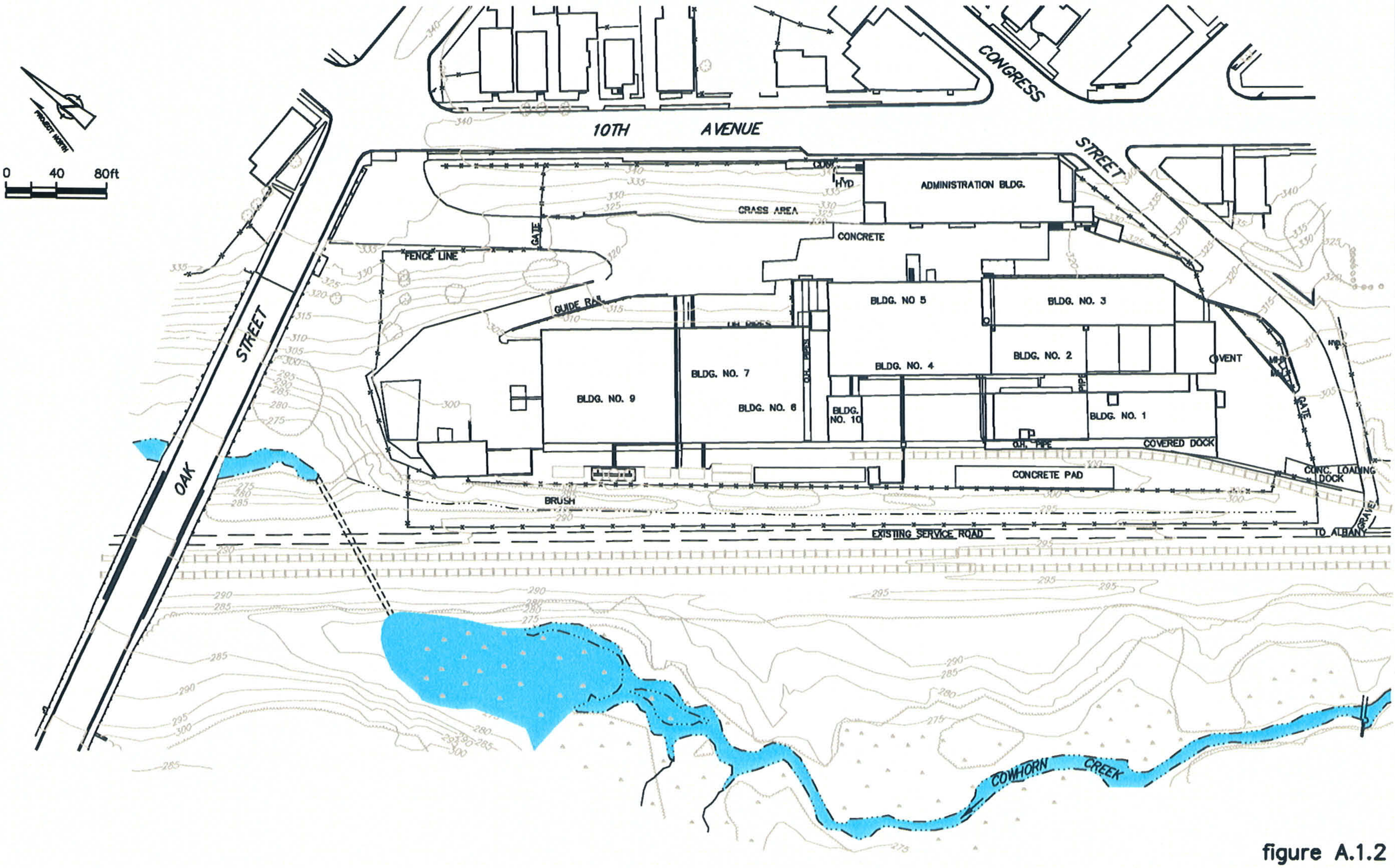
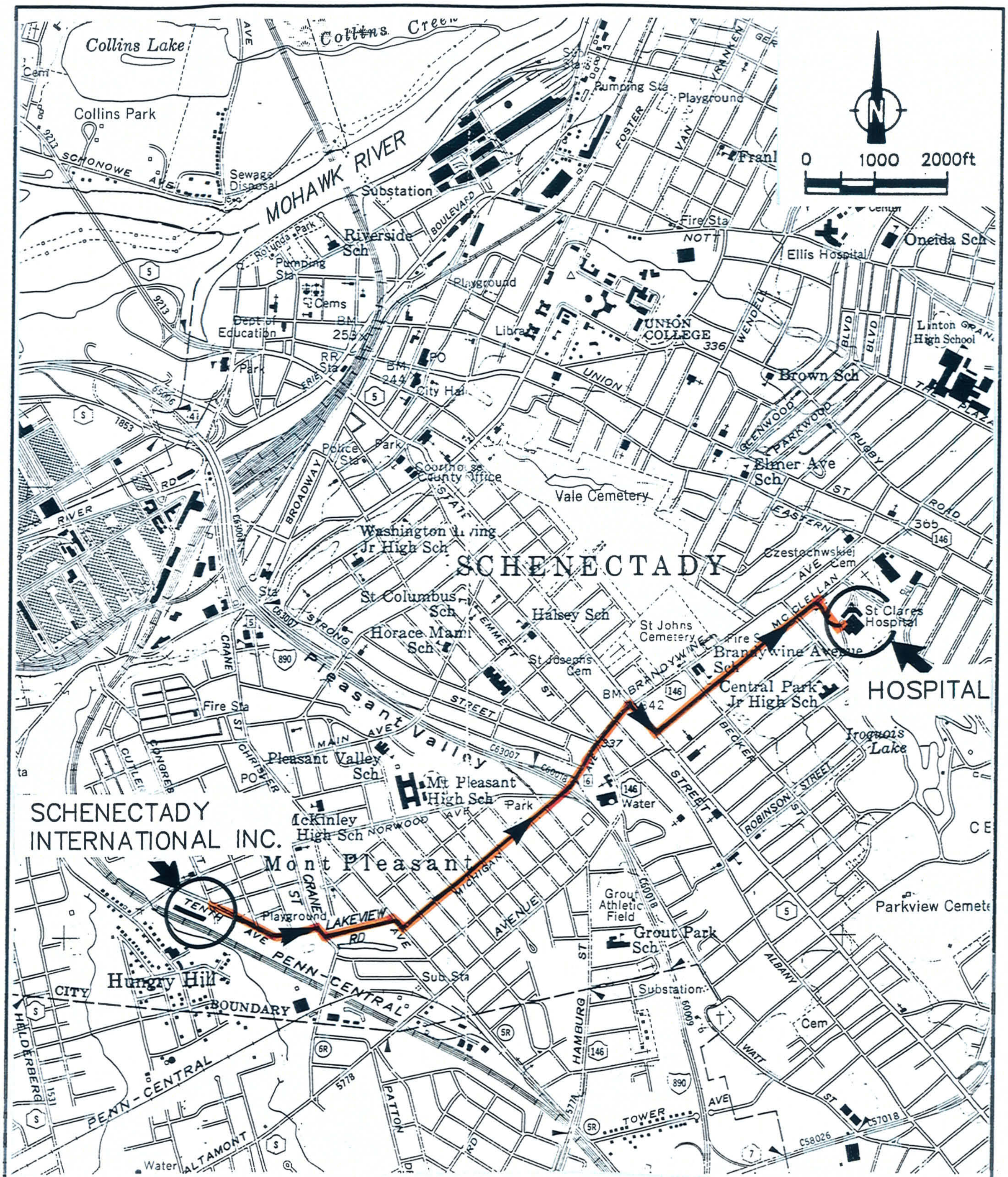


figure A.1.2

SITE PLAN
REMEDIAL ACTION WORK PLAN
CONGRESS STREET PLANT
Schenectady International Inc.

CRA
1312 (30) APR 17/97(W) REV.0 (P-99)



SOURCE: NEW YORK STATE DEPARTMENT OF TRANSPORTATION (1974)

figure A.11.1

HOSPITAL ROUTE
REMEDIAL ACTION WORK PLAN
CONGRESS STREET PLANT
Schenectady International Inc.

CRA

1312 (30) APR 17/97(W) REV.0

TABLE A.7.1

IDENTIFIED CHEMICAL COMPOUNDS AND RESPIRATORY CRITERIA(1)

Compound	*TWA(2)(3)* *(ppm)*	*(mg/m³)*	*STEL(2)(4)* *(ppm)*	*(mg/m³)*	*IDLH(5)* *(ppm)*
Volatile Organics					
Benzene(6)	1/10, A2	3/30, A2	–	–	2,000
Ethylbenzene	100	435	125	545	2,000
Tetrachloroethylene	50	339	200	1,368	–
Trans-1,12-Dichloroethylene	200	793	–	–	4,000
Trichloroethylene	50	270	200	1,080	1,000
Total Xylenes	100	434	150	651	1,000
Toluene	100	375	150	560	2,000
Vinyl Chloride	5,A1	13, A1	–	–	–
Trimethylbenzene	25	123	–	–	–
Semi-Volatiles					
Phenol	5	19	–	–	100
2-Methylphenol	–	–	–	–	–
4-Methylphenol	–	–	–	–	–
2,4-Dimethylphenol	–	–	–	–	–
Napthalene	10	50	15	75	500
2-Methylnaphthalene	–	–	–	–	–
Acenaphthene	–	–	–	–	–
Fluorene	–	–	–	–	–

Notes:

(1) Based on previous site studies.
(2) Data from "Threshold Limit Values and Biological Exposure Indices for 1987-1988", ACGIH.
(3) TWA - 8 hr time weighted average.
(4) STEL - 15-min time weighted average.
(5) IDLH (Immediately Dangerous to Life or Health) values from "NIOSH Pocket Guide to Chemical hazards" National Institute for Occupational Safety and Health, September 1985.
(6) OSHA PEL dependent on type of work operation and exposure levels. Higher PEL permitted where exposure to benzene is from liquid mixtures containing less than 0.1% benzene by volume or vapors from such liquids after September 12, 1989. Refer to 29 CFR 1910.1028.

A1 Confirmed human carcinogen - recognized to have carcinogenic potential. Reference "Threshold Limit Values and Biological Exposure Indices for 1987-1988", ACGIH.
A2 Suspected human carcinogen. Exposure to carcinogens must be kept to a minimum. Reference - "Threshold Limit Values and Biological Exposure Indices for 1987-1988", ACGIH.

