MALCOLM PIRNIE

FINAL

BROWNFIELDS SITE INVESTIGATION/ REMEDIAL ALTERNATIVES STUDY

Work Plan
Quality Assurance Project Plan
Health and Safety Plan
Citizen Participation Plan

Former Ashland Chemical Company
Johnstown, New York

CITY OF JOHNSTOWN, NEW YORK

Prepared by:
Malcolm Pirnie, Inc.
15 Cornell Road
Latham, New York 12110

September 1998
2384007

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WORK PLAN

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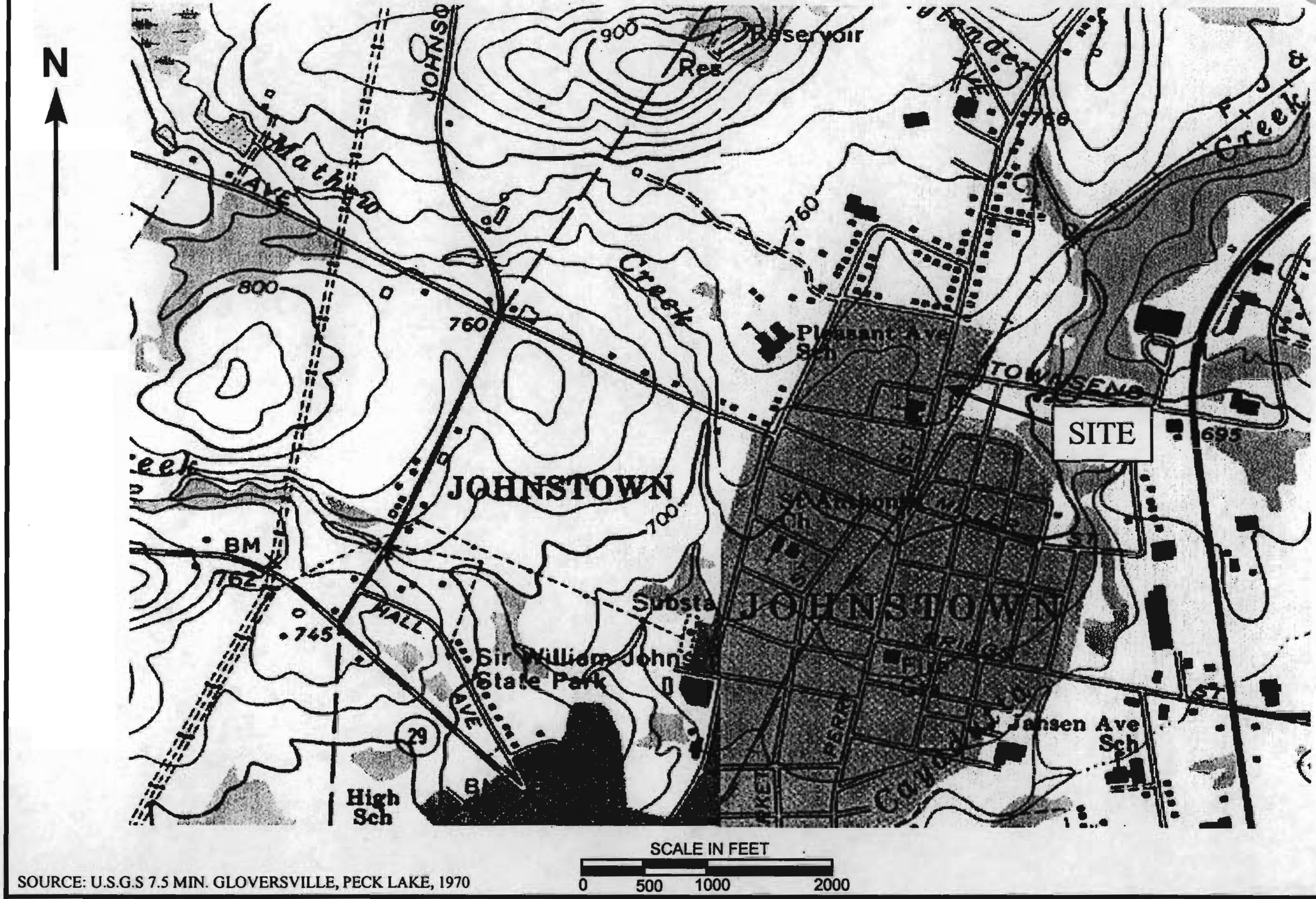
1.0 INTRODUCTION

The City of Johnstown has been awarded a grant under the 1996 New York State Brownfields Redevelopment Plan to conduct a Site Investigation/Remedial Alternatives Report (SI/RAR) for the former Ashland Chemical Company site in the City of Johnstown. Figure 1-1 shows the location of the site. Figure 1-2 is a plan of the former Ashland Chemical Company property. The Ashland Chemical Company formerly transferred chemicals from bulk aboveground storage tanks to 55-gallon drums and distributed these drums to businesses and industries. Based on a review of historical information, the site was used as a wholesale grocery warehouse from the early 1900s to the mid-1900s. Ashland Chemical Company acquired the site sometime after 1947 and abandoned the facility in the 1980s.

This Work Plan summarizes the scope of work for the SI/RAR. The goal of the SI/RAR is to assess the nature and extent of soil and groundwater contamination, if any, and to evaluate potential remedial alternatives. Figure 1-3 shows the proposed schedule for implementation of the Work Plan, public participation, and completing the record of decision for the site. This Work Plan and the associated Quality Assurance Project Plan (QAPP), Citizen Participation Plan (CPP), and Health and Safety Plan (HSP) will be submitted to the New York State Department of Environmental Conservation (NYSDEC) for regulatory approval.



SOURCE: U.S.G.S 7.5 MIN. GLOVERSVILLE, PECK LAKE, 1970

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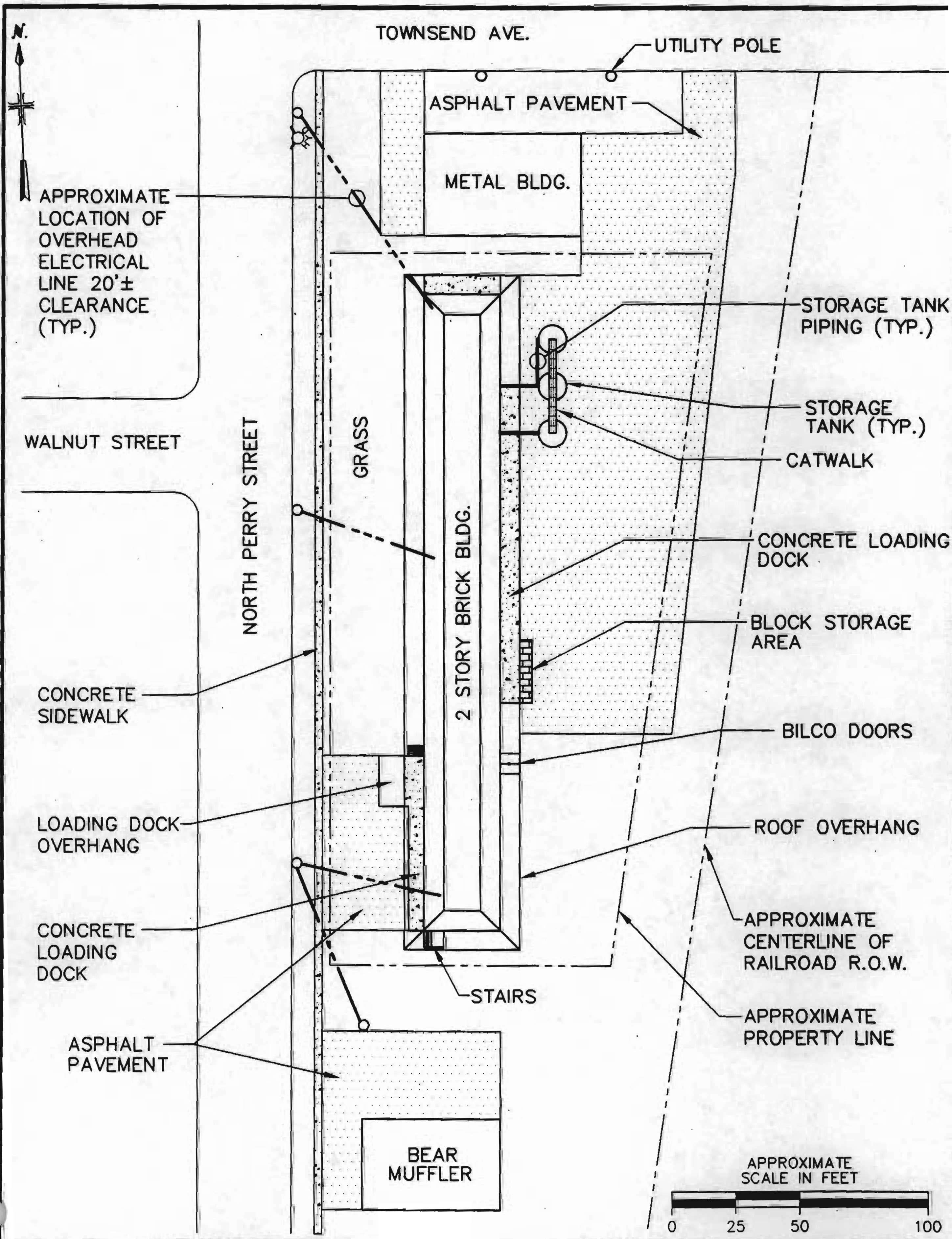
SITE LOCATION MAP

Figure 1-1



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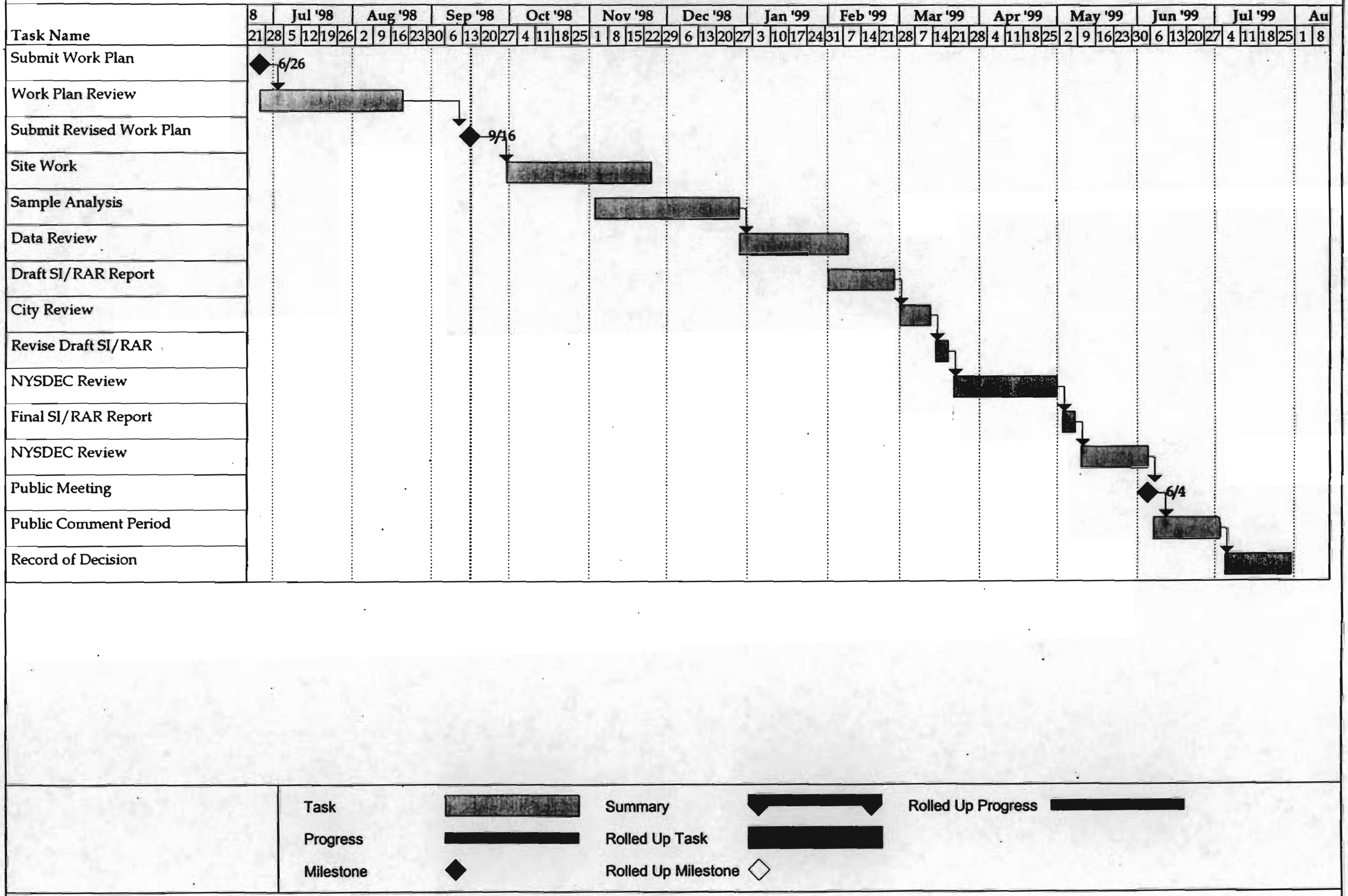
SITE PLAN

FIGURE 1-2

FI E 1-3
Former Ashland Chemical Property
Project Schedule



2.0 SITE DESCRIPTION AND BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

The former Ashland Chemical Company site is located at the southeast corner of the intersection of Townsend Road and North Perry Street in the City of Johnstown, Fulton County, New York (Figure 1-1). The approximately 0.9-acre site is bounded by Buanno Trucking and Townsend Street to the north, North Perry Street to the west, a former railroad right-of-way to the east, and Bear Muffler to the south. An approximately 250-foot long by 50-foot wide brick building is located in the western portion of the site. This building was the main operations building for the Ashland Chemical Company and consisted of offices and a warehouse where chemicals were handled and stored.