TABLE A.11.1

EMERGENCY CONTACTS

Emergency	*Organization/Agency*	*Emergency #*
Injury	1. Schenectady Fire Dept. (Emergency Medical Aid)	374-3111
	2. Ellis Hospital, Schenectady, New York	382-4121
	3. St. Clare's Hospital, Schenectady, New York	382-2222
Poison	1. Ellis Hospital, Schenectady, New York	382-4121
	2. St. Mary's Hospital Center Troy, New York	272-5000 (X5792)
	3. New York City Poison Control Center	(212) 304 4494
Fire/ Explosion	1. Schenectady Fire Department	374-3111
Hazardous Material Spill or Release	1. Schenectady Fire Department (if required)	374-3111
	2. New York State Department of Environmental Conservation (24-hour Hotline)	457-7362
	3. National Response Center (EPA 24-Hour Hot Line)	(800) 424-8802
	4. New England Pollution Control Co., Inc.	(203) 853-1990 (716) 343-6444

TABLE A.11.1

EMERGENCY CONTACTS

Emergency	*Organization/Agency*	*Emergency #*
Natural	1. New York State Waterways Maintenance - Lock #8	346-3382
	2. New York State - Section Superintendant	
	Mr. Al Ferris (Office)	237-0613
	(Home)	237-0269
	3. New York State - Region Waterways Engineer	
	Mr. John Hulchanski (Office)	474-6715
	(Home)	785-5748
	1. Schenectady Police Department	374-7744
	2. Schenectady County Sherriff's Office	382-3300
	3. New York State Police (24 hours), Albany, New York	457-6811
	4. American Red Cross, Schenectady, New York	393-3606

B

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

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B.1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) presents the policies, organization, objectives, functional activities and specific Quality Assurance (QA) and Quality Control (QC) activities designed to achieve the specific data quality goals associated with the proposed Remedial Action Work Plan, to be implemented relative to the Schenectady International, Inc. (SII) facility (Site) located at Congress Street and Tenth Avenue in Schenectady, New York. Specific locations and areas to be addressed by the Remedial Action, are identified in the Work Plan entitled "Remedial Action Work Plan, Congress Street Plant, Schenectady International, Inc".

The QAPP has been prepared to identify procedures for sample preparation and handling, sample chain-of-custody, laboratory analyses, and reporting to be implemented during this investigation to ensure the accuracy and integrity of the data generated.

A laboratory will be selected for the analyses of the sample upon approval of the QAPP. The laboratory will be CLP as well as NYSDOH ELAP certified.

B.2.0 PROJECT DESCRIPTION

B.2.1 GENERAL

The RA Work Plan has identified investigation activities to be implemented to obtain additional data necessary to complete the Remedial Design. The additional information collected will supplement the available data from the Site.

The current program will include:

- piezometer installation;
- vertical aquifer sampling; and
- pumping test and groundwater sampling.

B.2.2 SCHEDULE

The anticipated duration of the Remedial Action is identified in the Work Plan.

B.2.3 SAMPLING PROGRAM

The sampling program to be implemented will include the collection and analyses of groundwater samples from new soil borings and from monitoring well OW7a. Details regarding sampling procedures and protocols are provided in the Work Plan.

B.3.0 PROJECT MANAGEMENT

The Remedial Action Work Plan activities will be initiated by Conestoga-Rovers & Associates (CRA). The CRA project organization chart is presented in Figure B.3.1. A brief description of the duties of the key personnel are presented below.

J. Kay - Project Director

- provides overall project management
- ensures professional services by CRA are cost effective and of highest quality
- ensures all resources of CRA are available on an as-required basis
- participates in key technical negotiations with NYSDEC
- provides managerial and technical guidance to CRA's Project Coordinator

Jamie Puskas - Project Manager

- provides day-to-day project management
- provides managerial guidance to CRA's technical group
- provides technical representation at meetings as appropriate
- acts as liaison between the technical group and SII
- acts as liaison with NYSDEC
- reviews reports

Rich Snyder - Project Engineer

- assists with day-to-day project coordination;
- coordinates field investigation tasks; and
- evaluates data and prepares reports

Denise Tuhovak - CRA Quality Assurance/Quality Control Officer Analytical Activities

- overviews and reviews laboratory activities
- determines laboratory data corrective action
- performs analytical data validation and assessment
- reviews laboratory QA/QC
- assists in preparation and review of final report
- provides technical representation for analytical activities.

Site Coordinator - CRA Quality Assurance/Quality Control Officer
Field Activities

- provides immediate supervision of all on-site activities
- provides field management of sample collection and field QA/QC
- assists in preparation and review of final report
- provides technical representation for field activities
- is responsible for maintenance of the field equipment
- the individual designated to be Site Coordinator will be specified prior to commencement of field activities.

Laboratory - Project Manager, Analytical Contractor

- ensures resources of laboratory are available on an as-required basis
- coordinates laboratory analyses
- supervises laboratory's in-house chain-of-custody
- schedules analyses of samples
- oversees review of data
- oversees preparation of analytical reports
- approves final analytical reports prior to submission to CRA.

Laboratory - Quality Assurance/Quality Control Officer
Analytical Contractor

- overviews laboratory QA/QC
- overviews QA/QC documentation
- conducts detailed data review
- decides laboratory corrective actions, if required
- provides technical representation for laboratory QA/QC procedures.

Laboratory - Sample Custodian - Analytical Contractor

- receives and inspects the sample containers
- records the condition of the sample containers
- signs appropriate documents
- verifies chain-of-custodies and their correctness
- notifies laboratory project manager and laboratory QA/QC Officer of sample receipt and inspection
- assigns a unique laboratory identification number correlated to CRA's sample identification number, and enters each into the sample receiving log

- initiates transfer of the samples to the appropriate lab sections with assistance from the laboratory project manager
- controls and monitors access to and storage of samples and extracts.

Primary responsibility for data quality rests with CRA's QA/QC Officer - Analytical Activities and CRA's QA/QC Officer - Field Activities. Ultimate responsibility for project quality rests with CRA's Project Manager. Independent quality assurance will be provided by the laboratory's Project Manager and QA/QC Officer prior to release of the data to CRA.

The analytical laboratory chosen to perform the proposed work will be certified by the NYSDOH through the Environmental Laboratory Approval Program (ELAP) for the categories of analysis.

B.4.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for sample preparation and handling, sample chain-of-custody, laboratory analyses and reporting, which will provide accurate data. Specific procedures to be followed for sampling, sample custody and document control, calibration, laboratory analyses and data reduction, validation, assessment and reporting are presented in Sections B.5.0 through B.9.0 of this QAPP.

The purpose of this Section is to define the goals for the level of QA effort; namely, accuracy; precision and sensitivity of analyses; and completeness, representativeness and comparability of measurement data from the analytical laboratories. QA objectives for field measurements are also discussed.

Data quality objectives (DQOs) have been established in accordance with the USEPA guidance document entitled "Data Quality Objectives for the RI/FS Process", dated March 25, 1986 and the NYSDEC guidance document entitled "RCRA Quality Assurance Project Plan Guidance", dated August 1989 to ensure that the data base developed during the investigation meets the objectives and quality necessary for its intended use, namely, to further define the understanding of hydrogeologic and environmental conditions at the Site.

B.4.1 LEVEL OF QA EFFORT

To assess the quality of data resulting from the field sampling program, field duplicate samples, field blank samples, samples for laboratory matrix spike/matrix spike duplicate (MS/MSD) analyses, trip blanks and rinsate blank samples will be collected (where appropriate) and submitted to the contract laboratory.

For all field samples collected, field duplicate samples will be submitted at a frequency of one per 10 investigative samples or in the event that a sampling round consists of less than 10 samples, one field duplicate will be collected. Field blank samples will be collected at a frequency of one per 20 investigative samples. MS/MSD samples will be analyzed at a minimum frequency of one in 20 field investigative samples. Rinsate blanks will be submitted at a frequency of one per 20 investigative samples in the event that non-dedicated sampling equipment is used. Trip blanks will be submitted with each cooler containing aqueous VOCs.

The sampling and analysis program is summarized in Table B.4.1, which lists the specific parameters to be measured, the number of samples to be collected and the level of QA effort required for each matrix.

Groundwater samples will be analyzed for Target Compound List (TCL) volatiles, and TCL semi-volatiles. Samples collected during the pumping test will be analyzed for TCL VOCs, TCL SVOCs, metals, and general chemistry parameters. Compounds, analytes and target detection limits are presented in Tables B.4.2 and B.4.3.

Field blanks will be analyzed to check procedural contamination and/or ambient conditions and/or sample container contamination at the Site that may cause sample contamination.

Matrix spike and matrix spike duplicate samples will be analyzed as a check on the analytical method's accuracy and precision. Trip blank samples (for VOC determinations only) will be shipped by the laboratory to the Site and back to the laboratory without opening in the field. The trip blank will provide a measure of potential cross-contamination of samples resulting from shipment, handling and/or ambient conditions at the Site. Rinsate blank samples will be collected and analyzed as a check on the efficiency of the sampling device cleansing protocols.

B.4.2 ACCURACY, PRECISION AND SENSITIVITY OF ANALYSES

The fundamental QA objective with respect to the accuracy, precision and sensitivity of analytical data is to achieve the QC acceptance of each analytical protocol. The sensitivities required for these analyses will be at least the targeted detection limits listed on Tables B.4.2 and B.4.3. It should be noted that these limits are targeted detection limits only; lower detection limits, if achieved by the laboratory, will be substituted for the targeted detection limits in the final report.

The method(s) precision (relative percent difference of duplicate analysis) will be determined from the duplicate analyses of matrix spike samples. A minimum of one sample in each batch of 20 will be spiked and analyzed in duplicate. Analysis will compare with the criteria presented in the appropriate methods identified in Section B.8.0.

The method(s) accuracy (percent recovery) for water and soil samples will be determined by spiking selected samples (matrix spikes) with test compounds. Accuracy will be reported as the percent recovery of the test compound and will compare with the criteria given in the appropriate methods as identified in Section B.8.0.

B.4.3 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

It is expected that all analyses conducted in accordance with the methods will provide data meeting QC acceptance criteria for 80 percent of all samples tested. Any reasons for variances will be documented.

The sampling networks have been designed to provide data representative of Site conditions. During development of these networks, consideration was given to past disposal practices, existing data from past studies completed for the Site and physical setting. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data are documented in this QAPP. However, it may be necessary to verify similar documentation from previous analytical data to adequately establish comparability. Comparability of laboratory analyses will be ensured by the use of consistent units. Following completion of data collection, the existing data base will be evaluated for representativeness.

B.4.4 FIELD MEASUREMENTS

Field measurements and observations will assist in the interpretation of analytical results obtained. Therefore, it is important that these measurements and observations be as complete as possible. For each sample collected, the following shall be recorded in indelible ink in the field log book:

i) Site location identification;
ii) depth interval of sample;
iii) unique sample identification number;
iv) date and time (in 2400 hour time format) of sample collection;
v) weather conditions;
vi) designation as to the type of sample (soil, sediment, etc.);
vii) designation as to the means of collection (split spoon, etc.);
viii) brief description of the sample, including pH, specific conductivity and temperature of water samples;
ix) name of sampler;
x) analyses to be performed on sample; and
xi) any other relevant comments such as odor, staining, texture, size of area sampled, etc.

The general QA objective for measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the use of standardized procedures.

B.5.0 SAMPLING PROCEDURES

The procedures for collecting samples and for performing all related field activities are described in detail in the Work Plan. Required sample containers, sample preservation methods and maximum sample holding times are summarized in Table B.5.1.

B.6.0 SAMPLE CUSTODY AND DOCUMENT CONTROL

B.6.1 CHAIN-OF-CUSTODY

A Chain-of-Custody will be maintained to document the transfer of sample containers. An example of the Chain-of-Custody to be used is presented in Figure B.6.1. Each sample container will be properly sealed. Sample container labels will include sample number, place of collection and date and time of collection. Sample containers will be shipped to the Contract Laboratory at 4°C (±2°C) in sealed coolers.

Each sample cooler being shipped to the Contract Laboratory will contain a Chain-of-Custody form. The Chain-of-Custody form consists of four copies which are distributed to the shipper, the receiving laboratory, the CRA laboratory and the CRA office file. The shipper will maintain his copy while the other three copies are enclosed in a waterproof envelop within the cooler with the samples. The laboratory, upon receiving the samples, will complete the three remaining copies. The laboratory will maintain one copy for their records. One copy will be returned to CRA upon receipt of the samples by the laboratory. One copy will be returned to CRA with the data deliverables package. Each sample identification number of each sample shipped will be recorded on the sheet. The cooler will then be sealed properly for shipment.

Upon receipt of the cooler at the laboratory, it will be inspected by the designated sample custodian. The condition of the cooler and sample containers will be noted on the Chain-of-Custody record sheet by the sample custodian. The sample custodian will also document the date and time of receipt of the container and sign the form.

If damage or discrepancies are noticed, they will be recorded in the remarks column of the record sheet, dated and signed. Any damage or discrepancies will be reported to the lab supervisor who will inform the lab manager and QA Officer.

B.6.2 SAMPLE DOCUMENTATION IN THE LABORATORY

Each sample or group of samples shipped to the laboratory for analysis will be given a unique identification number. The laboratory sample custodian will record the client name, number of samples and date of receipt of samples in the Sample Control Log Book.

The Contract Laboratory will be responsible for maintaining analytical log books and laboratory data as well as sample inventory on hand for submittal to CRA on an "as required" basis. Samples will be maintained by the laboratory for a period of 30 days, under the conditions prescribed by the appropriate USEPA methods, for additional analyses, if necessary. Raw laboratory data files will be inventoried and maintained by the Contract Laboratory for a period of five years, at which time CRA will advise them regarding the need for additional storage.

B.6.3 STORAGE OF SAMPLES

Evidentiary files for the entire project will be inventoried and maintained by CRA and will consist of the following:

i) project related plans;
ii) project log books;
iii) field data records;
iv) sample identification documents;
v) Chain-of-Custody records;
vi) report notes, calculations, etc.;
vii) references, literature;
viii) miscellaneous - photos, maps, drawings, etc.; and
ix) copies of all final reports pertaining to the project.

The project file materials will be the responsibility of CRA's Project Manager with respect to maintenance and document removal.

B.7.0 CALIBRATION PROCEDURES AND FREQUENCY

B.7.1 INSTRUMENT CALIBRATION AND TUNING

Calibration of instrumentation is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet established reporting limits. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the linear range established for the analytical method. The frequency of calibration and the concentration of calibration standards is determined by the manufacturer's guidelines, the analytical method, or the requirements of special contracts.

B.7.1.1 Gas Chromatography/Mass Spectrometry (GC/MS)

Each day, prior to analysis of samples, the laboratory shall tune the instrument with bromofluorobenzene (BFB) for volatile organic compounds and decafluorotriphenylphosphine (DFTPP) for semi-volatile compounds. This shall be done according to the tuning criteria specified in the appropriate USEPA Methods. No samples shall be analyzed until the instrument has met tuning criteria.

The instrument shall then be calibrated for all target compounds. An initial calibration curve shall be produced and certain key compounds referred to as System Performance Calibration Compounds (SPCCs) and Continuing Calibration Compounds (CCCs) shall be evaluated on a daily basis to ensure that the system is within calibration limits. If the daily standard does not meet the established criteria, the system shall be recalibrated.

B.7.1.2 Chromatography

The field of chromatography involves a variety of instrumentation and detection systems. While calibration standards and acceptance criteria vary depending on the type of system and analytical methodology required for a specific analysis, the general principles of calibration apply uniformly. Each chromatographic system shall be calibrated prior to performance of analyses. Initial calibration shall consist of determining the linear range, establishing limits of detection, and establishing retention time windows. The calibration shall be checked on a daily basis to ensure that the system remains within specifications. If the daily calibration check does not meet established criteria, the system shall be recalibrated and samples analyzed since the last acceptable calibration check shall be reanalyzed.

B.7.1.3 Standard Curves for Inorganic Analysis

Standard curves used in the determination of inorganic analytes will be prepared as follows:

Standard curves derived from data consisting of one reagent blank and a minimum of three concentrations (one reagent blank and one concentration for ICP) will be prepared for each inorganic analyte. The standard curve will be used with each subsequent analysis provided the standard curve is verified by using at least one reagent blank and one standard at a level normally encountered or expected in such samples. If the results of the verification are not within ±10 percent of the original curve, a new standard will be prepared and analyzed. If the results of the second verification are not within ±10 percent of the original standard curve, a reference standard will be used to determine if the discrepancy is with the standard or with the instrument. New standards will also be prepared on a quarterly basis at a minimum. All data used in drawing or describing the curve will be so indicated on the curve or its description. A record will be made of the verification.

B.7.2 FIELD INSTRUMENT CALIBRATION

Calibration of the field instruments will be done prior to the collection of each water sample if the data indicates a change (>±10 percent) in pH and/or conductivity from the last location sampled. Calibration of field instruments will, however, be conducted at least daily during groundwater sampling. The field equipment will be maintained, calibrated and operated in a manner consistent with the manufacturer's guidelines and USEPA standard methods. However, since the majority of field measurements will be limited to pH, conductivity and depth (water level) the following procedures will be conducted, at a minimum:

1. pH
   - Calibrate daily against two buffer solutions within a pH of 2 of the anticipated water pH.

   B. Calibration of pH Meter

   The pH meter will be calibrated with commercially obtained pH 4, 7 and 10 buffer solutions. The pH calibration will be temperature compensated and will be performed immediately before initiating a sampling event. Calibration checks will be performed with every sample collected. In the event that the result fails to be within 0.1 pH units, the meter must be recalibrated and all samples after the last calibration must be remeasured.

   Calibration will be performed in accordance with the following procedures:

   1. rinse the probe in deionized water;
   2. insert probe in a fresh pH 7 buffer solution;
   3. slide battery compartment cover back to the first stop exposing the adjustment potentiometers;
   4. adjust the "CAL" potentiometer such that the display reads 7.00;
   5. remove the probe; rinse in deionized water;
   6. insert probe in a fresh pH 4 of pH 10 buffer solution;
   7. adjust the slope potentiometer until the correct pH is displayed; and
   8. remove probe; rinse in deionized water.

2. Conductivity
   - Check once per sampling event against a standard solution of potassium chloride and deionized water.

B. Calibration of the Specific Conductivity Meter

The specific conductivity meter is factory calibrated, but the calibration should be checked periodically and the probe thoroughly rinsed between samples. In the event that calibration of the specific conductivity meter does not meet with the manufacturer's calibration criteria, the meter will be recalibrated and all samples after the last calibration will be remeasured. Calibration will be performed in accordance with the following procedures:

1. rinse probe in deionized water;
2. wipe probe and allow to dry;
3. the conductivity displayed should be zero in air;
4. adjust the zero potentiometer if necessary;
5. immerse the probe in a solution of known conductivity;
6. adjust the "SPAN" potentiometer such that the correct conductivity is displayed; and
7. rinse probes thoroughly with deionized water and allow to dry.

B.8.0 ANALYTICAL PROCEDURES

B.8.1 OVERVIEW

Samples collected for laboratory chemical analysis will be analyzed for the parameters listed in Table B.8.1. All test parameters will be analyzed using the methods specified in Table B.8.1.

B.8.2 IDENTIFICATION

Compounds which will be analyzed by GC/MS are identified by comparison of the sample mass spectrum with the mass spectrum of a standard of the suspected compound (standard reference spectrum). Mass spectra for standard references should be obtained on the user's GC/MS within the same 12 hours as the sample analysis. These standard reference spectra may be obtained through analysis of the calibration standards. The following criteria must be satisfied to verify identification: (1) elution of the sample component at the same GC relative retention time (RRT) as the standard component; and (2) correspondence of the sample component and the standard component mass spectrum.

For GC determinations of specific analytes, the RRT of the unknown will be compared with that of an authentic standard. Since a true identification by GC is not possible, an analytical run for compound confirmation will be followed according to the specifications in the methods. Peaks must elute within daily retention time windows established for each indicator parameter to be declared a tentative or confirmed identification. Retention time windows are determined using standard protocols defined in each method.

B.8.3 QUANTIFICATION

The procedures for quantification of analytes are discussed in the appropriate analytical methods.

For any analysis by GC/MS, estimation of concentration of an organic compound not contained within the calibration standard may be accomplished by comparing the mass spectral responses of the compound with that of an internal standard. This procedure is specified in the referenced USEPA methods.