2.2 GEOLOGY/HYDROGEOLOGY

The surficial geology of the site is characterized as fluvial deltaic sand deposited during the last glacial retreat (Caldwell, 1987). The deltaic sands in Johnstown, near the former Ashland Chemical site, are likely associated with material deposited during the formation of the Fonda Outwash Plain (Van Diver, 1985). The sands of the outwash plain are characterized as generally fine-grained, proglacial topset fluvial in origin, and vary in thickness from 6 to 30 feet.

The former Ashland Chemical Company site is at an elevation of approximately 720 feet above mean sea level (amsl). Cayudetta Creek and Mathew Creek flow southward approximately 1,000 feet to the east, and approximately 2,000 feet to the west of the site, respectively. Bedrock in the vicinity of the site consists of Middle Ordovician Canajoharie Shale of the Lorraine, Trenton, and Black River Groups (Fisher, et al., 1970). The Canajoharie Shale is characterized as a dark gray to black finely bedded shale with occasional coarser grained fine sand sequences. The depth to bedrock in the vicinity of the site is unknown.

Area residences and businesses receive drinking water from the City of Johnstown municipal supply. There are no known wells on the site. Based on a review of potential well yield information, wells in the vicinity of the site are capable of yielding approximately 100 gallons per minute (Bugliosi and Trudell, 1988).

2.3 SITE HISTORY

Based on a preliminary review of historical information, the operational history of the site under the ownership of Ashland Chemical Company is as follows: Chemicals arrived at the site in railroad tanker cars adjacent to and east of the main facility building. Chemicals were transferred from the tanker cars to three aboveground storage tanks (ASTs) located on the northeastern side of the main facility building (Figure 1-2). From the ASTs, chemicals were transferred to 55-gallon drums for sale to businesses and industries. Based on existing labels affixed to the ASTs, it is believed that chemicals shipped to, stored at, and distributed from the site included, but may not have been limited to, sulphuric acid, naphtha, and mineral spirits.

Sanborn Company Fire Insurance Maps were reviewed for the former Ashland Chemical site and are provided in Appendix A. The Sanborn Maps show that the main brick building was present at the former Ashland Chemical site since at least 1902, when the building was a merchandise store operated by Edwards and Company. The following is a sequential description of site use based on a review of the following Sanborn Maps:

- ***1902 Sanborn Map*** - The main building was used by Edwards and Company as a merchandise store. A coffee roasting machine was present in the northeastern portion of the building. Lights in the building were fueled with natural gas.

  An auxiliary spur from an F.J.&G.R.R. railroad line extended along the south-eastern side of the on-site building. The main railroad line was located along the eastern boundary of the site. Fairgrounds were located on the opposite, east side of these railroad tracks.

- ***1907 Sanborn Map*** - Edwards and Company continued to operate a wholesale grocery store at the site. A spice mill and coffee roaster were located in the northern portion of the on-site building. Offices and a coal-fired heater were present at the southern end of the building. The Fulton County Agricultural Society Grounds were located across the railroad tracks to the east of the site.

- ***1912 Sanborn Map*** - No changes to the building were noted since 1907. The adjacent Fairground buildings were not in use. A Dutch Reformed Church was located on the opposite, western side of North Perry Street.

- ***1926 Sanborn Map*** - The on-site building remained a grocery warehouse but the coffee roaster had been removed and replaced with a steam heater. The natural gas-fired lights were replaced with electric lights. Two auxiliary railroad lines were present on-site in 1926 and extended on the eastern portion of the site.

- ***1947 Sanborn Map*** - The on-site building was used as a warehouse by the Milligan and Higgins Corporation in 1947. A gasoline filling station was located across Townsend Avenue to the northeast of the site. Three gasoline tanks were present on this adjacent gasoline station site in 1947. Another gasoline filling station and automobile repair facility was present on the property adjacent to and south/southwest of the site in 1947. Two gasoline tanks were shown on the Sanborn map on this adjacent property. To the northwest of the site, west of the intersection of Townsend Avenue and North Perry Street, an automobile sales and service facility was present in 1947.

- ***1980 Sanborn Map*** - The main on-site building was labeled as a chemical sales and storage facility on the 1980 Sanborn map. A metal shed was present adjacent to and northeast of the main building in 1980. No storage tanks were noted the 1980 Sanborn map. The gasoline filling station to the southwest of the site was labeled as an automobile repair facility in 1980.

The three aboveground storage tanks currently on-site at the northwest corner of the large brick building are labeled as naphtha, mineral spirits, and sulphuric acid, respectively. Each storage tank is 11 feet in diameter and 30 feet long with an approximate storage capacity of 20,000 gallons per tank. General descriptions of the three chemicals labeled on the tanks are as follows:

- ***Naphtha*** - Petroleum naphthas are complex mixtures which can be obtained from the petroleum light distillate or low boiling fraction. The light distillate is mainly composed of paraffins, mono- and dicycloparaffins, some olefins, alkybenzenes, naphthenes, and some benzenes (Clayton & Clayton, 1981).

- ***Mineral Spirits*** - A low boiling point fraction containing paraffins, naphthenes, and aromatics (Clayton & Clayton, 1981).

- ***Sulphuric Acid*** - H_2SO_4, sulphuric acid, is colorless, odorless, and extremely corrosive (Chang, 1988).

3.0 SITE INVESTIGATION

3.1 SITE INVESTIGATION/ POTENTIAL CONTAMINATION DISTRIBUTION

The focus of this work is to identify the distribution of potential chemical contamination in the soil and groundwater in areas where chemicals were previously stored, handled, and transported. This information will be used to identify potential sources of contamination to soil and groundwater stemming from the former handling and storage of chemicals on the site. This information will also be utilized in the Remedial Alternatives Report to evaluate remedial alternatives for the contaminated soil and groundwater, if any.

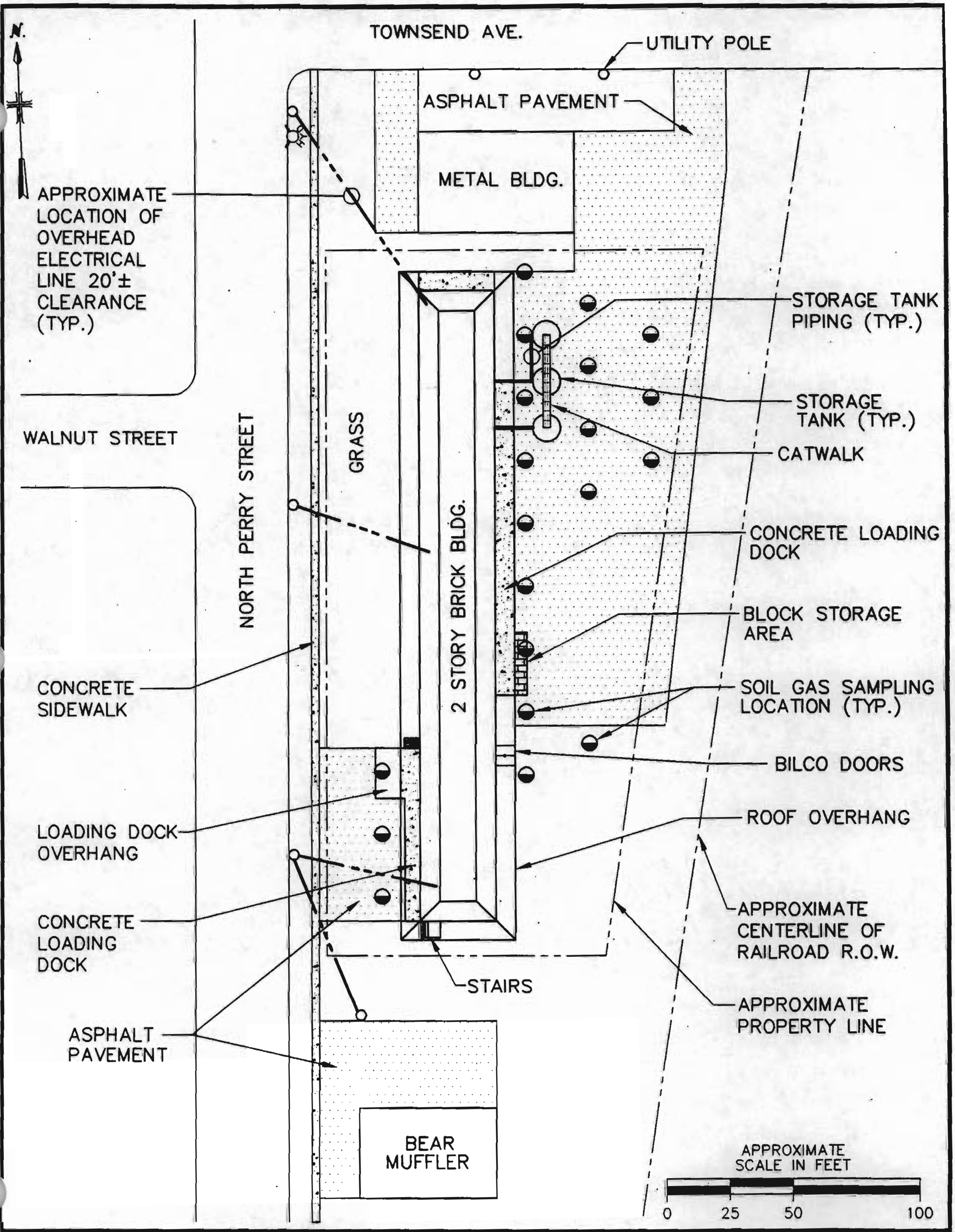
3.1.1 Existing Mapping

Sanborn Company Fire Insurance Maps dated 1902, 1907, 1912, 1926, 1947 and 1980 were reviewed and discussed in Section 2.3. Copies of these Sanborn Maps are provided in Appendix A.

3.1.2 Soil Gas Survey

To guide subsequent investigations, a passive soil gas survey will be conducted in portions of the site. Potential contaminant sources include bulk chemical storage tanks, drum storage areas, and chemical usage/transfer areas. Potential pathways include natural groundwater transport and preferential pathways associated with subsurface electrical and sewer lines.

The soil gas survey will be conducted at 20 locations around the main on-site building. The location of the soil gas survey points will be biased toward suspected areas of concern based on a review of historical Sanborn maps of the site and known areas of chemical transfer and handling, i.e., in the vicinity of the above ground storage tanks, loading docks, and Bilco doors. Approximate soil gas sampling locations are shown on Figure 3-1. Table 3-1 shows the soil gas analytes of concern that will be analyzed by GC/MS methods.



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SOIL GAS SURVEY LOCATIONS

FIGURE 3-1

TABLE 3-1

SOIL SURVEY MODULE ANALYTES

1,1-Dichloroethane	Carbon tetrachloride	Ethylbenzene	Undecane
Methyl t-butyl ether	1,2-Dichloroethane	m-Xylene	Naphthalene
trans-1,2-Dichloroethene	Trichloroethene	o-Xylene	Tridecane
cis-1,2-Dichloroethene	Toluene	1,3,5-Trimethylbenzene	2-Methyl naphthalene
1,1,1-Trichloroethane	Octane	1,2,4-Trimethylbenzene	Pentadecane
Benzene	Tetrachloroethene	1,4-Dichlorobenzene	Chloroform
Chlorobenzene			

Prior to any surface disturbance, underground utilities will be marked out. Small flags or markers will be used to locate the proposed soil gas module locations. Module locations that are located in concrete or asphalt will require a pre-drilled hole through the surface material. The pilot hole will be approximately 1.0-inch in diameter, which will later be plugged by a small (1 1/8-inch) cork.

For modules that will be installed directly into soil, a hole (approximately 1/2 to 3/4-inch in diameter) will be made with a slam bar or a rotary-hammer drill to a depth of 2 to 3 feet below grade. The installation date and time (along with any anomalous site conditions) will be noted in the field book, and the field data form provided by the laboratory. The sample location and module serial number are also recorded in the field book.

After a period of approximately two weeks, the sampling modules will be retrieved and placed in the original coded shipping containers provided by the laboratory. The date and time of retrieval will be recorded in the field book and field data form provided by the laboratory. Once removed from the subsurface the passive samplers will be held at <4°C. This will ensure a minimal loss of volatile organics during shipment to the laboratory.

3.1.3 Soil Borings

Up to 15 Geoprobe borings will be drilled to investigate the vertical and horizontal extent of the soil contamination across the site. The locations of the Geoprobe borings will be based on the results of the soil gas survey. The Geoprobe borings will be biased toward the areas with the highest soil gas survey concentrations and potential areas of concern, based on an understanding of the former site operations. In addition, one boring will be located in an on-site area which is anticipated to represent background conditions.

The procedure for advancing the soil borings, monitoring well installation and construction, and soil sampling and screening are discussed in the Quality Assurance Project Plan (QAPP). The 15 soil borings will be advanced using a Geoprobe Environmental Sampler (Macro Core) with continuous soil sampling from grade to the water table. Soil boring locations will be surveyed and referenced to an on-site datum.

Up to 20 subsurface soil samples will be collected for laboratory analysis from the 15 Geoporbe borings. The procedure for subsurface soil sample collection is provided in the QAPP. The selection of soil samples for laboratory analysis will be based on visual observations of staining, odors and PID readings. Laboratory analysis of subsurface soil samples for TCL/TAL analytes is discussed in the QAPP.

3.1.4 Monitoring Well Points

To provide information on the hydrogeology and groundwater quality of the site, up to five of the soil borings will be converted to monitoring well points. The locations of the monitoring well points will be based on the results of the soil gas survey and PID readings recorded during the Geoprobe soil sampling. The monitoring well points are intended to provide information on groundwater quality upgradient of the site, in the near downgradient direction from the suspected chemical storage and handling areas, and at the downgradient edge of the property.

The monitoring well points will be installed in the Geoprobe boreholes with the well screen intercepting the water table. The monitoring well points will be installed as follows. A 2.0-inch O.D. diameter, threaded, steel rod drive casing will be inserted into an expendable drive point and advanced through the borehole left by the Macro Core soil sampling. The drive casing will be advanced to the bottom of the borehole with an hydraulic ram. Once the drive casing is in place, 1.0-inch diameter PVC riser will attached to a PVC well screen and lowered into the drive casing to 2 to 3 feet below the water table. The annular space between the drive casing and the PVC screen will be filled with clean silica filter pack sand. The drive casing will then be removed to expose the PVC screen and riser pipe. Clean silica filter pack will continue to added as the drive casing is recovered. The filter pack material will extend to 1 to 2 feet above the PVC screen. The remainder of the borehole will be filled with a bentonite/water mixture. The well points will be constructed of 1.0-inch I.D. Schedule 40 PVC screen, 6 feet in length with screen openings of 0.010 inches, and 1.0-inch I.D. Schedule 40 PVC flush-threaded riser. The riser will be sealed at the ground surface with bentonite. A flush mount protective casing will be set around each well point, the top of which will be fitted with a locking cap. After the well points are installed and developed, groundwater samples will be collected for analysis of TAL/TCL analytes. The well points will be surveyed to existing site datum.

3.1.5 Monitoring Well Point Sampling

Following the installation of the five monitoring well points, groundwater from all monitoring well points will be sampled. The monitoring wells will be sampled according to procedures provided in the QAPP. The samples collected from the newly-installed well points will be analyzed for TCL/TAL analytes including cyanide.

3.1.6 Lead Paint/Asbestos Survey

As part of the investigation, the two story brick structure totaling approximately 30,000 square feet will undergo an asbestos and lead paint assessment. The assessment will involve an inspection of all readily available asbestos containing building materials and lead-based paints, as well as the identification of readily accessible mercury switches. The assessment will be divided into three separate tasks as described below:

- ***Task I - Asbestos & Lead Paint survey and Assessment*** - An EPA-accredited asbestos building inspector will locate, quantify and assess all accessible and exposed suspect asbestos containing material (ACM) at the facility. This will be completed by performing a visual survey and assessment on a room-by-room basis in general accordance with the EPA's AHERA protocols. Suspect materials identified during the survey will be located and grouped into homogenous areas on the basis of color, texture, use and apparent construction history. All quantities shall be field measured or visually estimated. Areas identified which demonstrate consistent use, apparent paint histories and substrate types will be grouped into a single test combination (i.e., wooden window sashes, mullions and frames). Additionally, suspected lead-based paints identified during the assessment will be grouped into testing combinations on the basis of area, substrate and component. The location and quantity of all readily accessible mercury containing switches shall be located and included as part of the survey assessment.

- ***Task II - Sample Collection and Analysis*** - Upon completion of the asbestos and lead paint survey and assessment, representative bulk samples will be collected of all homogeneous areas of suspect ACM. A single representative sample of each test combination will be collected and submitted to an accredited laboratory for analysis by atomic absorption spectroscopy (AAS) or inductively coupled plasma - atomic emissions spectroscopy (ICP-AES). There will be no samples of mercury collected during the Sample Collection and Analysis task.

- ***Task III - Report Generation*** - Following sample collection and analysis, a survey report will be generated which will summarize the scope of work, methodology and findings of the assessment performed. The lead-based paint portion of the report will identify the locations and conditions of the lead-based paints. Additionally, cost estimates for the abatement of the lead-based paints and confirmed or likely ACM shall be provided and included as part of the report.

3.1.7 Storage Tank Removal

As shown on Figure 1-2, three aboveground storage tanks (ASTs) are located at the eastern exterior wall of the main building, approximately 100 feet to the south of Townsend Avenue. These ASTs are constructed of steel and coated with a grey primer. Each tank measures 11 feet in diameter and approximately 30 feet in height. The ASTs are individually mounted on steel supports, which are fastened onto a concrete pad. Access to the top of the tanks is provided by a single-caged manway. This manway is mounted on the side of one of the tanks and leads directly to an overhead catwalk.

During full operation, the former Ashland Chemical Company apparently utilized the three tanks to store mineral spirits, naphtha and sulfuric acid. The liquids were transferred from the tanks to the building through a series of 2.0-inch, aboveground steel pipes.

As part of the proposed work, the contents of the tanks will be emptied and properly disposed according to New York State regulations. The steel tanks will be cleaned, cut into smaller pieces, and removed from the site by a mobile crane. The associated piping will also be cleaned and cut for off-site disposal. During disassembly of the tanks and associated piping and prior to removal of any steel from the site, all materials will be decontaminated. The steel will then be either properly disposed or recycled.

A Chemical Bulk Storage (CBS) registration form will be completed for the tanks at the outset of the project. The CBS registration form will be provided to the City for subsequent submission, with the applicable fee, to the NYSDEC.

4.0 SITE INVESTIGATION/REMEDIAL ALTERNATIVES REPORT

A SI/RAR Report will be prepared and submitted to the NYSDEC for review and comment. The report will include the following:

- Discussion of field investigation activities.
- Presentation of analytical results for all media sampled.
- Quality assurance/quality control evaluation of the analytical data including the results of the data validation.
- Discussion of the nature and extent of any contaminants identified.
- Comparison of analytical results to historical concentrations.
- Conclusions and recommendations drawn from the interpretation of the data.
- Supporting data, including analytical data packages, field log forms, and well point construction diagrams.

The RA portion of the report will include the following discussions:

- ***Identification and Screening of Remedial Technologies*** - The feasible technologies and process options for site remediation will be identified for each general response action, and the results of the remedial technologies screening will be described.
- ***Development and Initial Screening of Remedial Alternatives*** - Remedial alternatives will be developed by combining the technologies identified in the previous screening process. The results of the initial screening of remedial alternatives, with respect to effectiveness, implementability and cost, will be described.
- ***Description and Detailed Analysis of Alternatives*** - A detailed description of the cost and non-cost features of each remedial action alternative passing the initial screening of the previous section will be presented. A detailed evaluation of each remedial alternative with respect to each of the evaluation criteria will be presented. A comparison of these alternatives will also be presented.

5.0 REMEDIAL ALTERNATIVES ANALYSIS

Following completion of the Site Investigation, alternatives for remediation of the former Ashland Chemical Company site will be developed. The alternatives will be designed to attain the remedial objectives, which are to be established during the SI to address identified risks to human health and the environment, and the site's State Standards Criteria and Guidance Values (SCGs). An initial screening of remedial alternatives will be performed according to the procedures recommended in NYSDEC's TAGM, Selection of Remedial Actions at Inactive Hazardous Wastes Sites and the Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA/540/G89/004).

The tasks to be conducted during the screening process will include the following:

- Development of general response actions.
- Identification of applicable remedial technologies and process options.
- Development of remedial alternatives.

5.1 DEVELOPMENT OF GENERAL RESPONSE ACTIONS

Remedial action objectives will be developed during the SI based on the data collected. Prior to the development of these objectives, any significant site problems and contaminant pathways will be identified, routes of exposure considered and SCGs identified. The remedial response objectives that will eliminate or minimize substantial risks to public health and the environment will be developed in detail.

Based on the response objectives, general response actions will be delineated to address each of the site's areas of concern. The response actions will form the foundation for the screening of remedial technologies. General response actions considered will include the No Action alternative as a baseline against which all other alternatives can be compared.

Based on the remedial action objectives and each identified general response action, potential treatment technologies and their associated containment or treatment and disposal requirements will be identified. A prescreening of these potential treatment technologies for suitability as part of a remedial alternative will be conducted. Where several process options exist for a particular technology, the process option for which most data exists and whose capacities/constraints most closely match site conditions will be selected for further detailed evaluation.

Technologies which could prove extremely difficult to implement, which might not achieve the remedial objective in a reasonable time, or which might not be applicable or feasible based on the site-specific conditions will be eliminated from further consideration. Surviving technologies will then be combined into remedial alternatives which meet the response objectives.

5.2 PRELIMINARY SCREENING OF REMEDIAL ALTERNATIVES

Following identification, the list of potential remedial alternatives will be screened. The objective of this effort is to reduce the number of technologies and alternatives for further analysis while preserving a range of options. This screening will be accomplished by evaluating alternatives on the basis of effectiveness, implementability and cost. These screening criteria are briefly described below:

- ***Effectiveness Evaluation*** - The effectiveness evaluation will consider the capability of each remedial alternative to protect human health and the environment. Each alternative will be evaluated as to the protection it would provide and the reductions in toxicity, mobility or volume of contaminants it would achieve.

- ***Implementability Evaluation*** - The implementability evaluation will be used to measure both the technical and administrative feasibility of constructing, operating and maintaining a remedial action alternative. In addition, the availability of the technologies involved in a remedial alternative will be considered.

  Innovative technologies will be considered throughout the screening process if there is a reasonable belief that they offer potential for better treatment performance or implementability, few or lesser adverse impacts than other available approaches, or lower costs than demonstrated technologies.

- ***Cost Evaluation*** - Cost evaluation will include estimates of capital costs, annual operation and maintenance (O&M) cost, and present worth analysis. These conceptual cost estimates are order-of-magnitude estimates, and will be prepared based on:
  - Preliminary conceptual engineering for major construction components.
  - Unit costs of capital investment and general annual operation and maintenance costs available from USEPA documents and from Malcolm Pirnie in-house files.

5.3 DETAILED ANALYSIS OF ALTERNATIVES

The remedial alternatives which pass the initial screening will be further evaluated. The evaluation will conform to the requirements of the NYSDEC's TAGM (#4030), Selection of Remedial Actions at Inactive Hazardous Waste Sites. It will consist of a technical, environmental and cost evaluation, as well as an analysis of other factors, as appropriate. The detailed evaluation will also follow the general process specified in the "Guidance on Feasibility Studies Under CERCLA" (USEPA, 1985a), as updated in the December 1986 and July 1987 Memoranda on "Interim Final Guidance on Superfund Selection of Remedy", and the "Interim Guidance for Conducting RI/FS under CERCLA" (USEPA, October 1988).

The NYSDEC has established specific objectives which must be addressed by the remedial alternatives. These alternatives must:

- Be protective of human health and the environment.
- Attain SCGs.
- Satisfy the preference for treatment that significantly and permanently reduces toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants.
- Be cost effective.

To meet these goals a series of seven specific screening criteria have been established. These include:

1. ***Short-Term Effectiveness*** - This criterion addresses the effects of the alternative during the construction and implementation phase until the remedial actions have been completed and the selected level of protection has been achieved. Each alternative is evaluated with respect to its effects on the community and on-site workers during the remedial action, environmental impacts resulting from implementation, and the amount of time until protection is achieved.

2. ***Long-Term Effectiveness and Performance*** - This criterion addresses the results of a remedial action in terms of the risk remaining at the site after the response objectives have been met. The primary focus of this evaluation is to determine the extent and effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes. The factors to be evaluated include the magnitude of remaining risk (measured by numerical standards such as cancer risk levels), and the adequacy, suitability and long-term reliability of management controls for providing continued protection from residuals (i.e., assessment of potential failure of the technical components).

3. ***Reduction of Toxicity, Mobility, or Volume*** - This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility or volume of the contaminants. The factors to be evaluated include the treatment process employed, the amount of hazardous material destroyed or treated, the degree of reduction expected in toxicity, mobility or volume, and the type and quantity of treatment residuals.

4. ***Implementability*** - This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation. Technical feasibility considers construction and operational difficulties, reliability, ease of undertaking additional remedial action (if required), and the ability to monitor its effectiveness. Administrative feasibility considers activities needed to coordinate with other agencies (e.g., state and local) in regard to obtaining permits or approvals for implementing remedial actions.

5. ***Cost*** - This criterion addresses the capital costs, annual operation and maintenance costs, and present worth analysis.

   Capital costs consist of direct (construction) and indirect (non-construction and overhead) costs. Direct costs include expenditures for the equipment, labor and material necessary to perform remedial actions. Indirect costs include expenditures for engineering, financial and other services that are not part of actual installation activities but are required to complete the installation of remedial alternatives. Annual operation and maintenance costs are post-construction costs necessary to ensure the continued effectiveness of a remedial action. These costs will be estimated to provide an accuracy of +50 percent to -30 percent.

A present worth analysis will be used to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year, usually the current year. This allows the cost of remedial action alternatives to be compared on the basis of a single figure representing the amount of money that would be sufficient to cover all costs associated with the remedial action over its planned life. As suggested in the USEPA's guidance (1988), a discount rate of five percent will be considered, unless the market values indicate otherwise, during the performance of the RAR.

6. ***Compliance With SCGs*** - This criterion is used to determine how each alternative complies with State Standards, Criteria and Guidance values as established during the SI.

7. ***Overall Protection of Human Health and the Environment*** - This criterion provides a final check to assess whether each alternative meets the requirement that it is protective of human health and the environment. The overall assessment of protection is based on a composite of factors assessed under the evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with SCGs.

The alternatives will be evaluated using these criteria. Alternatives with extremely low cost/benefit values will be deleted from further consideration. Alternatives which provide similar levels of protection, yet which have significantly different cost will be compared. The least costly of these will be selected for further study. Eventually, an alternative will be recommended which is protective of public health and the environment, attains the SCGs, satisfies the established remedial objectives, is cost-effective, reflects consideration for the preference for permanent remedies and represents the best balance of all evaluation factors.

6.0 UTILIZATION PLAN

6.1 MINORITY/WOMEN-OWNED BUSINESS ENTERPRISE (M/WBE)

This MBE/WBE Plan documents the good faith efforts to be undertaken to comply with the requirements of New York State Funded Clean Water/Clean Air Bond Act under the Brownfields Program to subcontract with minority- and women-owned business enterprises and to employ minorities and women. The purpose of the MBE/WBE Plan is to demonstrate and document Malcolm Pirnie's intention to make a good faith effort to meet the goals as stated in the Environmental Restoration Projects (Brownfields) document. This goal is as follows:

> The Contractor agrees to make good faith efforts to subcontract certain percentages of the total contract value to New York State certified MBE and WBE firms.