B.8.4 DETECTION LIMIT REQUIREMENTS

The data used to conduct the investigation will have targeted detection limits that are the lowest applicable limit for the appropriate method as presented on Table B.8.1. The targeted detection limits for chemical analysis are presented in Tables B.4.2 and B.4.3.

B.9.0 DATA REDUCTION, VALIDATION, ASSESSMENT AND REPORTING

B.9.1 GENERAL

The Contract Laboratory will perform analytical data reduction and validation in-house under the direction of the laboratory QA Officer. The laboratory's QA Officer will be responsible for assessing data quality and advising of any data which were rated "preliminary" or "unacceptable" or other qualifications based on the QC criteria outlined in the methods, which would caution the data user of possible unreliability. Figure B.9.1 illustrates analytical data flow through the laboratory. Data reduction, validation and reporting by the laboratory will be conducted as detailed in the following:

- Raw data produced and checked by the responsible analysts is turned over for independent review by another analyst.
- The area supervisor reviews the data for attainment of quality control criteria presented in the referenced analytical methods.
- Upon completion of all reviews and acceptance of the raw data by the laboratory operations manager, a computerized report will be generated and sent to the laboratory Quality Assurance Officer.
- The laboratory Quality Assurance Officer will complete a thorough inspection of all reports.
- The QA Officer and area supervisor will decide whether any sample reanalysis is required.
- Upon acceptance of the preliminary reports by the QA Officer, final reports will be generated and signed by the Laboratory Manager.

CRA's QA/QC Officer will conduct an independent evaluation of data reduction and reporting by the laboratory. These evaluations will consider the finished data sheets, rinsate blank data, field duplicate data and recovery data for surrogate and matrix spikes. The material will be checked for legibility, completeness, correctness and the presence of requisite dates, initials and signatures. The results of these checks will be assessed and reported to CRA and the laboratory project managers noting any discrepancies and their effect upon the acceptability of the data. The qualifications of the QA/QC officer are presented in Attachment I.

Validation of the analytical data will be performed by CRA's QA/QC Officer. Assessment of analytical and field data will include checks for data consistency by looking for comparability of duplicate analyses, potential sample contamination as indicated by results of rinsate blank sample analyses, laboratory QA procedures, adherence to accuracy and precision criteria, transmittal errors and anomalously high or low parameter values. The results of these data validations will be reported to the project managers, noting any discrepancies and their effect upon acceptability of the data.

Raw data from field measurements and sample collection activities that are used in project reports will be appropriately identified and appended to the report. Where data have been reduced or summarized, the method of reduction will be documented in the report. Field data will be reviewed for anomalously high or low values that may appear to be inconsistent with other data. In addition to the review discussed above, the data validation will be performed in accordance with the following documents:

i) "National Functional Guidelines for Organic Data Review", (December 1990), prepared by USEPA, revised June 1991.

ii) "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses", (July 1, 1988), prepared by the USEPA Data Review Group.

B.9.2 LABORATORY REPORTING

All reporting and deliverables shall include, but not be limited to, all items listed in Table B.9.1.

B.10.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

B.10.1 FIELD QC

Quality control procedures for field measurements will be limited to checking the reproducibility of the measurement in the field by obtaining multiple readings and by calibrating the instruments (where appropriate).

Quality control of field sampling will involve collecting trip blanks, field blanks and rinsate blanks (where appropriate) in accordance with the applicable procedures described in the Work Plan.

B.10.2 LABORATORY QC

Specific procedures related to internal laboratory QC samples (namely blanks, MS/MSD, surrogates and QC check samples) are described in the following subsections.

B.10.2.1 Blank Samples

A reagent blank will be analyzed by the laboratory at a frequency of one blank per 20 analyses, or in the event that an analytical round consists of less than 20 samples, one reagent blank will be analyzed. The reagent blank, an aliquot of analyte-free water or solvent, will be carried through the entire analytical procedure.

B.10.2.2 Matrix Spike/Matrix Spike Duplicates (MS/MSDs)

An MS/MSD sample will be analyzed at a minimum frequency of one in 20 investigative samples. Acceptable criteria and compounds that will be used for matrix spikes are identified in the appropriate methods (see Section B.8.0). However, Tables B.10.1 and B.10.2 present a summary of the compounds and acceptable criteria. Percent spike recoveries will be used to evaluate analytical accuracy while percent relative standard deviation or the relative percent difference (RPD) between matrix spike analyses will be used to assess analytical precision.

B.10.2.3 Surrogate Analyses

Surrogates are organic compounds which are similar to the analytes of interest, but which are not normally found in environmental samples. Surrogates are added to samples to monitor the effect of the matrix on the accuracy of the analysis. Every blank, standard and environmental sample analyzed by GC or GC/MS, including MS/MSD samples, will be spiked with surrogate compounds prior to sample preparation.

Surrogates will be spiked into samples according to the appropriate analytical methods. Surrogate spike recoveries will be compared with the control limits set by procedures specified in the method (or from laboratory specific control limits) for analytes falling within the quantification limits without dilution. Dilution of samples to bring the analyte concentration into the linear range of calibration may dilute the surrogates out of the quantification limit; assessment of analytical quality in these cases will be based on the quality control embodied in the check and MS/MSD samples.

Presented in Table B.10.3 is a summary of the surrogate recovery control limits as stated within the analytical methods.

B.10.2.4 Blind Check Samples

As supplied by the agencies, an analytical batch may contain a check sample. In general, the check sample will be obtained from the USEPA and supplied to CRA. The analytes employed in the check sample will be a representative subset of the analytes of interest.

B.11.0 PERFORMANCE AND SYSTEM AUDITS AND FREQUENCY

For the purpose of external evaluation, performance evaluation check samples from the USEPA and various State agencies will be analyzed periodically by the Contract Laboratory.

The QA Officer may carry out performance and/or systems audits to ensure that data of known or defensible quality are consistently produced during a program.

Systems audits are qualitative evaluations of all components of field and laboratory quality control measurement systems. They determine if the measurement systems are being used appropriately. The audits may be carried out before all systems are operational, during the program, or after the completion of the program. Such audits typically involve a comparison of the activities given in the QAPP described herein, with activities actually scheduled or performed. A special type of systems audit is the data management audit. This audit addresses only data collection and management activities.

The performance audit is a quantitative evaluation of the measurements systems used for a monitoring program. It requires testing the measurement systems with samples of known composition or behavior to evaluate precision and accuracy. A performance audit may be carried out by or under the auspices of the QA Officer without the knowledge of the analyst during each sampling event for this program.

In addition, an external QA audit may be conducted by CRA prior to the analyses of any investigatory samples. It should be noted, however, that any external QA audits will only be performed if deemed necessary by either CRA Project Managers or the CRA QA/QC Officer. The Contract Laboratory may also undergo QC audit(s) by the NYSDEC or NYSDOH, if so required.

B.12.0 PREVENTIVE MAINTENANCE

All analytical instruments to be used in this project will be serviced by laboratory personnel at regularly scheduled intervals in accordance with the manufacturers' recommendations. Instruments may also be serviced at other times due to failure. Requisite servicing beyond the abilities of laboratory personnel will be performed by the equipment manufacturer or their designated representative.

Daily checks of each instrument will be performed by the analyst who has been assigned responsibility for that instrument. This will include changing GC inlet liners, tuning of the GC/MS, checking operation of data systems, checking for leaks, etc. Manufacturers' recommended procedures will be followed in every case.

B.13.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS

B.13.1 QA MEASUREMENT QUALITY INDICATORS

B.13.1.1 Precision

Precision will be assessed by comparing the analytical results between duplicate spike analyses. Precision as relative percent difference (RPD) will be calculated as follows:

$$\text{Precision} = \frac{[D_2 - D_1]}{(D_1 + D_2)/2} \times 100$$

D_1 = matrix spike recovery
D_2 = matrix spike duplicate spike recovery

B.13.1.2 Accuracy

Accuracy will be assessed by comparing a set of analytical results to the accepted or "true" values that would be expected. In general, MS/MSD and surrogate spike recoveries will be used to assess accuracy. Accuracy as percent recovery will be calculated as follows:

$$\text{Accuracy} = \frac{B-B}{C} \times 100$$

A = The analyte determined experimentally from the spike sample.
B = The background level determined by a separate analysis of the unspiked sample.
C = The amount of spike added.

B.13.1.3 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under normal conditions.

To be considered complete, the data set must contain all QC check analyses verifying precision and accuracy for the analytical protocol. In addition, all data are reviewed in terms of stated goals in order to determine if the database is sufficient.

When possible, the percent completeness for each set of samples will be calculated as follows:

$$\text{Completeness} = \frac{\text{valid data obtained}}{\text{total data planned}} \text{ x } 100 \text{ percent}$$

B.13.1.4 Outliers

Procedures discussed previously will be followed for documenting deviations. In the event that a result deviates significantly from method established control limits, this deviation will be noted and its effect on the quality of the remaining data assessed and documented.

B.14.0 CORRECTIVE ACTION

The need for corrective action may be identified by system or performance audits or by standard QC procedures. The essential steps in the corrective action system will be:

- checking the predetermined limits for data acceptability beyond which corrective action is required;
- identifying and defining problems;
- assigning responsibility for investigating the problem;
- investigating and determining the cause of the problem;
- determination of a corrective action to eliminate the problem (this may include reanalysis or resampling and analyses);
- implementing the corrective action and evaluating the effectiveness;
- verifying that the corrective action has eliminated the problem; and
- documenting the corrective action taken.

For each measurement system, the Laboratory QA/QC Officer will be responsible for initiating the corrective action and the laboratory supervisor will be responsible for implementing the corrective action.

B.15.0 QUALITY ASSURANCE REPORT TO MANAGEMENT

The CRA Project Manager will receive reports on the performance of the measurement system and the data quality following each sampling round and at the conclusion of the project.

At a minimum, these reports will include:

- assessment of measurement quality indicators; i.e. data accuracy, precision and completeness;
- results of systems audits; and
- QA problems and recommended solutions.

CRA's QA/QC Officer will be responsible within the organizational structure for preparing these periodic reports. The final report for the project will also include a separate QA section which will summarize data quality information contained in the periodic QA/QC reports to management, and present an overall data assessment and validation in accordance with the data quality objectives outlined in this QAPP.

REFERENCES

"Preparation of Federal-Lead Remedial Investigation Quality Assurance Project Plans for Region V, December 20, 1985". Quality Assurance Office, USEPB.

"Preparation Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAM-005/80)". Office of Monitoring Systems and Quality Assurance Office of Research and Development, USEPB.