6.1.1 Malcolm Pirnie Corporate Affirmative Action Statement

6.1.1.1 Affirmative Action Statement

Malcolm Pirnie supports the NYSDEC's commitment to minority- and women-owned business enterprises. The firm will make good faith efforts to meet or exceed the goals for this contract. Malcolm Pirnie is in compliance with Title VII of the Civil Rights Acts of 1964, as amended by the Equal Employment Opportunity Act of 1972.

6.1.2 Good Faith Efforts Undertaken To Ensure MBE/WBE Participation

6.1.2.1 General

As part of the New York State Clean Water/Clean Air Bond Act Brownfields Investigation Grant, the City of Johnstown has retained Malcolm Pirnie to perform the following Tasks:

- Perform a Site Investigation (SI).
- Prepare an SI Report.
- Prepare a Remedial Alternatives Report (RAR).

Subcontractors/Suppliers will be needed to assist or provide services in the following areas.

1. Well Development and Groundwater Sampling.
2. Data Evaluation Services.
3. Laboratory Analyses.
4. Soil Gas Survey
5. Geoprobe Services
6. Storage Tank Removal
7. Asbestos/Lead-Based Paint Inspection

6.1.2.2 MBE/WBE Participation

- ***Well Development and Groundwater Sampling*** - Malcolm Pirnie has procured Star Environmental, a certified MBE company, for the development of approximately five monitoring well points and associated groundwater sampling of those wells. The estimated fee for these service is approximately $570.

- ***Data Evaluation Services*** - Malcolm Pirnie has procured Data Validation Services, a certified WBE company, for professional data evaluation services. Data Validation Services will review the analytical data in accordance with the 1997 NYSDEC Department of Environmental Remediation Data Usability Summary Report (DUSR) Guidelines and prepare a DUSR. The estimated fee for these services is approximately $1575.

- ***Laboratory Analyses Services*** - Malcolm Pirnie has procured Chemtech, a certified MBE firm, to perform requested laboratory services in accordance with NYSDEC ASP CLP. The estimated fee for these services is approximately $10,500.

7.0 REFERENCES

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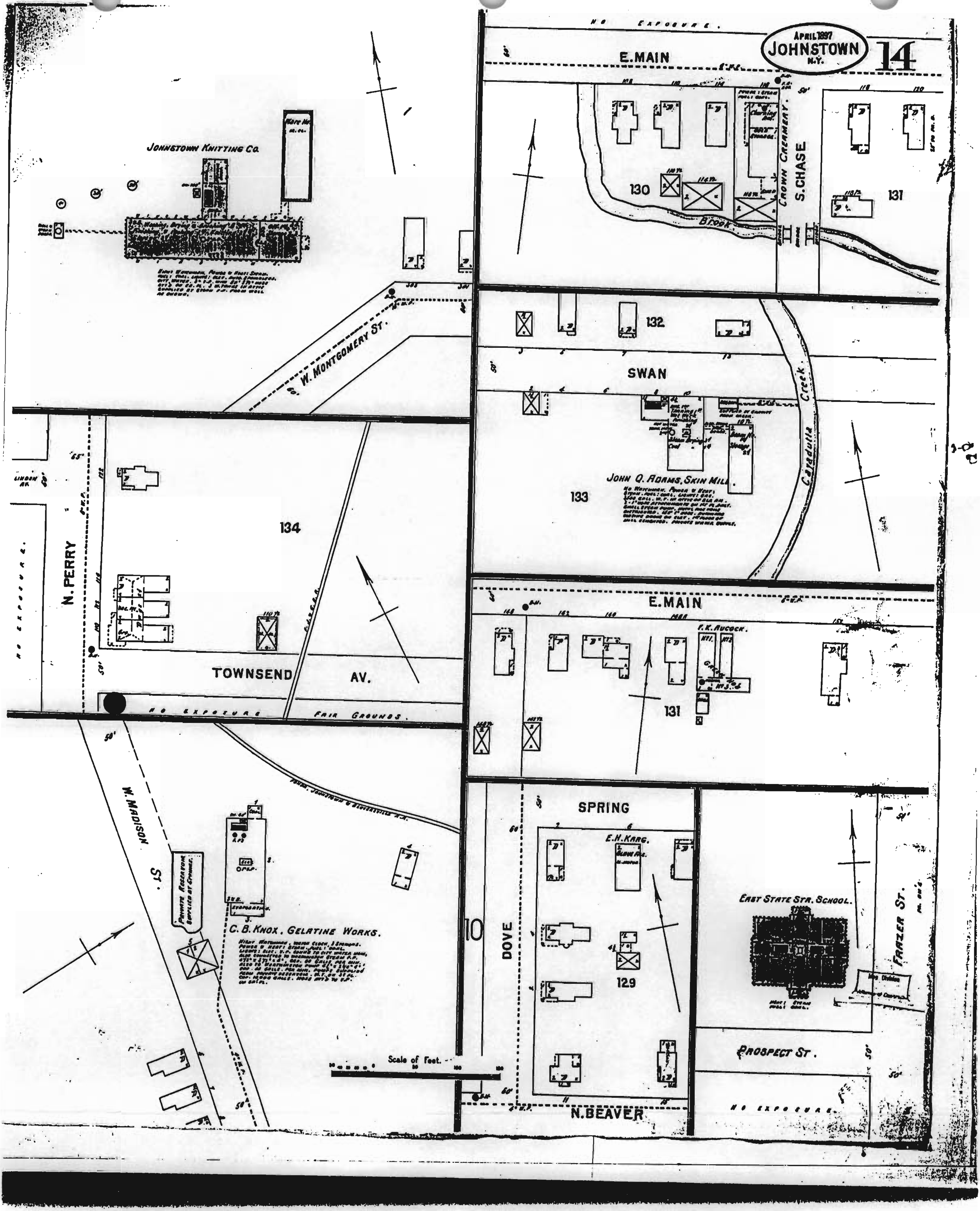
APPENDIX A

Sanborn Company Fire Insurance Maps



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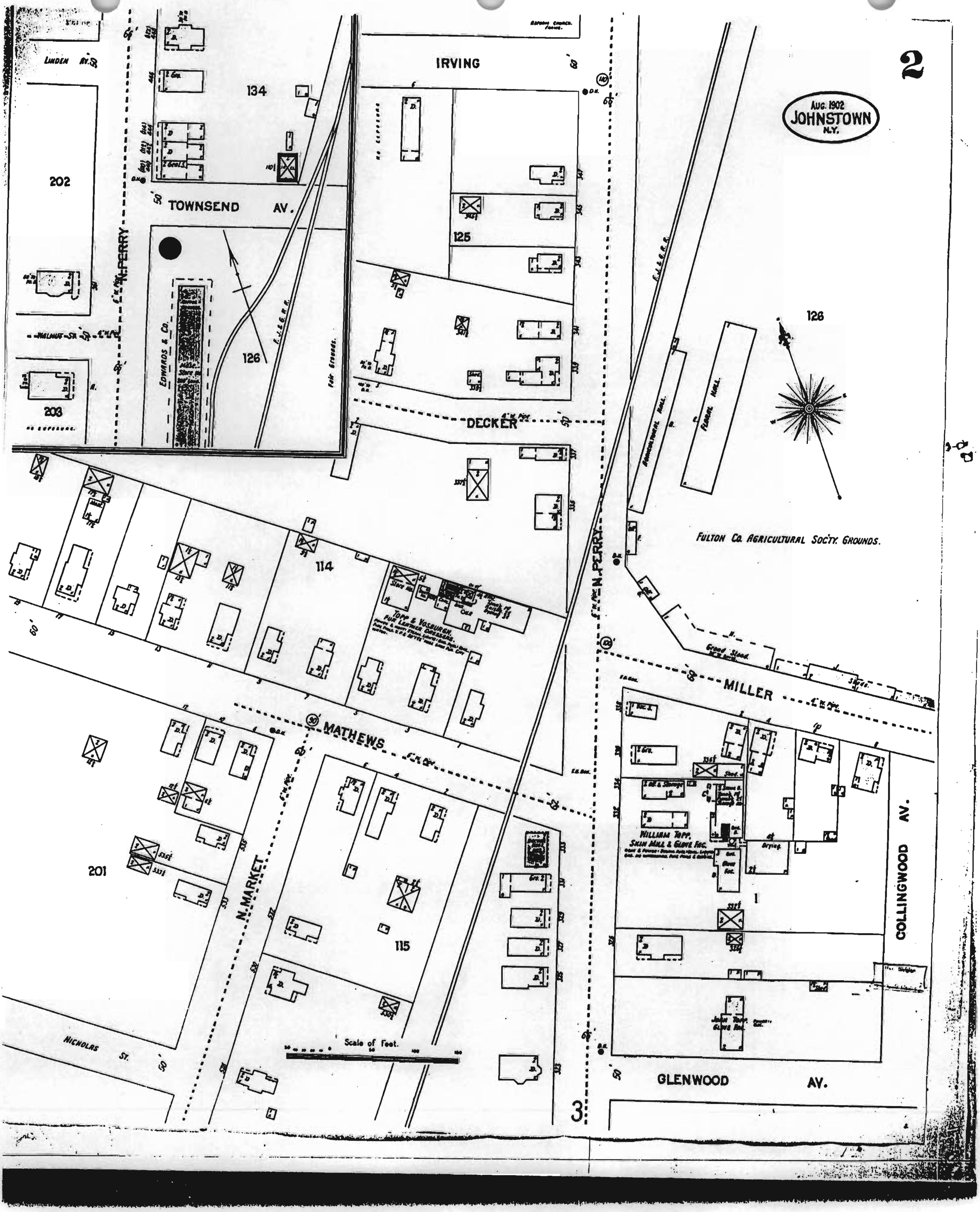
ERIIS

SANBORN 1897



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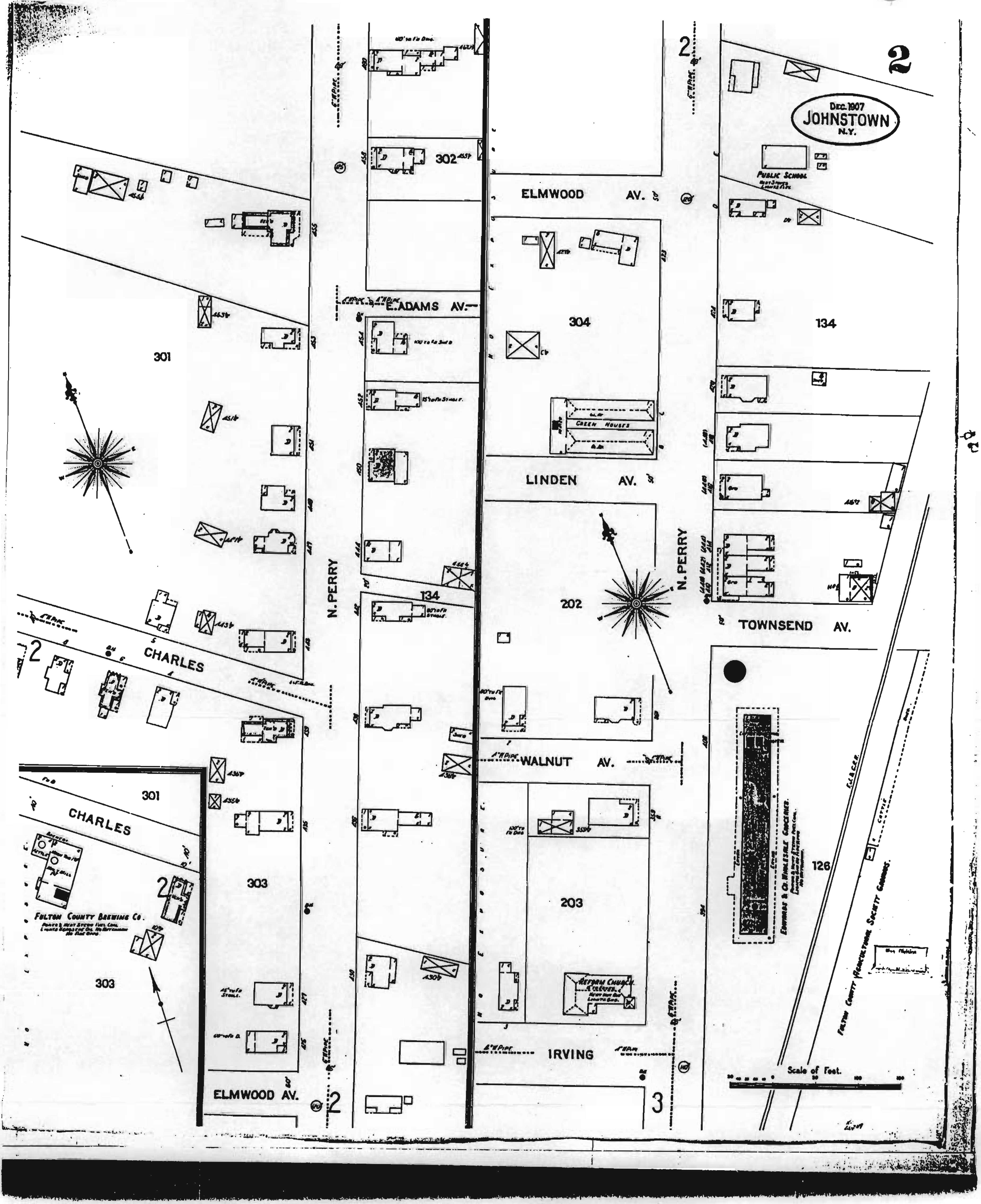

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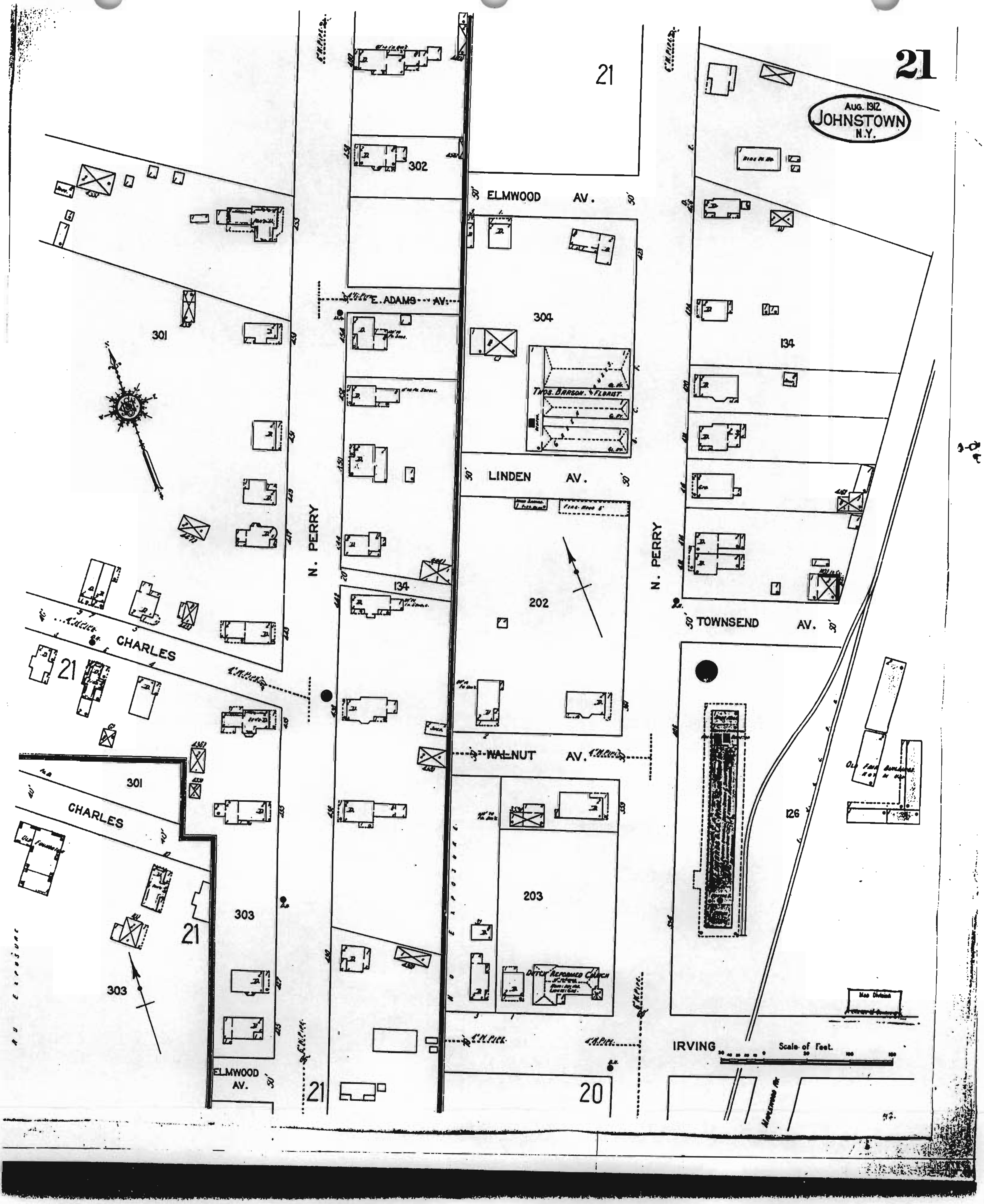
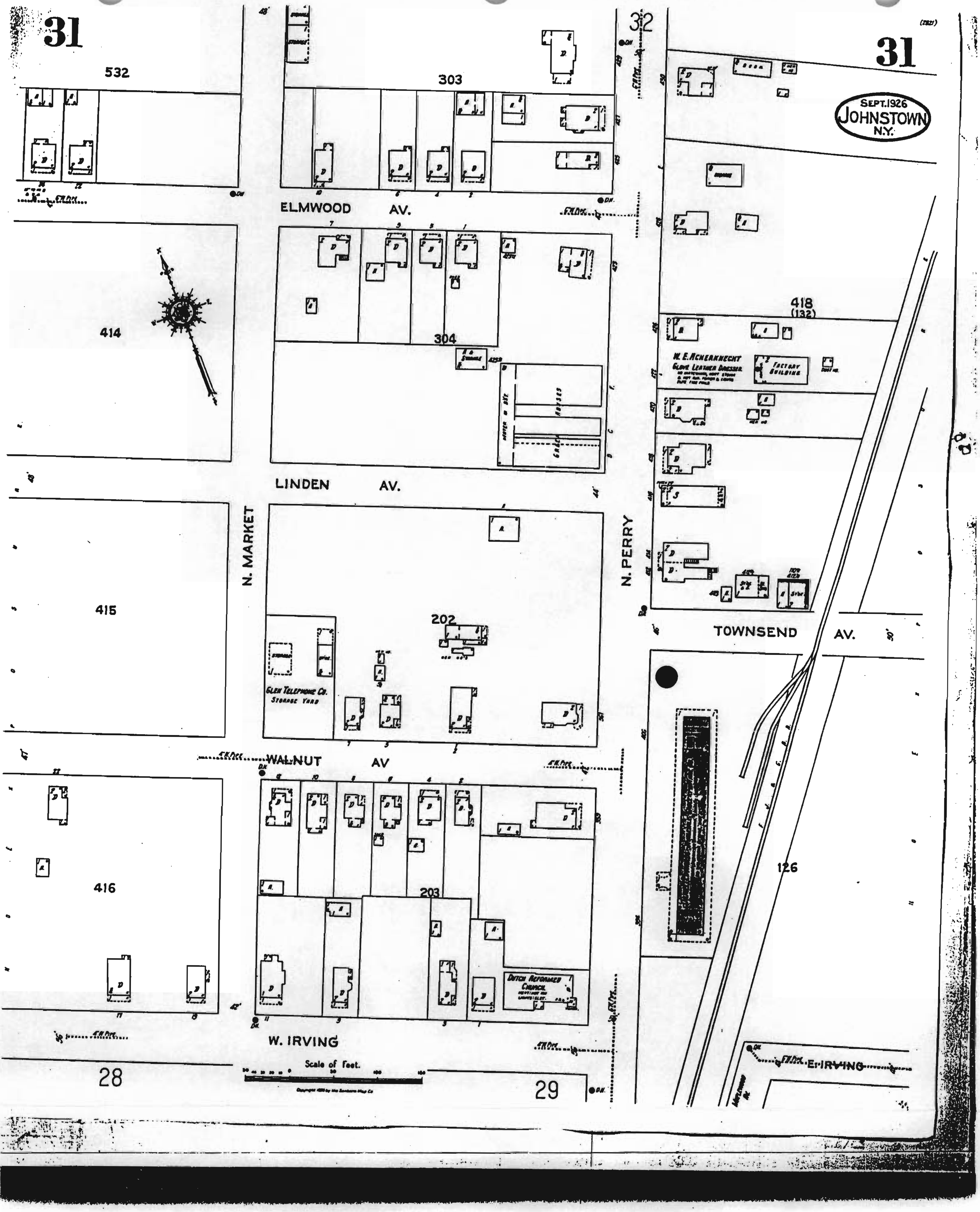
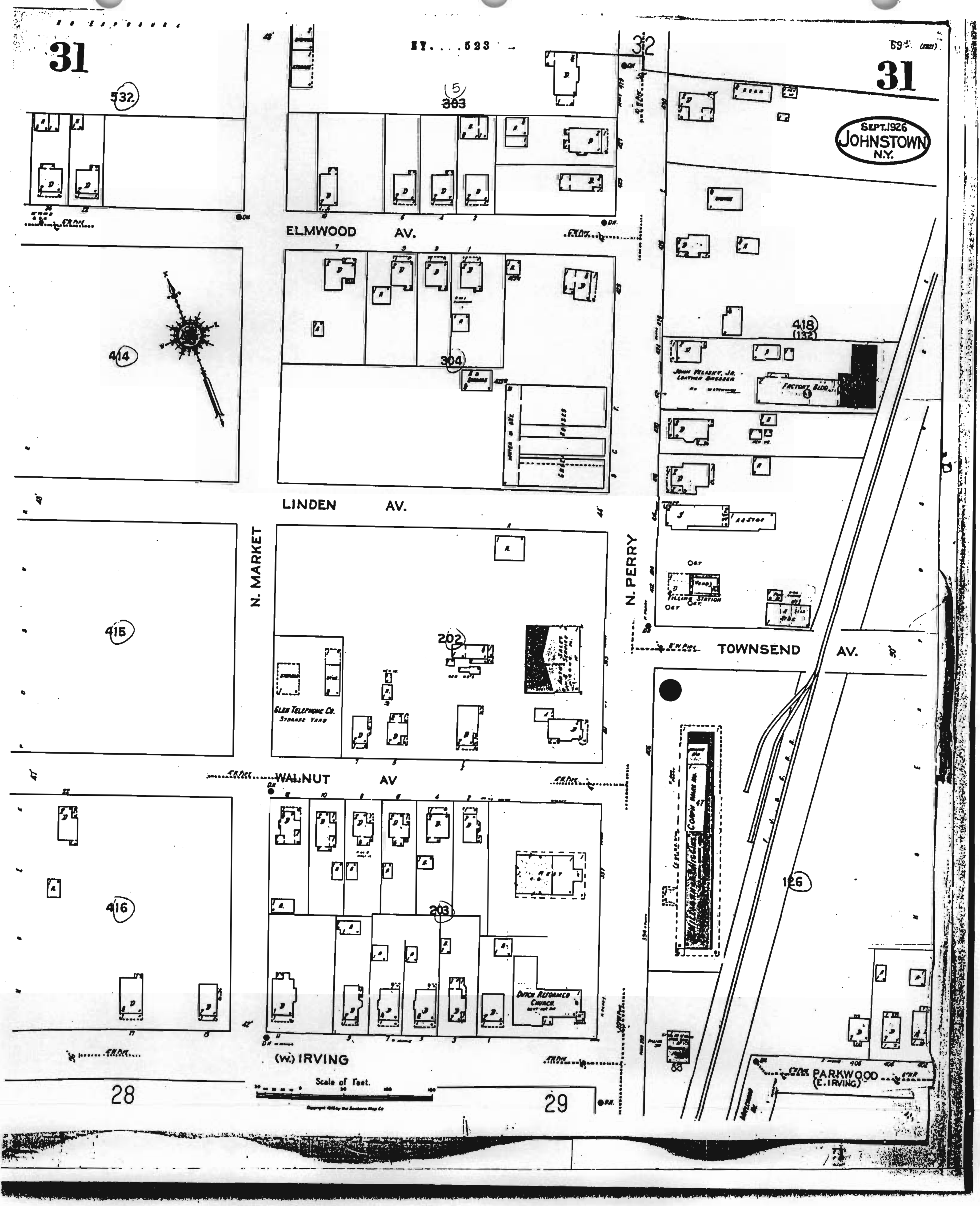
1907


21
Aug. 1912
JOHNSTOWN
N.Y.
N. PERRY
N. PERRY
ELMWOOD AV.
E. ADAMS AV.
LINDEN AV.
TOWNSEND AV.
WALNUT AV.
CHARLES
CHARLES
IRVING
ELMWOOD AV.
THOS. BARSON. FLORIST
DUTCH REFORMED CHURCH
Scale of Feet.
301
302
304
134
202
203
126
303
20
21

1912


31
31
SEPT.1926
JOHNSTOWN
N.Y.
32
532
303
ELMWOOD AV.
414
304
418
(132)
W. E. ACHERKNECHT
GLOVE LEATHER DRESSER
FACTORY BUILDING
LINDEN AV.
N. MARKET
N. PERRY
415
202
GLEN TELEPHONE CO.
STORAGE YARD
TOWNSEND AV.
WALNUT AV.
126
416
203
DUTCH REFORMED CHURCH
W. IRVING
E. IRVING
Scale of Feet.
28
29