"NEIC Policies and Procedures (EPA-330/9-78-001-R" May 1979 (Revised February 1983)", National Enforcement Investigations Center, USEPB.

"RCRA Quality Assurance Project Plan Guidance", NYSDEC, August 1989.

ATTACHMENT I

QUALIFICATIONS OF QA/QC OFFICER

DENISE ROBINSON TUHOVAK, B.S.

EDUCATION

B.S.	Chemistry, Canisius College, Buffalo, New York, 1986
Other Courses	USEPA Region II Training Course for CLP Organic Data Validation, Westchester Community College, Dr. John Samulian, June 1993
	USEPA Region II Training Course for CLP Inorganic Data Validation, Westchester Community College, Dr. John Rankin, March 1995
	Dupont Differential Scanning Calorimeter Training Course, 1990
	Varian Gas Chromatography Training Course, 1989
	Mattson FTIR Training Course, 1988
	40-Hour Hazardous Waste Site Worker Training Program, Niagara Community College, 1995
	XYZ's of Field Analytical Techniques, 1996 Pittsburgh Conference
	Hazardous Waste Management: The Complete Course, Environmental Resource Center, 1995

EMPLOYMENT

1994-Present	Manager - Analytical Support Services TreaTek-CRA Company
1993-94	Project Chemist, Conestoga-Rovers & Associates
1990-93	Laboratory Manager, Advanced Environmental Services
1988-90	Research Chemist, Wilson Greatbatch Ltd.
1986-88	Analytical Chemist, Recra Environmental
1986	Research Assistant, Buffalo Color Corporation

AFFILIATIONS

American Chemical Society

New York Association of Approved Environmental Laboratories

PROFILE OF PROFESSIONAL ACTIVITIES

Manager - Analytical Support Services:

- Assessment and validation of ASP, CLP, 40 CFR Part 136, and SW846 analytical data
- Preparation of analytical Quality Assurance Project Plans (QAPPs) and Site Sampling and Analysis Plans
- Liaison with EPA/State Agencies regarding QA/QC issues for various analytical programs
- Performance of laboratory audits and assessments
- QA/QC Officer for numerous Superfund and RCRA investigation and remediation programs

- Oversight and review of analytical testing in support of SPDES programs

Laboratory Manager:

- Responsible for all laboratory personnel, and the quality of data generated
- Provided technical support to laboratory personnel and clientele

Research Chemist:

- Performed research for the design of lithium batteries for various medical and commercial applications
- Maintained analytical instrumentation and developed analytical methods to support research efforts

Analytical Chemist:

- Analyzed environmental samples using a variety of analytical instrumentation
- Compiled analytical data reports and reviewed all quality control results

Research Assistant:

- Performed anhydride synthesis research
- Developed analytical methods for monitoring product quality control

PUBLICATIONS

- D. Tuhovak, E. Takeuchi, C. Post, "Low Temperature Electrolytes for Lithium/Silver Vanadium Oxide Cells", Journal of Power Sources, 34 (1991) 51-64

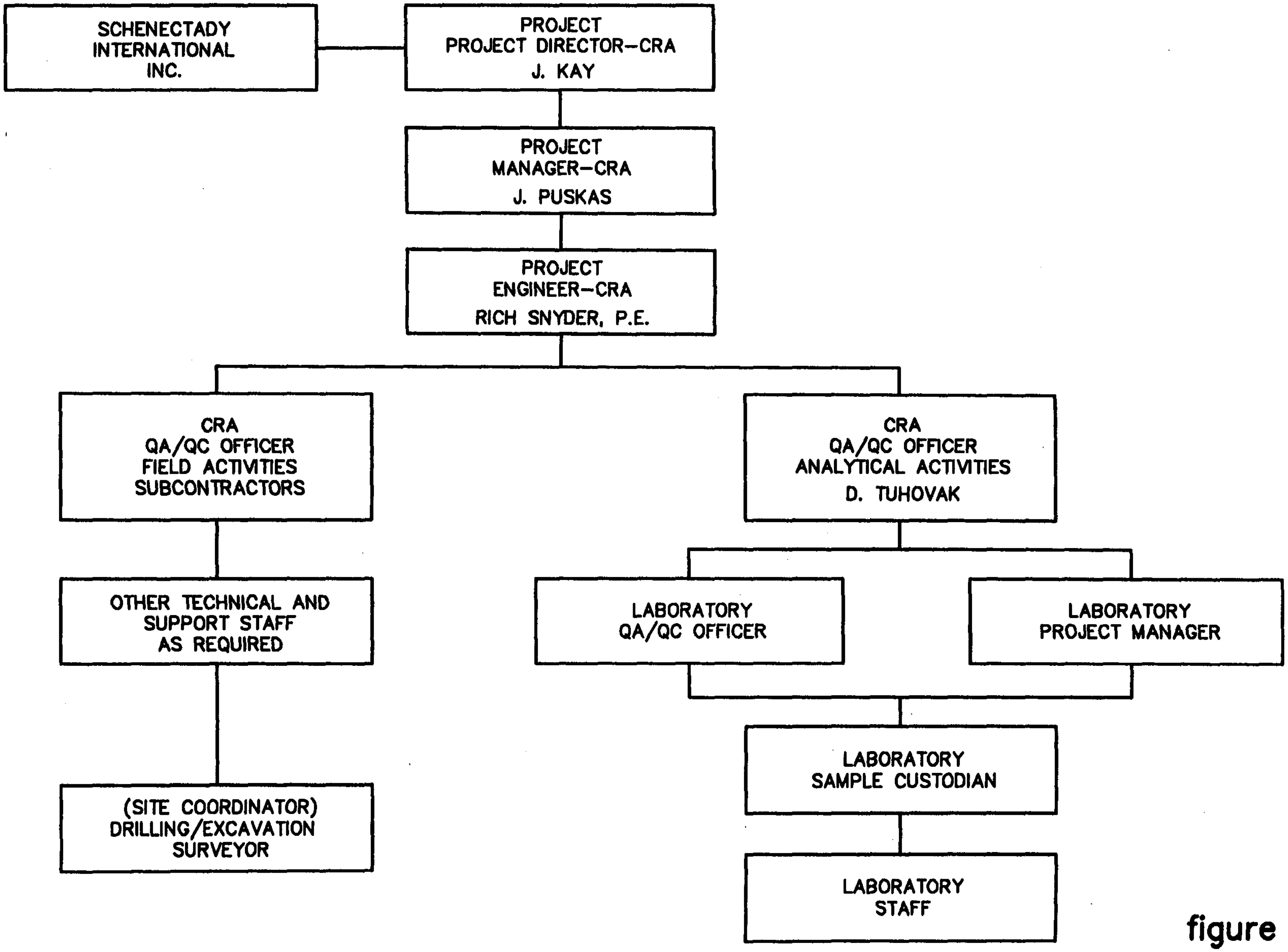
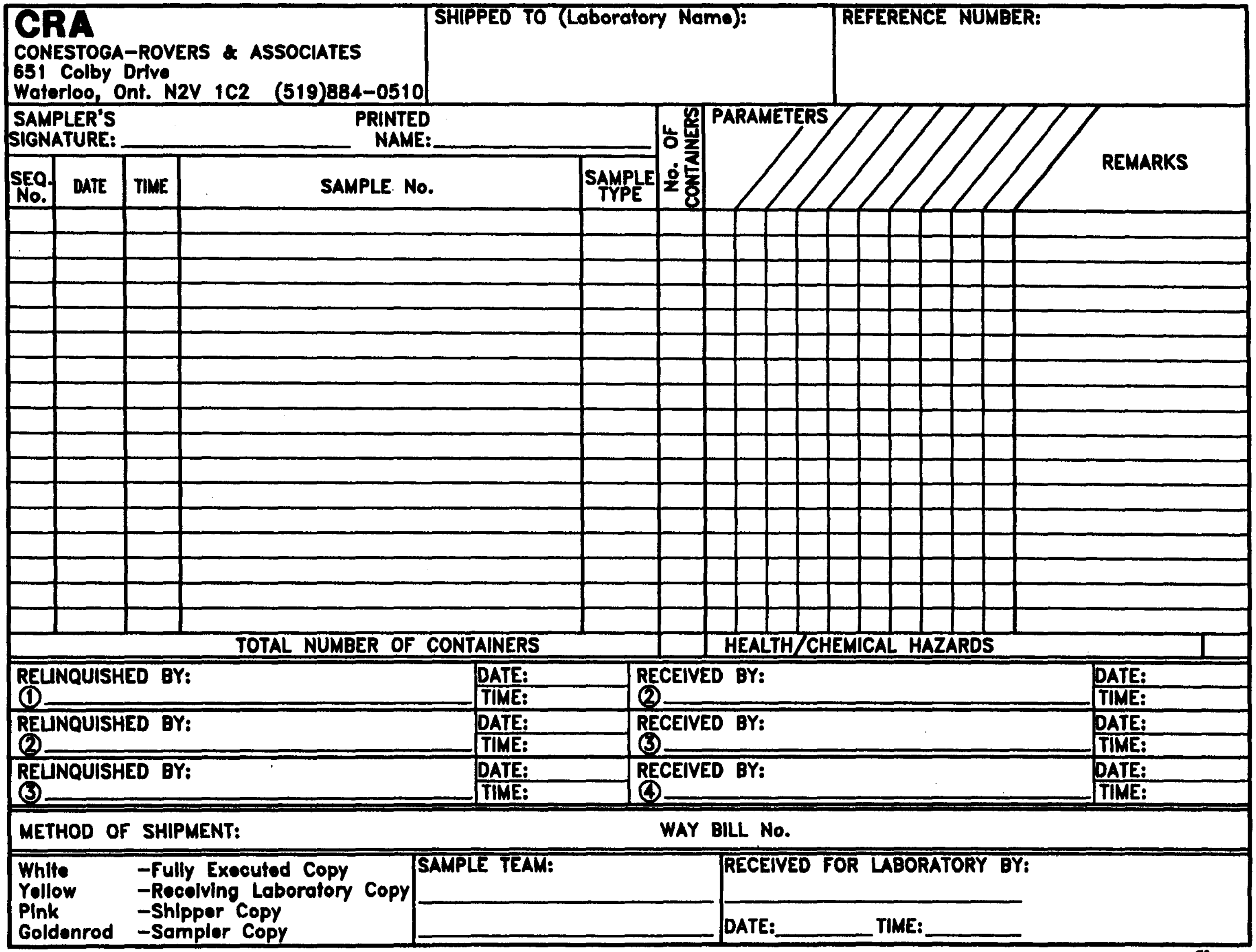


figure B.3.1

CRA PROJECT ORGANIZATION
CONGRESS STREET PLANT
Schenectady International Inc.

CRA

1312 (30) APR 17/97(W) REV.0 (C–10)



CRA
CONESTOGA-ROVERS & ASSOCIATES
651 Colby Drive
Waterloo, Ont. N2V 1C2 (519)884-0510

SHIPPED TO (Laboratory Name):

REFERENCE NUMBER:

SAMPLER'S SIGNATURE: ____________ PRINTED NAME: ____________

SEQ. No.	DATE	TIME	SAMPLE No.	SAMPLE TYPE	No. OF CONTAINERS	PARAMETERS										REMARKS
TOTAL NUMBER OF CONTAINERS						HEALTH/CHEMICAL HAZARDS										

RELINQUISHED BY: ① ____________	DATE: TIME:	RECEIVED BY: ② ____________	DATE: TIME:
RELINQUISHED BY: ② ____________	DATE: TIME:	RECEIVED BY: ③ ____________	DATE: TIME:
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METHOD OF SHIPMENT: WAY BILL No.

White —Fully Executed Copy Yellow —Receiving Laboratory Copy Pink —Shipper Copy Goldenrod —Sampler Copy	SAMPLE TEAM: ____________ ____________	RECEIVED FOR LABORATORY BY: ____________ DATE:________ TIME:________

figure B.6.1

CHAIN OF CUSTODY FORM
CONGRESS STREET PLANT
Schenectady International Inc.

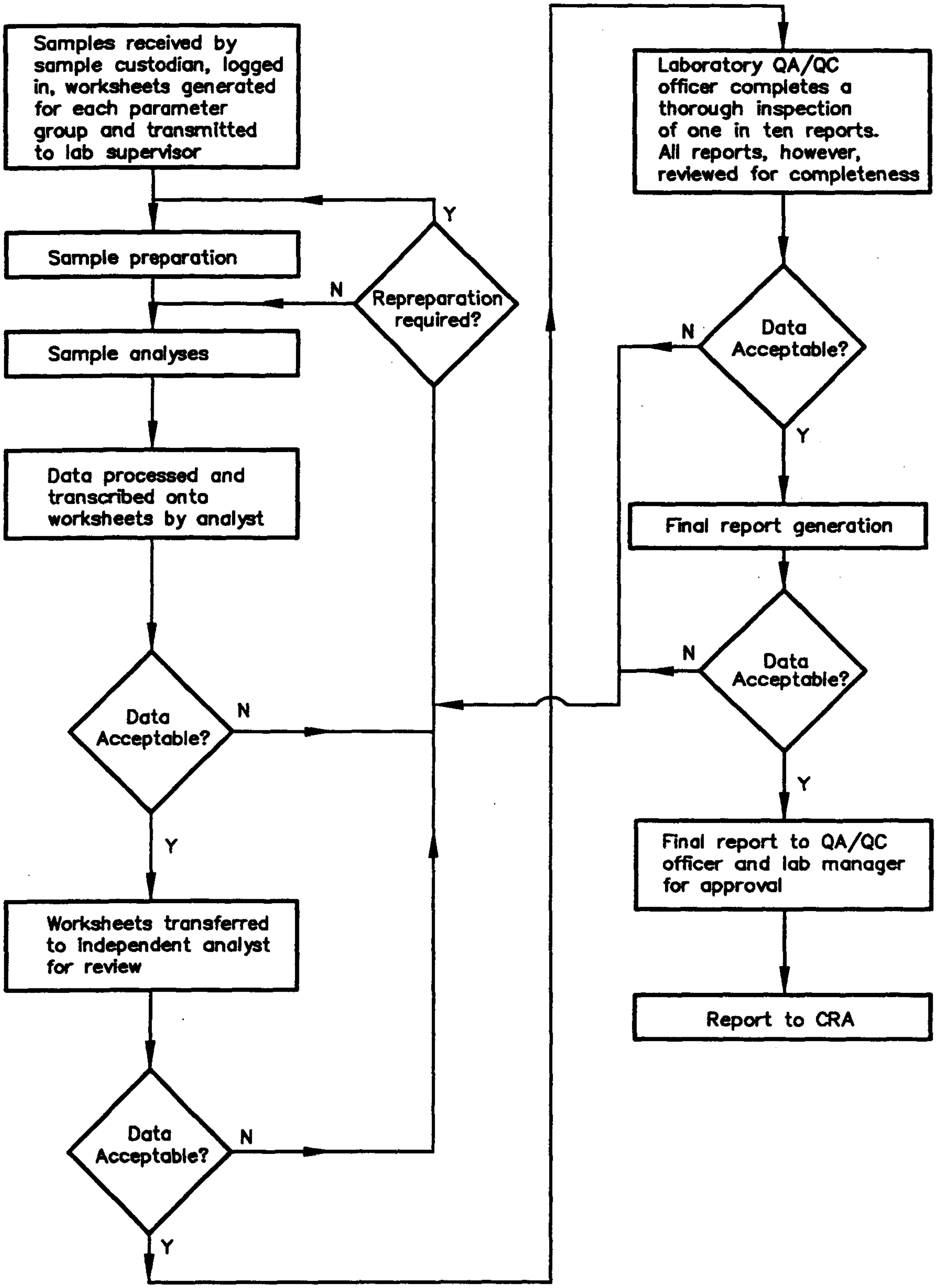

figure B.9.1

ANALYTICAL DATA FLOW
REMEDIAL ACTION PLAN
CONGRESS STREET PLANT
Schenectady International Inc.

CRA

1312 (30) APR 17/97(W) REV.0 (C-09)

TABLE B.4.1

SUMMARY OF SAMPLING AND ANALYSIS PLAN
SCHENECTADY INTERNATIONAL INC.
SCHENECTADY, NEW YORK

Sample Matrix	*Laboratory Parameters*	*Investigative Samples*	*Field Duplicates*	*Field Blanks*	*Rinsate(1) Blanks*	*Trip Blanks*	*MS/MSD(2)*	*Total*
Groundwater	TCL VOCs/SVOCs	12	1	1	1	1	1/1	18
Pumping Test Groundwater	VOCs/SVOCs/ Metals/General Chemistry	3	--	--	--	1	--	4

<u>Notes:</u>

(1) Rinsate blank samples will be submitted in the event that non-detected equipment is employed.
(2) QA/QC will be performed in accordance with the frequency outlined in Section B.4.1.

TCL	Target Compound List: volatiles, semi-volatiles.
MS/MSD	Matrix Spike/Matrix Spike Duplicate samples.
Trip Blanks	For VOC analyses only.

TABLE B.4.2

TARGET COMPOUND LIST (TCL) ORGANICS AND PRACTICAL QUANTITATION LIMITS (PQLs) SCHENECTADY INTERNATIONAL INC. SCHENECTADY, NEW YORK

TCL Volatiles		*CAS Number*	*Quantitation Limits*
			Water (µg/L)
1.	Chloromethane	74-87-3	10
2.	Bromomethane	74-83-9	10
3.	Vinyl Chloride	75-01-4	10
4.	Chloroethane	75-00-3	10
5.	Methylene Chloride	75-09-2	10
6.	Acetone	67-64-1	10
7.	Carbon Disulfide	75-15-0	10
8.	1,1-Dichloroethylene	75-35-4	10
9.	1,1-Dichloroethane	75-35-3	10
10.	1,2-Dichloroethylene (total)	540-59-0	10
11.	Chloroform	67-66-3	10
12.	1,2-Dichloroethane	107-06-2	10
13.	2-Butanone	78-93-3	10
14.	1,1,1-Trichloroethane	71-55-6	10
15.	Carbon Tetrachloride	56-23-5	10
16.	Vinyl Acetate	108-05-4	10
17.	Bromodichloromethane	75-27-4	10
18.	1,2-Dichloropropane	78-87-5	10
19.	cis-1,3-Dichloropropene	10061-01-5	10
20.	Trichloroethene	79-01-6	10
21.	Dibromochloromethane	124-48-1	10
22.	1,1,2-Trichloroethane	79-00-5	10
23.	Benzene	71-43-2	10
24.	trans-1,3-Dichloropropene	10061-02-6	10
25.	Bromoform	75-25-2	10
26.	4-Methyl-2-pentanone	108-10-1	10
27.	2-Hexanone	591-78-6	10
28.	Tetrachloroethene	127-18-4	10
29.	Toluene	108-88-3	10
30.	1,1,2,2-Tetrachloroethane	79-34-5	10
31.	Chlorobenzene	108-90-7	10
32.	Ethylbenzene	100-41-4	10
33.	Styrene	100-42-5	10
34.	Xylenes (Total)	1330-20-7	10

TABLE B.4.2

TARGET COMPOUND LIST (TCL) ORGANICS AND PRACTICAL QUANTITATION LIMITS (PQLs) SCHENECTADY INTERNATIONAL INC. SCHENECTADY, NEW YORK

TCL Semi-volatiles		*CAS Number*	*Quantitation Limits* *Water (µg/L)*
35.	Phenol	108-95-2	10
36.	bis (2-Chloroethyl) ether	111-44-4	10
37.	2-Chlorophenol	95-57-8	10
38.	1,3-Dichlorobenzene	541-73-1	10
39.	1,4-Dichlorobenzene	106-46-7	10
40.	Benzyl Alcohol	100-51-6	10
41.	1,2-Dichlorobenzene	95-50-1	10
42.	2-Methylphenol	95-48-7	10
43.	bis(2-Chloroisopropyl) ether	108-60-1	10
44.	4-Methylphenol	106-44-5	10
45.	N-Nitroso-di-n-dipropylamine	621-64-7	10
46.	Hexachloroethane	67-72-1	10
47.	Nitrobenzene	98-95-3	10
48.	Isophorone	78-59-1	10
49.	2-Nitrophenol	88-75-5	10
50.	2,4-Dimethylphenol	105-67-9	10
51.	Benzoic Acid	65-86-0	10
52.	bis (2-Chloroethoxy) methane	111-91-1	10
53.	2,4-Dichlorophenol	120-83-2	10
54.	1,2,4-Trichlorobenzene	120-82-1	10
55.	Naphthalene	91-20-3	10
56.	4-Chloroaniline	106-47-8	10
57.	Hexachlorobutadiene	87-68-3	10
58.	4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10
59.	2-Methylnaphthalene	91-57-6	10
60.	Hexachlorocyclopentadiene	77-47-4	10
61.	2,4,6-Trichlorophenol	88-06-2	10
62.	2,4,5-Trichlorophenol	95-95-4	25
63.	2-Chloronaphthalene	91-58-7	10
64.	2-Nitroaniline	88-74-4	25
65.	Dimethylphthalate	131-11-3	10
66.	Acenaphthylene	208-96-8	10
67.	2,6-Dinitroluene	606-20-2	10