1926

31
NY....523
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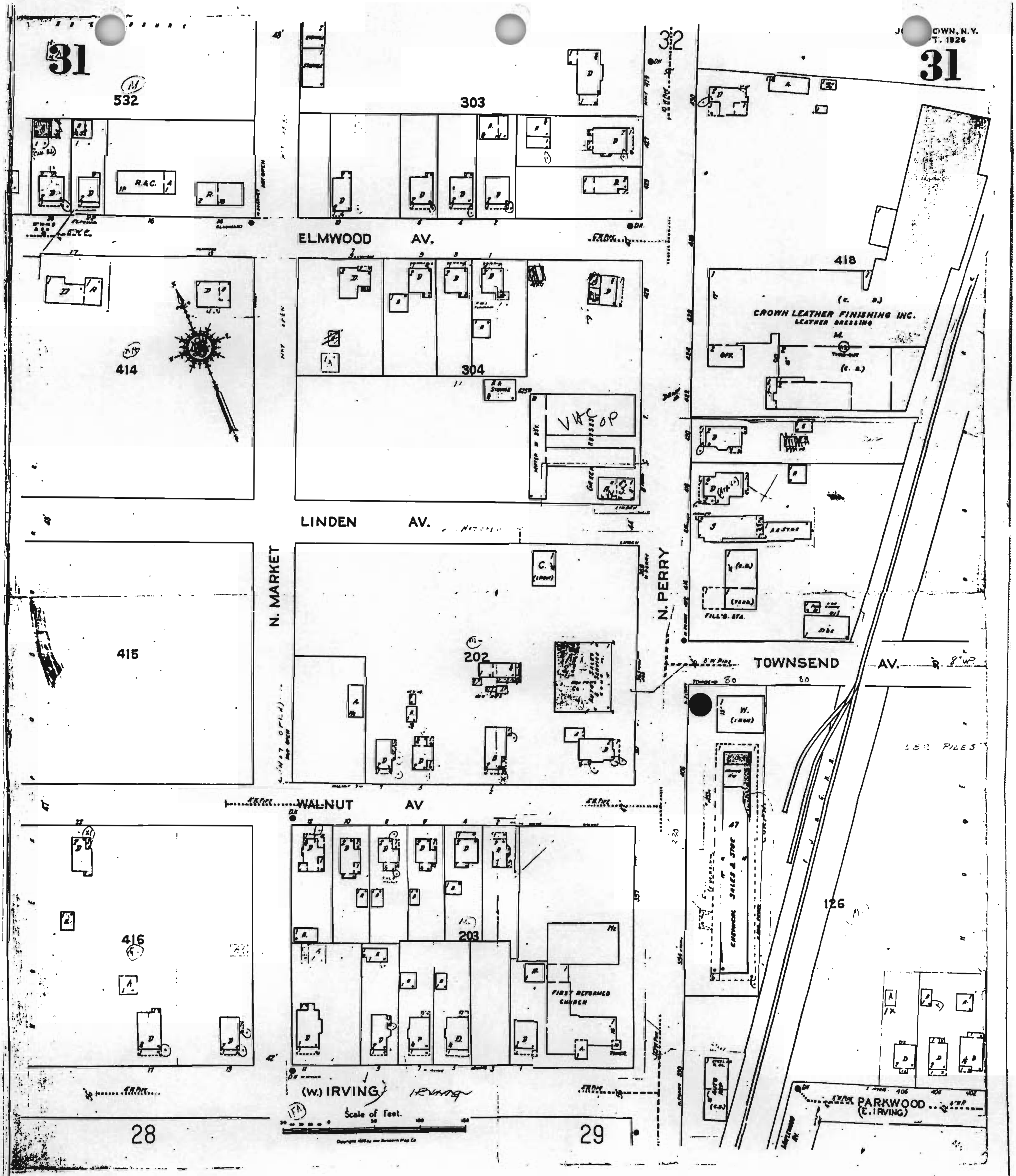
JOHNSTOWN
N.Y.
532
5
303
ELMWOOD AV.
414
304
418
(132)
John Welsby, Jr.
Leather Dresser
Factory Bldg.
LINDEN AV.
N. MARKET
N. PERRY
Filling Station
415
202
Glen Telephone Co.
Storage Yard
TOWNSEND AV.
WALNUT AV
126
416
203
Dutch Reformed Church
(W.) IRVING
Scale of Feet.
28
29
PARKWOOD
(E. IRVING)

1947



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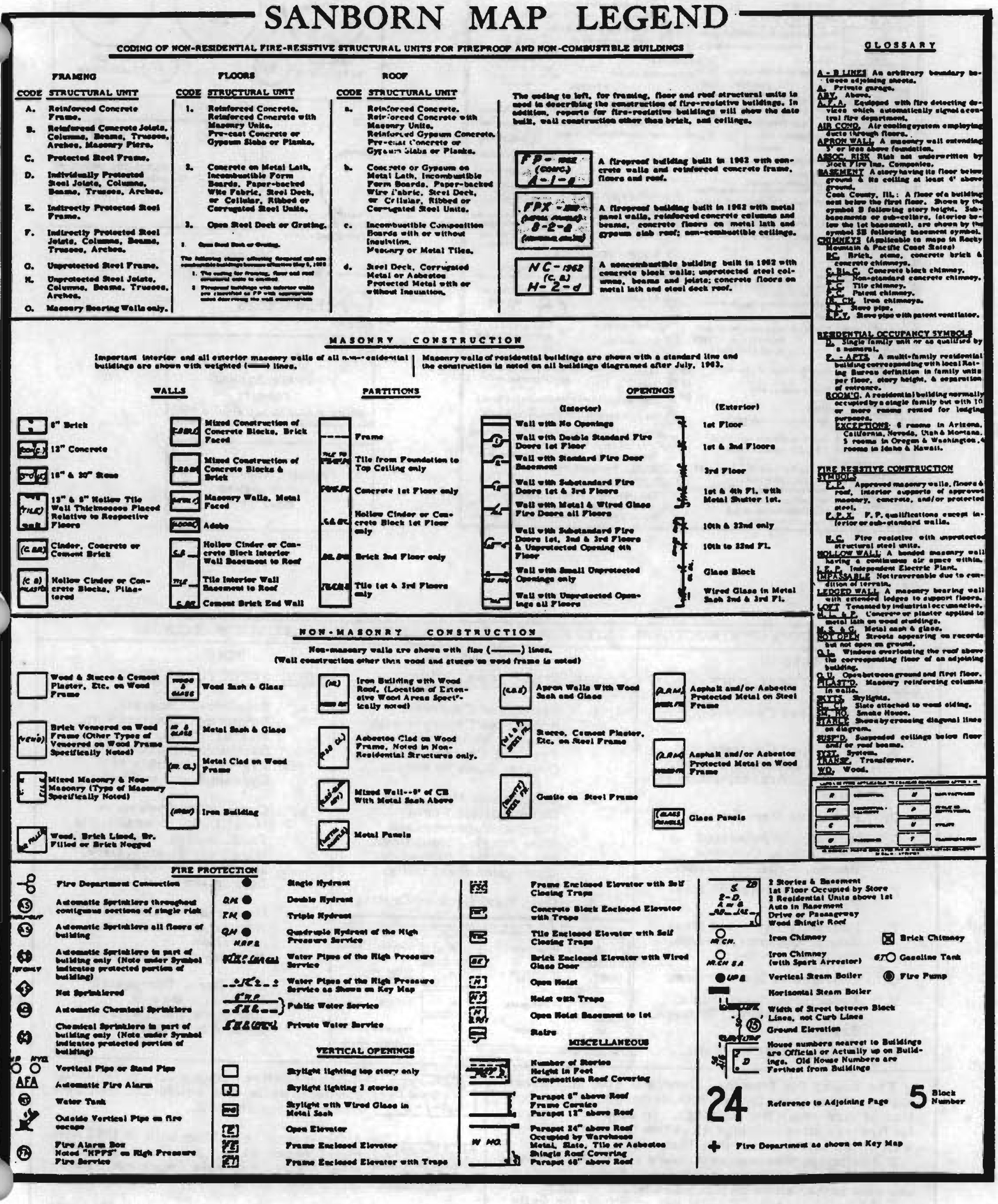
1980



SANBORN MAP LEGEND

CODING OF NON-RESIDENTIAL FIRE-RESISTIVE STRUCTURAL UNITS FOR FIREPROOF AND NON-COMBUSTIBLE BUILDINGS

FRAMING		FLOORS		ROOF	
CODE	STRUCTURAL UNIT	CODE	STRUCTURAL UNIT	CODE	STRUCTURAL UNIT
A.	Reinforced Concrete Frame.	1.	Reinforced Concrete. Reinforced Concrete with Masonry Units. Pre-cast Concrete or Gypsum Slabs or Planks.	a.	Reinforced Concrete. Reinforced Concrete with Masonry Units. Reinforced Gypsum Concrete. Pre-cast Concrete or Gypsum Slabs or Planks.
B.	Reinforced Concrete Joists, Columns, Beams, Trusses, Arches, Masonry Piers.	2.	Concrete on Metal Lath, Incombustible Form Boards, Paper-backed Wire Fabric, Steel Deck, or Cellular, Ribbed or Corrugated Steel Units.	b.	Concrete or Gypsum on Metal Lath, Incombustible Form Boards, Paper-backed Wire Fabric, Steel Deck, or Cellular, Ribbed or Corrugated Steel Units.
C.	Protected Steel Frame.	3.	Open Steel Deck or Grating.	c.	Incombustible Composition Boards with or without Insulation. Masonry or Metal Tiles.
D.	Individually Protected Steel Joists, Columns, Beams, Trusses, Arches.			d.	Steel Deck, Corrugated Metal or Asbestos Protected Metal with or without Insulation.
E.	Indirectly Protected Steel Frame.				
F.	Indirectly Protected Steel Joists, Columns, Beams, Trusses, Arches.				
G.	Unprotected Steel Frame.				
H.	Unprotected Steel Joists, Columns, Beams, Trusses, Arches.				
O.	Masonry Bearing Walls only.				

3\. Open Steel Deck or Grating.

The following change affecting fireproof and non-combustible buildings became effective [illegible]

1\. The coding for framing, floor and roof structural units is omitted.

2\. Fireproof buildings with inferior walls are classified as FP with appropriate [illegible]

The coding to left, for framing, floor and roof structural units is used in describing the construction of fire-resistive buildings. In addition, reports for fire-resistive buildings will show the date built, wall construction other than brick, and ceilings.

FP-1962 (CONC.) A-1-a — A fireproof building built in 1962 with concrete walls and reinforced concrete frame, floors and roof.

FPX-1962 B-2-b — A fireproof building built in 1962 with metal panel walls, reinforced concrete columns and beams, concrete floors on metal lath and gypsum slab roof; non-combustible ceilings.

NC-1962 (C. B.) H-2-d — A noncombustible building built in 1962 with concrete block walls; unprotected steel columns, beams and joists; concrete floors on metal lath and steel deck roof.

MASONRY CONSTRUCTION

Important interior and all exterior masonry walls of all non-residential buildings are shown with weighted (▬▬) lines.

Masonry walls of residential buildings are shown with a standard line and the construction is noted on all buildings diagramed after July, 1963.

WALLS

- 8" Brick
- 12" Concrete
- 16" & 20" Stone
- 12" & 8" Hollow Tile Wall Thicknesses Placed Relative to Respective Floors
- Cinder, Concrete or Cement Brick
- Hollow Cinder or Concrete Blocks, Pilastered
- Mixed Construction of Concrete Blocks, Brick Faced
- Mixed Construction of Concrete Blocks & Brick
- Masonry Walls, Metal Faced
- Adobe
- Hollow Cinder or Concrete Block Interior Wall Basement to Roof
- Tile Interior Wall Basement to Roof
- Cement Brick End Wall

PARTITIONS

- Frame
- Tile from Foundation to Top Ceiling only
- Concrete 1st Floor only
- Hollow Cinder or Concrete Block 1st Floor only
- Brick 2nd Floor only
- Tile 1st & 3rd Floors only

OPENINGS

(Interior)

- Wall with No Openings
- Wall with Double Standard Fire Doors 1st Floor
- Wall with Standard Fire Door Basement
- Wall with Substandard Fire Doors 1st & 3rd Floors
- Wall with Metal & Wired Glass Fire Doors all Floors
- Wall with Substandard Fire Doors 1st, 2nd & 3rd Floors & Unprotected Opening 4th Floor
- Wall with Small Unprotected Openings only
- Wall with Unprotected Openings all Floors

(Exterior)

- 1st Floor
- 1st & 2nd Floors
- 3rd Floor
- 1st & 4th Fl. with Metal Shutter 1st.
- 10th & 22nd only
- 10th to 22nd Fl.
- Glass Block
- Wired Glass in Metal Sash 2nd & 3rd Fl.

NON-MASONRY CONSTRUCTION

Non-masonry walls are shown with fine (———) lines.
(Wall construction other than wood and stucco on wood frame is noted)

- Wood & Stucco & Cement Plaster, Etc. on Wood Frame
- Brick Veneered on Wood Frame (Other Types of Veneered on Wood Frame Specifically Noted)
- Mixed Masonry & Non-Masonry (Type of Masonry Specifically Noted)
- Wood, Brick Lined, Br. Filled or Brick Nogged
- Wood Sash & Glass
- Metal Sash & Glass
- Metal Clad on Wood Frame
- Iron Building
- Iron Building with Wood Roof. (Location of Extensive Wood Areas Specifically noted)
- Asbestos Clad on Wood Frame, Noted in Non-Residential Structures only.
- Mixed Wall--9' of CB With Metal Sash Above
- Metal Panels
- Apron Walls With Wood Sash and Glass
- Stucco, Cement Plaster, Etc. on Steel Frame
- Gunite on Steel Frame
- Asphalt and/or Asbestos Protected Metal on Steel Frame
- Asphalt and/or Asbestos Protected Metal on Wood Frame
- Glass Panels

FIRE PROTECTION

- Fire Department Connection
- Automatic Sprinklers throughout contiguous sections of single risk
- Automatic Sprinklers all floors of building
- Automatic Sprinklers in part of building only (Note under Symbol indicates protected portion of building)
- Not Sprinklered
- Automatic Chemical Sprinklers
- Chemical Sprinklers in part of building only (Note under Symbol indicates protected portion of building)
- Vertical Pipe or Stand Pipe
- Automatic Fire Alarm
- Water Tank
- Outside Vertical Pipe on fire escape
- Fire Alarm Box Noted "HPFS" on High Pressure Fire Service
- Single Hydrant
- Double Hydrant
- Triple Hydrant
- Quadruple Hydrant of the High Pressure Service
- Water Pipes of the High Pressure Service
- Water Pipes of the High Pressure Service as Shown on Key Map
- Public Water Service
- Private Water Service

VERTICAL OPENINGS

- Skylight lighting top story only
- Skylight lighting 3 stories
- Skylight with Wired Glass in Metal Sash
- Open Elevator
- Frame Enclosed Elevator
- Frame Enclosed Elevator with Traps
- Frame Enclosed Elevator with Self Closing Traps
- Concrete Block Enclosed Elevator with Traps
- Tile Enclosed Elevator with Self Closing Traps
- Brick Enclosed Elevator with Wired Glass Door
- Open Hoist
- Hoist with Traps
- Open Hoist Basement to 1st
- Stairs