TABLE B.4.2

TARGET COMPOUND LIST (TCL) ORGANICS AND PRACTICAL QUANTITATION LIMITS (PQLs) SCHENECTADY INTERNATIONAL INC. SCHENECTADY, NEW YORK

TCL Semi-volatiles		*CAS Number*	*Quantitation Limits* *Water* *(μg/L)*
68.	3-Nitroaniline	99-09-2	25
69.	Acenaphthene	83-32-9	10
70.	2,4-Dinitrophenol	51-28-5	25
71.	4-Nitrophenol	100-02-7	25
72.	Dibenzofuran	132-64-9	10
73.	2,4-Dinitroluene	121-14-2	10
74.	Diethylphthalate	84-66-2	10
75.	4-Chlorophenyl-phenyl ether	7005-72-3	10
76.	Fluorene	86-73-7	10
77.	4-Nitroaniline	100-01-6	25
78.	4,6-Dinitro-2-methylphenol	534-52-1	25
79.	N-nitrosodiphenylamine	86-30-6	10
80.	4-Bromophenyl-phenyl ether	101-55-3	10
81.	Hexachlorobenzene	118-74-1	10
82.	Pentachlorophenol	87-86-5	25
83.	Phenanthrene	85-01-8	10
84.	Anthracene	120-12-7	10
85.	Di-n-butyphthalate	84-74-2	10
86.	Fluoranthene	206-44-0	10
87.	Pyrene	120-00-0	10
88.	Butylbenzylphthalate	85-68-7	10
89.	3,3'-Dichlorobenzidine	91-94-1	10
90.	Benzo(a) anthracene	56-55-3	10
91.	Chrysene	218-01-9	10
92.	bis (2-Ethylhexyl) phthalate	117-81-7	10
93.	Di-n-octylphthalate	117-84-0	10
94.	Benzo (b) fluoranthrene	205-99-2	10
95.	Benzo (k) fluoranthene	207-08-9	10
96.	Benzo (a) pyrene	50-32-8	10
97.	Indeno (1,2,3-cd) pyrene	193-39-5	10
98.	Dibenz (a,h) anthracene	53-70-3	10
99.	Benzo (g,h,i) perylene	191-24-2	10

TABLE B.4.3

INORGANIC TARGET ANALYTE LIST (TAL) AND PRACTICAL QUANTITATION LIMITS (PQLs) SCHENECTADY INTERNATIONAL INC. SCHENECTADY, NEW YORK

		Quantitation Limits
		Water
TAL Metals (µg/L)		
1.	Aluminum	200
2.	Antimony	60
3.	Arsenic	10
4.	Barium	200
5.	Calcium	5000
6.	Chromium	10
7.	Cobalt	50
8.	Copper	25
9.	Iron	100
10.	Lead	3
11.	Magnesium	1000
12.	Manganese	15
13.	Mercury	0.2
14.	Nickel	40
15.	Potassium	5000
16.	Selenium	5
17.	Sodium	5000
18.	Vanadium	50
19.	Zinc	20
20.	Cyanide	10
General Chemistry Parameters (mg/L)		
1.	Total Organic Carbon (TOC)	1.0
2.	Dissolved Organic Carbon (DOC)	1.0
3.	BOD	2.0
4.	Total and Soluble COD	5.0
5.	Total Kjeldahl Nitrogen (TKN)	0.5
6.	Ammonia	0.1
7.	Nitrates	0.1
8.	Nitrites	0.1
9.	Alkalinity	10
10.	Hardness	1.0
11.	Total Dissolved Solids (TDS)	5.0
12.	Total Suspended Solids (TSS)	5.0
13.	Total and Soluble Phosphorous	0.5
14.	Oil and Grease	5.0
15.	Chlorides	1.0
16.	Bromide	2.0
17.	Fluoride	0.1
18.	Sulfates	1.0
19.	Cyanides	0.01
20.	Chromium	0.05

Notes:

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

TABLE B.5.1

CONTAINER, PRESERVATION AND PACKAGING REQUIREMENTS
SCHENECTADY INTERNATIONAL INC.
SCHENECTADY, NEW YORK

Analysis	*Sample Containers*	*Preservation*	*Maximum Holding Times*	*Shipping Means*	*Packaging*
Groundwater					
VOCs	2-40 ml glass vial	Cool to 4°C (±2°C)	7 days from collection to analysis	Fed. Express (Priority 1)	Bubble Pack
		Cool to 4°C (±2°C) HCl to pH<2	14 days from collection to analysis		
Semi volatiles	2-1 L amber glass	Cool to 4°C (±2°C)	7 days from collection to extraction 40 days from extraction to analysis	Fed. Express (Priority 1)	Bubble Pack
Metals	500 ml polyethylene	Cool to 4°C (±2°C) (1) HNO3 to pH<2	6 months from collection to analysis (mercury 28 days from collection)	Fed. Express (Priority 1)	Bubble Pack
Cyanide	1 L polyethylene	Cool to 4°C (±2°C) NaOH to pH>12	14 days from collection to analysis	Fed. Express (Priority 1)	Bubble Pack
TOC/DOC	polyethylene	Cool to 4°C (±2°C) HCL to pH<2	28 days from collection	Fed. Express (Priority 1)	Bubble Pack
BOD	2 L polyethylene	Cool to 4°C (±2°C)	48 hours from collection	Fed. Express (Priority 1)	Bubble Pack
COD	125 ml polyethylene	Cool to 4°C (±2°C) H2SO4 to pH<2	28 days from collection	Fed. Express (Priority 1)	Bubble Pack
TKN	1 L polyethylene	Cool to 4°C (±2°C) H2SO4 to pH<2	28 days from collection	Fed. Express (Priority 1)	Bubble Pack
Ammonia	1 L polyethylene	Cool to 4°C (±2°C) H2SO4 to pH<2	28 days from collection	Fed. Express (Priority 1)	Bubble Pack

TABLE B.5.1

CONTAINER, PRESERVATION AND PACKAGING REQUIREMENTS
SCHENECTADY INTERNATIONAL INC.
SCHENECTADY, NEW YORK

Analysis	*Sample Containers*	*Preservation*	*Maximum Holding Times*	*Shipping Means*	*Packaging*
Nitrates	250 ml polyethylene	Cool to 4°C (±2°C)	48 hours from collection	Fed. Express (Priority 1)	Bubble Pack
Nitrites	125 ml polyethylene	Cool to 4°C (±2°C)	48 hours from collection	Fed. Express (Priority 1)	Bubble Pack
Alkalinity	250 ml polyethylene	Cool to 4°C (±2°C)	14 days from collection	Fed. Express (Priority 1)	Bubble Pack
Hardness	250 ml polyethylene	HNO3 to pH<2	6 months from collection	Fed. Express (Priority 1)	Bubble Pack
TDS	250 ml polyethylene	Cool to 4°C (±2°C)	7 days from collection	Fed. Express (Priority 1)	Bubble Pack
TSS	250 ml polyethylene	Cool to 4°C (±2°C)	7 days from collection	Fed. Express (Priority 1)	Bubble Pack
Phosphorous	125 ml polyethylene	Cool to 4°C (±2°C) (1) H2SO4 to pH<2	28 days from collection	Fed. Express (Priority 1)	Bubble Pack
Oil and Grease	2 - 1 L amber glass	Cool to 4°C (±2°C) H2SO4 to pH<2	28 days from collection	Fed. Express (Priority 1)	Bubble Pack
Chloride	125 ml polyethylene	None	28 days from collection	Fed. Express (Priority 1)	Bubble Pack
Bromide	250 ml polyethylene	None	28 days from collection	Fed. Express (Priority 1)	Bubble Pack

TABLE B.5.1

CONTAINER, PRESERVATION AND PACKAGING REQUIREMENTS
SCHENECTADY INTERNATIONAL INC.
SCHENECTADY, NEW YORK

Analysis	*Sample Containers*	*Preservation*	*Maximum Holding Times*	*Shipping Means*	*Packaging*
Fluoride	500 ml polyethylene	None	28 days from collection	Fed. Express (Priority 1)	Bubble Pack
Sulfates	125 ml polyethylene	Cool to 4°C (±2°C)	28 days from collection	Fed. Express (Priority 1)	Bubble Pack
Tri and Hexavalent Chromium	500 ml polyethylene	Cool to 4°C (±2°C)	24 hours from collection	Fed. Express (Priority 1)	Bubble Pack

Notes:

VTSR - Verified time of sample receipt.
(1) Soluble metals must be filtered in the field prior to preservation.

TABLE B.8.1

SUMMARY OF ANALYTICAL METHODS
SCHENECTADY INTERNATIONAL INC.
SCHENECTADY, NEW YORK

Parameter	*Methodology (2)(3)*
Waters	
TCL VOCs (1)	8240 (2)
TCL BNAs (1)	8270 (2)
Metals	6010/7000 Series (2)
Cyanide	9010 (2)
Total Organic Carbon (TOC)	9060 (2)
Dissolved Organic Carbon (DOC)	9060 (2)
BOD	405.1 (3)
Total and Soluble COD	410 (3)
Total Kjeldahl Nitrogen (TKN)	351 (3)
Ammonia	350 (3)
Nitrates	9200 (2)
Nitrites	354.1 (3)
Alkalinity	310 (3)
Hardness	130 (3)
Total Dissolved Solids (TDS)	160.1 (3)
Total Suspended Solids (TSS)	160.2 (3)
Total and Soluble Phosphorous	365.4 (3)
Oil and Grease	9070 (2)
Chlorides	9252 (2)
Bromide	320.1 (3)
Fluoride	340 (3)
Sulfates	9038 (2)
Cyanides	9010 (2)
Chromium	7196 (2)

Notes:

(1) VOC and BNA analysis also require TICs to be reported.
(2) "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", 3rd Edition, Sept. 86 and subsequent revisions.
(3) "Methods for Chemical Analysis of Water and Wastes"; USEPA (1983).