MISCELLANEOUS

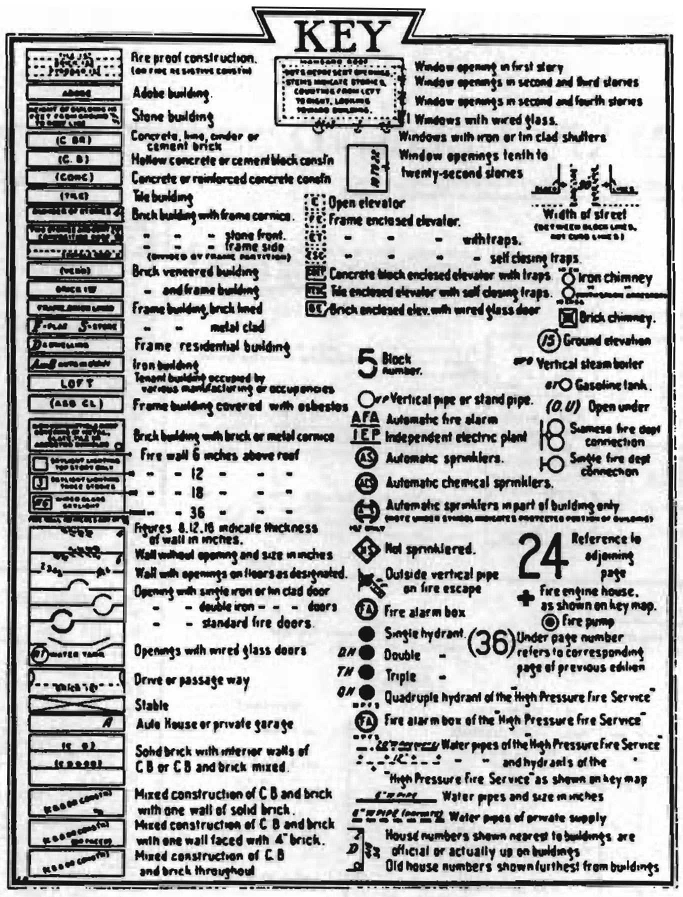
- Number of Stories Height in Feet Composition Roof Covering
- Parapet 6" above Roof Frame Cornice Parapet 12" above Roof
- Parapet 24" above Roof Occupied by Warehouse Metal, Slate, Tile or Asbestos Shingle Roof Covering Parapet 48" above Roof
- 2 Stories & Basement 1st Floor Occupied by Store 2 Residential Units above 1st Auto in Basement Drive or Passageway Wood Shingle Roof
- Iron Chimney
- Iron Chimney (with Spark Arrestor)
- Vertical Steam Boiler
- Horizontal Steam Boiler
- Brick Chimney
- Gasoline Tank
- Fire Pump
- Width of Street between Block Lines, not Curb Lines
- Ground Elevation
- House numbers nearest to Buildings are Official or Actually up on Buildings. Old House Numbers are Farthest from Buildings
- 24 Reference to Adjoining Page
- 5 Block Number
- Fire Department as shown on Key Map

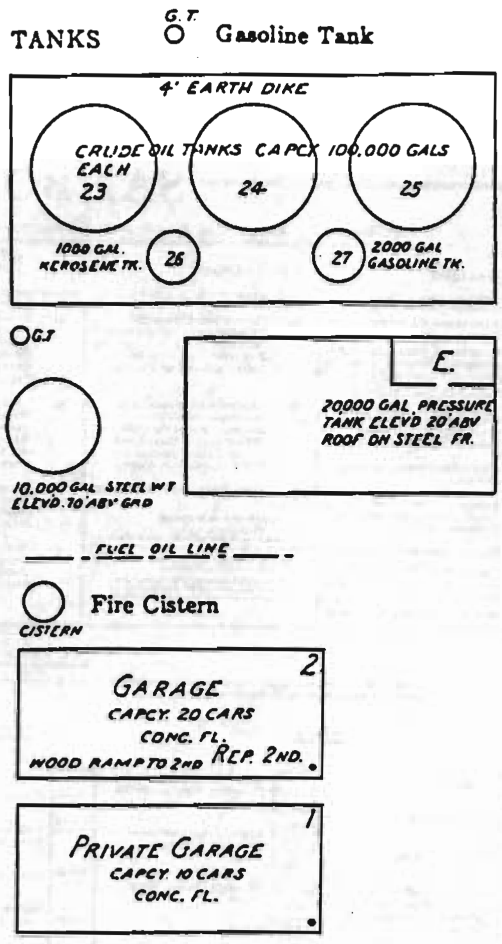
GLOSSARY

A - B LINES An arbitrary boundary between adjoining sheets.
A. Private garage.
ABV. Above.
A.F.A. Equipped with fire detecting devices which automatically signal a central fire department.
AIR COND. Air cooling system employing ducts through floors.
APRON WALL. A masonry wall extending 5' or less above foundation.
ASSOC. RISK Risk not underwritten by Stock Fire Ins. Companies.
BASEMENT A story having its floor below ground & its ceiling at least 4' above ground.
Cook County, Ill.: A floor of a building next below the first floor. Shown by the symbol B following story height. Sub-basements or sub-cellars, (stories below the 1st basement), are shown by the symbol SB following basement symbol.
CHIMNEYS (Applicable to maps in Rocky Mountain & Pacific Coast States)
BC. Brick, stone, concrete brick & concrete chimneys.
C.BL.C. Concrete block chimney.
N.C. Non-standard concrete chimney.
T.C. Tile chimney.
P.C. Patent chimney.
IR. CH. Iron chimneys.
S.P. Stove pipe.
S.P.V. Stove pipe with patent ventilator.

RESIDENTIAL OCCUPANCY SYMBOLS
D. Single family unit or as qualified by a numeral.
F. - APTS. A multi-family residential building corresponding with local Rating Bureau definition in family units per floor, story height, & separation of entrance.
ROOM'G. A residential building normally occupied by a single family but with 10 or more rooms rented for lodging purposes.
EXCEPTIONS: 6 rooms in Arizona, California, Nevada, Utah & Montana. 5 rooms in Oregon & Washington, 4 rooms in Idaho & Hawaii.

FIRE RESISTIVE CONSTRUCTION SYMBOLS
F.P. Approved masonry walls, floors & roof, interior supports of approved masonry, concrete, and/or protected steel.
F.P.X. F.P. qualifications except inferior or sub-standard walls.
N.C. Fire resistive with unprotected structural steel units.
HOLLOW WALL A bonded masonry wall having a continuous air space within.
I.E.P. Independent Electric Plant.
IMPASSABLE Nontraversable due to condition of terrain.
LEDGED WALL A masonry bearing wall with extended ledges to support floors.
LOFT Tenanted by industrial occupancies.
M.L. & P. Concrete or plaster applied to metal lath on wood studdings.
M.S. & G. Metal sash & glass.
NOT OPEN Streets appearing on records but not open on ground.
O.L. Windows overlooking the roof above the corresponding floor of an adjoining building.
O.U. Open between ground and first floor.
PILAST'D. Masonry reinforcing columns in walls.
SKYTS. Skylights.
SL. CL. Slate attached to wood siding.
SM. HO. Smoke House.
STAGE Shown by crossing diagonal lines on diagram.
SUSP'D. Suspended ceilings below floor and/or roof beams.
SYST. System.
TRANSF. Transformer.
WD. Wood.





CODING OF STRUCTURAL UNITS FOR FIREPROOF AND NON-COMBUSTIBLE BUILDINGS

FRAMING		FLOORS		ROOF	
CODE	STRUCTURAL UNIT	CODE	STRUCTURAL UNIT	CODE	STRUCTURAL UNIT
A.	Reinforced Concrete Frame.	1.	Reinforced Concrete. Reinforced Concrete with Masonry Units. Pre-cast Concrete or Gypsum Slabs or Planks.	a.	Reinforced Concrete. Reinforced Concrete with Masonry Units. Reinforced Gypsum Concrete. Pre-cast Concrete or Gypsum Slabs or Planks.
B.	Reinforced Concrete Joists, Columns, Beams, Trusses, Arches, Masonry Piers.	2.	Concrete on Metal Lath, Incombustible Form Boards, Paper-backed Wire Fabric, Steel Deck, and Cellular, Ribbed or Corrugated Steel Units.	b.	Concrete or Gypsum on Metal Lath, Incombustible Form Boards, Paper-backed Wire Fabric, Steel Deck, and Cellular, Ribbed or Corrugated Steel Units.
C.	Protected Steel Frame.	3.	Open Steel Deck or Grating.	c.	Incombustible Composition Boards with or without Insulation. Masonry or Metal Tiles.
D.	Individually Protected Steel Joists, Columns, Beams, Trusses, Arches.			d.	Steel Deck, Corrugated Metal or Asbestos Protected Metal with or without Insulation.
E.	Indirectly Protected Steel Frame.				
F.	Indirectly Protected Steel Joists, Columns, Beams, Trusses, Arches.				
G.	Unprotected Steel Frame.				
H.	Unprotected Steel Joists, Columns, Beams, Trusses, Arches.				
O.	Masonry Bearing Walls.				

LAND USE CODE APPLICABLE TO CHANGES DIAGRAMMED AFTER [illegible]

R	RESIDENTIAL	M	MANUFACTURING
RT	RESIDENTIAL - TRANSIENT	P	PUBLIC OR INSTITUTIONAL
C	COMMERCIAL	U	UTILITY
W	WAREHOUSE	T	TRANSPORTATION

NUMERICAL PREFIX INDICATES THE NUMBER OF ESTABLISHMENTS IN EACH CATEGORY

The coding for framing, floor and roof structural units as shown above is used in describing the construction of fire-resistive buildings. In addition, reports for fire-resistive buildings will show the date built and wall construction when other than brick.

F P buildings have masonry floors and roof; concrete and/or directly or indirectly protected steel framing; and clay brick, stone or poured concrete walls.

F P X buildings are F P buildings with inferior walls such as concrete block, cement brick, metal or glass panels, etc.

N C buildings have unprotected steel framing and fire-resistive but non-masonry floors and roof.

FP-1962
(CONC.)
A-1-a

A fire-resistive building built in 1962 with concrete walls and reinforced concrete frame, floors and roof.

FPX-1962
(METAL PANELS)
E-2-b
NONCOMB CEIL'G

A fire-resistive building built in 1962 with metal panel walls, indirectly protected steel frame, concrete floors and roof on metal lath, noncombustible ceilings.

NC-1962
(C. B.)
H-2-d

A noncombustible building built in 1962 with concrete block walls; unprotected steel columns and beams; concrete floors on metal lath and steel deck roof.

FINAL

QUALITY ASSURANCE PROJECT PLAN

BROWNFIELDS SITE INVESTIGATION/ REMEDIAL ALTERNATIVES STUDY

Former Ashland Chemical Company
Johnstown, New York

CITY OF JOHNSTOWN, NEW YORK

Prepared by:

Malcolm Pirnie, Inc.
15 Cornell Road
Latham, New York 12110

September 1998
2384007

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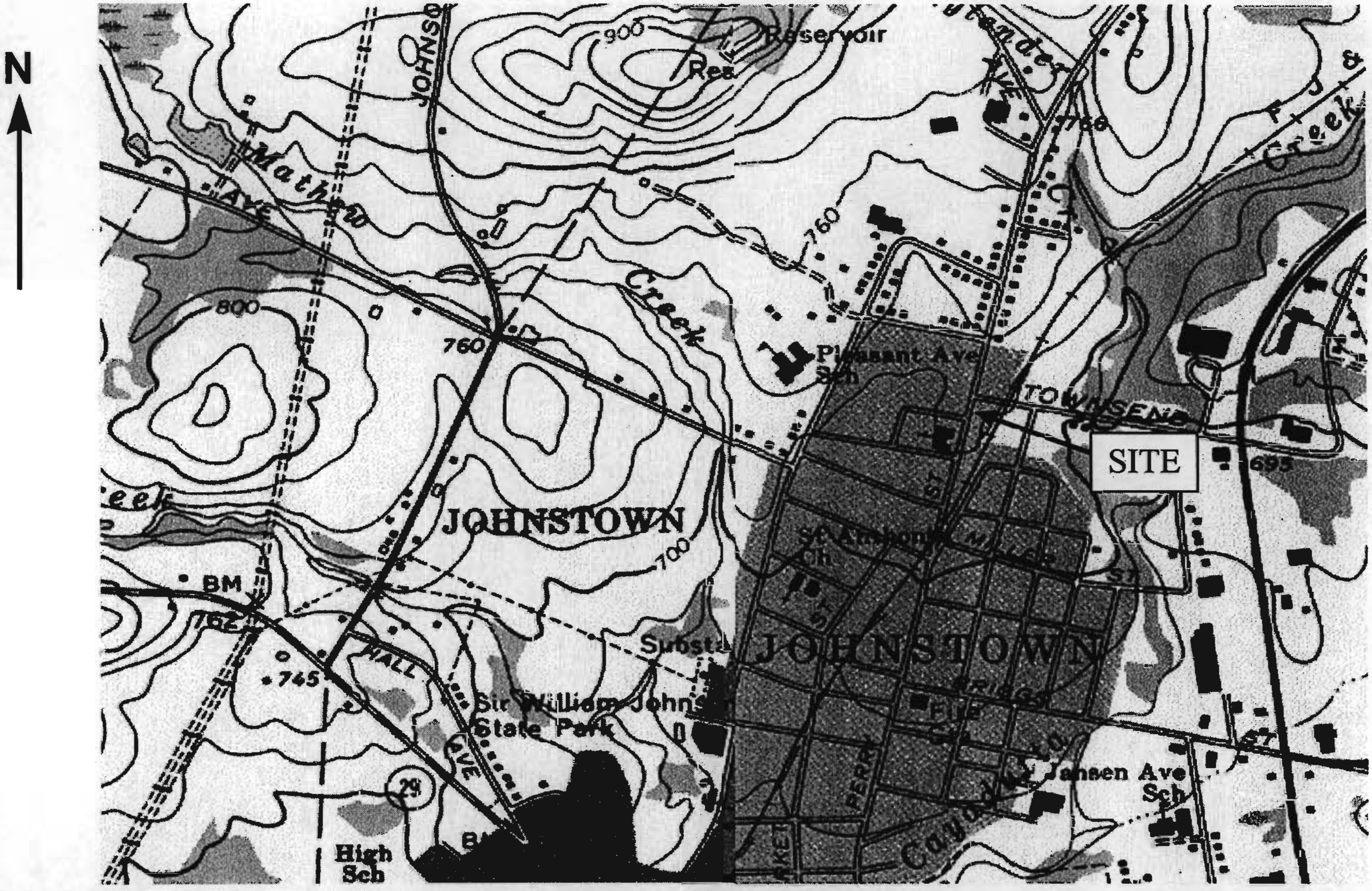


SOURCE: U.S.G.S 7.5 MIN. GLOVERSVILLE, PECK LAKE, 1970

SCALE IN FEET

0 500 1000 2000

MALCOLM PIRNIE

ASHLAND CHEMICAL CO. BROWNFIELD REDEVELOPMENT
CITY OF JOHNSTOWN, NEW YORK

SITE LOCATION MAP

Figure 1-1

1.0 INTRODUCTION/BACKGROUND

1.1 BACKGROUND/OBJECTIVES

As part of the New York State Brownfields Redevelopment Plan, the City of Johnstown has retained Malcolm Pirnie, Inc. (Malcolm Pirnie) to perform a Site Investigation/Remedial Alternatives Report (SI/RAR) for the former Ashland Chemical Company site in the City of Johnstown. The location of the site is shown in Figure 1-1. Based on an historical review, the Ashland Chemical Company formerly transferred chemicals from bulk containers to 55-gallon drums and distributed these drums to businesses and industries.