TABLE B.9.1

LABORATORY REPORTING DELIVERABLES
SCHENECTADY INTERNATIONAL INC.
SCHENECTADY, NEW YORK

A detailed report narrative should accompany each submission, summarizing the contents, results, and all relevant circumstances of the work.

A. Parameter Requested

B. Sample Number, Matrix
   - i) date collected
   - ii) date extracted
   - iii) date analyzed
   - iv) chain-of-custody report form, including confirmation of unbroken chain-of-custody.

C. Results (including CLP-like summary forms)
   - i) sample results
   - ii) duplicate
   - iii) blank
   - iv) spike; spike duplicate
   - v) surrogate recoveries

D. Supporting QA/QC
   - i) methodology
   - ii) method detection limits

All sample data and its corresponding QA/QC data shall be maintained accessible to CRA either in hard copy or on magnetic tape or disk (computer data files).

TABLE B.10.1

MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) PERCENT RECOVERY CONTROL LIMITS (ORGANICS)

SCHENECTADY INTERNATIONAL INC.
SCHENECTADY, NEW YORK

Matrix Spike Compounds	*Water*[a]	*RPD*[b]
VOCs		
1,1-Dichloroethene	61-145	14(22)
Trichloroethene	71-120	14(24)
Chlorobenzene	75-130	13(21)
Toluene	76-125	13(21)
Benzene	76-127	11(21)
BNAs		
1,2,4-Trichlorobenzene	39-98	28(23)
Acenaphthene	46-118	31(19)
2,4-Dinitrotoluene	24-96	38(47)
Pyrene	26-127	31(36)
N-Nitroso-Di-n-Propylamine	41-116	38(38)
1,4-Dichlorobenzene	36-97	28(27)
Pentachlorophenol	9-103	50(47)
Phenol	12-110	42(35)
2-Chlorophenol	27-123	40(50)
4-Chloro-3-Methylphenol	23-97	42(33)
4-Nitrophenol	10-80	50(50)

Notes:

a These limits are for advisory purposes only. They are not used to determine if a sample should be analyzed. When sufficient multi-lab data are available, standard limits will be calculated.

b $RPD = \left| \frac{(X1 - X2)}{\frac{X1 + X2}{2}} \right|$ x 100%; values in parenthesis indicate RPD limit for soil matrix.

TABLE B.10.2

MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)
PERCENT RECOVERY CONTROL LIMITS (INORGANICS)
SCHENECTADY INTERNATIONAL INC.
SCHENECTADY, NEW YORK

Matrix Spike Analytes	*Water Control Limits (1) (Percent)*
Aluminum	75-125 (25)
Antimony	75-125 (25)
Arsenic	75-125 (25)
Barium	75-125 (25)
Calcium	75-125 (25)
Chromium	75-125 (25)
Cobalt	75-125 (25)
Copper	75-125 (25)
Iron	75-125 (25)
Lead	75-125 (25)
Magnesium	75-125 (25)
Manganese	75-125 (25)
Mercury	75-125 (25)
Nickel	75-125 (25)
Potassium	75-125 (25)
Selenium	75-125 (25)
Sodium	75-125 (25)
Thallium	75-125 (25)
Tin	75-125 (25)
Vanadium	75-125 (25)
Cyanide	75-125 (25)

Notes:

(1) Value in parenthesis indicates maximum acceptable relative percent difference (RPD) between duplicate analyses.

TABLE B.10.3
PERCENT SURROGATE RECOVERY CONTROL LIMITS
SCHENECTADY INTERNATIONAL INC.
SCHENECTADY, NEW YORK

Surrogate Spike Compounds	*Water Control Limits (Percent)*
<u>VOCs</u>	
Toluene d_8	88-110
Bromofluorobenzene	86-115
1,2-Dichloroethane - d_4	76-114
<u>BNAs</u>	
Nitrobenzene - d_5	35-114
2-Fluorobiphenyl	43-116
Terphenyl - d_{14}	33-141
Phenol - d_6	10-110
2-Fluorophenol	21-110
2,4,6-Tribromophenol	10-123

C

APPENDIX C

PUMPING TEST PROGRAM

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C.1.0 PUMPING TEST PROGRAM

A pumping test will be performed in observation well OW7A-92 to provide sufficient data for the following:

i) calculation of aquifer coefficients for the gaciolacustrine deposits;
ii) estimation of aquifer yield in observation well OW7A-92;
iii) estimation of steady-state zone of capture at the estimated aquifer yield;
iv) estimation of hydraulic connection between the glaciolacustrine deposits and surface water (i.e., Cowhorn Creek); and
v) determination of groundwater chemistry to aid in the assessment of groundwater treatment options.

The test program will consist of step-drawdown test and constant-rate pumping test in observation well OW7A-92. The location of OW7A-92 is shown on Figure 3.2. The constant-rate pumping test will be conducted for a minimum period of 48 hours. If steady-state conditions have not been achieved at the end of 48 hours, the test may be extended to a maximum period of 72 hours.

Prior to the performance of the pumping test program, two piezometers, designated as aquifer test piezometers #1 and #2 will be installed approximately 25 feet and 40 feet west and east of OW7A-92, respectively. The locations of these piezometers are shown on Figure 3.2.

Groundwater generated during the aquifer test program will be contained in tanks with estimated combined capacity of approximately 5,000 gallons.

A review of the installation details for observation well OW7A-92 was conducted to assess the feasibility of performing an aquifer test in this well. Observation well OW7A -92 is 2 inches in diameter and 30 feet deep. The length of the water column in this well is approximately 7 to 11 feet. The stratigraphic log for this observation well is provided in Attachment 1 to Appendix C.

C1.1 STATIC (BASELINE)WATER LEVELS

Prior to conducting the step-drawdown test and the constant-rate pumping test in OW7A-92, water levels will be monitored for three days to establish baseline conditions (i.e., fluctuations in water levels in response to seasonal effects). Water levels will be measured at the following locations:

OW7A 92 (pumping well);
OW7B-92;
OW-3;
OW3B-87;
OW14-94;
OW13-94;
OW12-94 (background well);
SW-3 (Cowhorn Creek);
SW-1A (Cowhorn Creek);
Aquifer Test Piezometer #1 (approximately 25 feet west of OW7A-92); and
Aquifer Test Piezometer #2 (approximately 40 feet east of OW7A-92).

Should significant hydraulic responses be measured at the above noted observation wells or surface water monitoring locations, the monitoring network may be expanded to include the following:

OW8A-92;
OW8B-92;
OW9A-94; and
OW9B-94.

The locations of the pumping well (OW7A-92), observation wells, and surface water monitoring stations are shown on Figure 3.2.

C.1.2 STEP-DRAWDOWN TEST

A step-drawdown test will be conducted in advance of the 48-hour constant-rate pumping test in OW7A-92 to determine the pumping rate for the constant rate test. Based on preliminary calculations the glaciolacustrine deposits are expected to yield pumping rates less than 1 gpm.

The step-drawdown test will consist of pumping OW7A-92 at three different increasing flow rates. Each step will be conducted for a period of approximately one-hour with periods of recovery of approximately 30 minutes between tests. A review of the existing data indicates that preliminary pumping rates for the step drawdown test will be approximately 0.1, 0.25, and 0.5 gpm. Following completion of the step-drawdown aquifer test, the drawdown data will be evaluated to determine the highest pumping rate that the pumping well is expected to maintain for a minimum period of 48 hours.

C.1.3 CONSTANT-RATE TEST

The constant-rate pumping test will be conducted in observation well OW7A-92 for a minimum period of 48 hours at the maximum allowable pumping rate determined from the results of the step-drawdown test. A stainless steel Grunfos™ submersible electric pump will be used for the test.

Water level measurements will be measured in the pumping well OW7A-92, observation wells, and surface water monitoring stations listed in Section C.1.1 for the duration of the aquifer test. Groundwater levels will be measured in the pumping and observation wells at the frequencies specified in Tables C.1 and C.2. The pumping rate will be checked periodically during the pumping test.

The water level indicators will be cleaned between measurements in different observation wells.

TABLE C.1

RECOMMENDED TIME INTERVALS FOR MEASURING DRAWDOWN IN THE PUMPING WELL DURING THE PUMPING TEST

Time Since Pumping Started (or Stopped) (minutes)	*Time Intervals Between Measurements (minutes)*
0 - 10	0.5 - 1
10 - 15	1
15 - 60	5
60 - 300	30
300 - 400	60
1440 - termination of test	480 (8 hrs)

TABLE C.2

RECOMMENDED TIME INTERVALS FOR MEASURING DRAWDOWN IN THE OBSERVATION WELLS/SURFACE WATER LOCATIONS DURING THE PUMPING TEST

Time Since Pumping Started (or Stopped) (minutes)	*Time Intervals Between Measurements (minutes)*
0 - 60	2
60 - 120	5
120 - 240	10
240 - 360	30
360 - 1440	60
1440 - termination of test	480 (8 hrs)

Following termination of pumping, water levels in OW7A-92 will be monitored for a period of approximately six hours or until 80 percent of recovery is achieved, whichever is longer, to assess recovery.

As part of the pumping test in OW7A-92, precipitation and atmospheric pressure data will be obtained from the weather station for the pumping test period. These data will be evaluated to assess the external (climatic) effects in the hydraulic response of the glaciolacustrine deposits to pumping.

The drawdown/recovery data will be evaluated to determine the hydraulic coefficients for the glaciolacustrine deposits. The drawdown and recovery data will be reduced and analyzed by the applicable methods for unconfined conditions (Theis, 1935 and/or Cooper and Jacobs, 1946). The hydraulic coefficients (transmissivity) will be employed to calculate the steady-state capture zone associated with OW7A-92.

The drawdown experienced by the wells will provide an estimate of the capture zone for the pumping well OW7-92 at the sustainable pumping rate.

The drawdown and recovery data will be plotted on a distance-drawdown curve to provide an estimate of the radius of influence for OW7A-92. The observed capture zone will be compared to the calculated steady-state capture zone.

C.2.0 EXTRACTED GROUNDWATER SAMPLING

Monitoring of groundwater quality with time will be accomplished by sampling pumped groundwater from the OW7A-92 at a frequency of 0, 24, and 48 hours during the constant-rate pumping test.

Analytical parameters for these samples are summarized in Table 3.1. The analytical results will be used to determine the design of the appropriate treatment system.

REFERENCES

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