This Quality Assurance Project Plan (QAPP) presents, in specific terms, the policies, organizations, objectives, functional activities, and quality assurance (QA) and quality control (QC) activities designed to achieve the data quality goals of the SI/RAR at the former Ashland Chemical Company site. The organizational structure of the project, including personnel responsible for QA/QC activities, is provided in Appendix A.

The QA addressed herein is applicable to both the field sampling activities and the laboratory analyses of field samples. Most of the laboratory analyses and QC procedures will be in accordance with the 1995 New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP). Chemtech, Inc., a NYS Department of Health Environmental Laboratory Approval Program (ELAP)-certified laboratory, will analyze the field samples collected during the SI and will report the analytical results using NYSDEC ASP Category B deliverables.

2.0 QUALITY ASSURANCE OBJECTIVES

2.1 PURPOSE

The purpose of this QAPP is to ensure that data collected as part of the SI at the former Ashland Chemical Company site are of sufficient quality to make sound project decisions. In this section, the specific quality assurance objectives are identified and developed by establishing Data Quality Objectives (DQOs). The intended use of the data, the procedures available for laboratory and field analyses, and the available resources are used to establish DQOs . The end result of this process is the development of specific quality requirements for each data collection activity. Once the DQOs have been established, the analytical methods which are capable of supporting the DQOs are selected. Specific quality assurance objectives for the analytical methods are then determined.

This process is presented more completely and specifically in the following sections.

2.2 DATA REQUIREMENTS/LEVELS OF CONCERN

The purpose of the SI is to characterize the nature and extent of contaminants in the soil and groundwater at the site in accordance with the SI Work Plan. SI analytical sampling results will be used to determine if contaminant concentrations in ground water exceed State Standards Criteria and Guidance Values (SCGs). Analytical results for soil samples will be compared to state guidance values presented in TAGM HWR-94-4046. Data gathered during the SI will be used to identify cost-effective, environmentally sound, long-term measures for remediation of the site, if required.

The work plan includes sampling procedures, analytical methods, and special analyses for quantitatively assessing the site. The investigation process includes quality assurance goals and QA procedures to measure data quality. To ensure that the data quality goals are met, certain DQOs are established for the data to be gathered.

2.3 DATA QUALITY OBJECTIVES AND QUALITY ASSURANCE OBJECTIVES

The DQOs are specific, pre-determined goals for data quality that must be achieved for this data to be useful in supporting project decisions. The DQOs have been developed to ensure that the various investigation activities and analyses produce data that is valid and useful for this project. The DQOs need to be supported by a certain level of data quality which varies based on the intended use of the data. The USEPA has defined certain analytical levels and associated confidence levels, which are used to support the DQOs. The analytical levels required for specific data uses and the types of analyses needed to achieve a particular analytical level are defined as follows:

1. ***Level I*** - Field screening or analysis using portable instruments. Results are often not compound specific and not quantitative but results are available in real-time.

2. ***Level II*** - Field analyses using more sophisticated portable analytical instruments; in some cases the instruments may be set up in a mobile laboratory on-site. There is a wide range in the quality of data that can be generated. It depends on the use of suitable calibration standards, reference materials, and sample preparation equipment; and the training of the operator. Results are available in real-time or within several hours.

3. ***Level III*** - Analyses performed in a mobile or an off-site analytical laboratory. Level III analyses may or may not use CLP procedures, but do not usually utilize the validation or documentation procedures required of CLP Level IV analysis. The off-site laboratory may or may not be a CLP laboratory.

4. ***Level IV*** - CLP routine analytical services. Level IV is characterized by rigorous QA/QC protocols and documentation.

5. ***Level V*** - Non-standard methods. Analyses may require method modification and/or development. Method development or method modification may be required for specific constituents or detection limits.

To measure and control the quality of analysis and to ensure that the DQOs are met, certain QA parameters are defined and utilized in data analysis activities in this project. They are defined as follows:

- ***Precision*** - is a measure of mutual agreement among individuals of the same property, usually under prescribed similar conditions. Precision is expressed in terms of standard deviation and is evaluated based on the calculated relative percent difference (RPD) of standard matrix spikes, sample matrix spikes, and sample duplicates (field duplicates and laboratory duplicates). The evaluation of precision for this project will be based on the RPD between duplicate standard matrix spikes, duplicate sample matrix spikes, and sample duplicates.

- ***Accuracy*** - is the degree of difference between measured or calculated values and true values. The difference is expected to be within the precision interval for the measurement to be deemed accurate. For this project, accuracy will be measured based on the average percent recovery of standard matrix control spikes.

- ***Representativeness*** - expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. To assure that the samples delivered to the laboratory for analysis are representative of the site conditions, quality assurance procedures for sample collection and handling (discussed below) will be followed whenever samples are collected.

- ***Completeness*** - is a measure of the amount of the data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions. The goal and objective is 100 percent completeness. However, due to unforeseen field conditions, laboratory conditions and analytical limitations (such as matrix interference or required dilution) which could result in data qualification, it may not be possible to achieve 100 percent completeness. The minimum level of laboratory completeness is expected to be 95 percent for each analytical parameter. The minimum level of project completeness will be 90 percent. This is expected to be achieved by ensuring proper sample packaging and extraction procedures. The project manager has the responsibility of deciding whether re-sampling and reanalysis are required to meet the data quality objectives. The project manager will then inform the laboratory coordinator and the QA supervisor of the decision.

- ***Comparability*** - is the confidence with which one data set can be compared with another. All data will be calculated and reported in units consistent with standard procedures so that the results of the analyses can be compared with those of other laboratories. The objectives of the analytical laboratory for comparability are to:

1. Demonstrate traceability of standards to NIST or EPA sources,
2. Use standard methodology,
3. Report results from similar matrices in standard units,
4. Apply appropriate levels of quality control within the context of the laboratory QA program, (Level III, EPA Data Objectives for Remedial Response Activities, 1987), and
5. Participate in inter-laboratory studies to document laboratory performance.

- ***Sensitivity*** - The data generated during the SI will be sensitive enough to meet SCG criteria. Table 1 provides the analytical detection limits for the project analytes.

2.4 DATA QUALITY OBJECTIVES DEVELOPMENT

In this section the DQOs for each data collection activity are described along with the necessary QA/QC requirements. Anticipated QA/QC samples for these data collection activities are presented in Tables 2 through 4.

Air

Air monitoring is performed for site characterization and monitoring during SI/RAR activities, to provide information concerning the health and safety of the workers at the site and for the population in nearby residences and businesses. Air monitoring is to provide for worker health and safety and as a precautionary measure for nearby residents. The air monitoring results will be used to select appropriate personal protective equipment, to stop work in the event that perimeter levels exceed those indicated in the Health and Safety Plan. The air monitoring will be conducted using portable field instrumentation to screen the site. To meet the DQOs of screening the site for particulates, Level I analytical support will be required. In Level I analysis, results are available in real-time and the instruments used are sensitive enough to screen for contaminant levels that threaten health and safety.

TABLE 1

SAMPLE ANALYSIS METHODS
FORMER ASHLAND CHEMICAL COMPANY
CITY OF JOHNSTOWN, NEW YORK

Analyte	CRQLs	
	Water (µg/l)	Soil (µg/kg)
<u>TAL Metals</u>		
Aluminum	9.1	1820
Antimony	6.4	1300
Arsenic	4.3	900
Barium	0.5	100
Beryllium	0.5	100
Cadmium	1.3	300
Calcium	31.2	6240
Chromium	1.6	320
Cobalt	6.5	1300
Copper	3	600
Iron	14	2800
Lead	2.4	500
Magnesium	46.7	9340
Manganese	0.5	100
Mercury	0.20	100
Nickel	5.8	1200
Potassium	119	23800
Selenium	2.9	600
Silver	1.7	340
Sodium	113	22600
Thallium	5.8	1200
Vanadium	2.5	500
Zinc	3.8	800
Cyanide	10	500

TABLE 1

SAMPLE ANALYSIS METHODS
FORMER ASHLAND CHEMICAL COMPANY
CITY OF JOHNSTOWN, NEW YORK

	CRQLs	
Analyte	**Water (µg/l)**	**Soil (µg/kg)**
Pesticides and PCBs (8080)		
Alpha-BHC	0.05	1.7
Beta-BHC	0.05	1.7
Delta-BHC	0.05	1.7
Gamma-BHC (Lindane)	0.05	1.7
Heptachlor	0.05	1.7
Aldrin	0.05	1.7
Heptachlor epoxide	0.05	1.7
Endosulfan I	0.05	1.7
Dieldrin	0.10	3.3
4,4-DDE	0.10	3.3
Endrin	0.10	3.3
Endosulfan II	0.10	3.3
4,4-DDD	0.10	3.3
Endrin Aldehyde	0.10	3.3
Endosulfan sulfate	0.10	3.3
4,4-DDT	0.10	3.3
Methoxychlor	0.50	17
alpha-Chlordane	0.05	1.7
gamma-Chlordane	0.05	1.7
Toxaphene	5	170
AROCLOR-1016	0.1	33
AROCLOR-1221	0.2	67
AROCLOR-1232	0.1	33
AROCLOR-1242	0.1	33
AROCLOR-1248	0.1	33
AROCLOR-1254	0.1	33
AROCLOR-1260	0.1	33

TABLE 1

SAMPLE ANALYSIS METHODS
FORMER ASHLAND CHEMICAL COMPANY
CITY OF JOHNSTOWN, NEW YORK

	CRQLs	
Analyte	Water (µg/l)	Soil (µg/kg)
Volatile Organics (8240)		
Acetone	10	10
Benzene	0.7	5
Bromodichloromethane	5	5
Bromoform	5	5
Bromomethane	5	5
2-Butanone	10	10
Carbon disulfide	5	5
Carbon tetrachloride	5	5
Chlorobenzene	5	5
Chloroethane	5	5
Chloroform	5	5
Chloromethane	10	10
Dibromochloromethane	5	5
1,1-Dichloroethane	5	5
1,2-Dichloroethane	5	5
1,1-Dichloroethene	5	5
1,2-Dichloroethene	5	5
1,2-Dichloropropane	5	5
cis-1,3-Dichloropropene	5	5
trans-1,3-Dichloropropene	5	5
Ethylbenzene	5	5
2-Hexanone	10	10
Methylene chloride	5	5
4-Methyl-2-pentanone	10	10
Styrene	10	10
1,1,2,2-Tetrachloroethane	5	5
Tetrachloroethene	5	5
Toluene	5	5
1,1,1-Trichloroethane	5	5
1,1,2-Trichloroethane	5	5
Trichloroethene	5	5
Vinyl acetate	10	10
Vinyl chloride	2	5
Xylene, total	5	5

TABLE 1

SAMPLE ANALYSIS METHODS
FORMER ASHLAND CHEMICAL COMPANY
CITY OF JOHNSTOWN, NEW YORK

	CRQLs	
Analyte	**Water (µg/l)**	**Soil (µg/kg)**
Semi-Volatile (8270)		
Acenaphthene	10	330
Acenaphylene	10	330
Anthracene	10	330
Benzo(a)anthracene	2	100
Benzo(b)fluoranthene	2	330
Benzo(k)fluoranthene	2	330
Benzo(a)pyrene	2	330
Benzo(ghi)perylene	10	330
Butylbenzylphthalate	10	330
bis(2-Chloroethyl)ether	5	330
bis(2-Chloroethoxy)methane	5	330
bis(2-Ethylhexyl)phthalate	10	330
4-Bromophenylphenylether	10	330
2-Chloronapthalene	5	330
4-Chlorophenylphenylether	2	330
Chrysene	2	330
Dibenzo(a,h)anthracene	10	330
di-n-Butylphthalate	10	330
1,3-Dichlorobenzene	5	330
1,2-Dichlorobenzene	5	330
1,4-Dichlorobenzene	5	330
Diethylphthalate	10	330
Dimethylphthalate	10	330
2,4-Dinitrotoluene	5	330
2,6-Dinitrotoluene	5	140
di-n-Octylphthalate	10	330

SAMPLE ANALYSIS METHODS
FORMER ASHLAND CHEMICAL COMPANY
CITY OF JOHNSTOWN, NEW YORK

	CRQLs	
Analyte	Water (µg/l)	Soil (µg/kg)
Semi-Volatiles (8270) (Cont'd)		
Fluoranthene	10	330
Fluorene	10	330
Hexachlorobenzene	2	330
Hexachlorobutadiene	5	330
Hexachlorocyclopentadiene	5	1000
Hexachloroethane	10	330
Indeno(1,2,3-cd)pyrene	2	330
Isophorone	10	330
Naphthalene	10	330
Nitrobenzene	5	330
4-Nitrophenol	10	800
n-Nitrosodi-n-propylamine	5	330
n-Nitrosodiphenylamine	10	330
Pentachlorophenol	20	800
Phenanthrene	10	330
Phenol	2	100
Pyrene	10	330
1,2,4-Trichlorobenzene	5	330
2-Methylnapthalene	10	330
2,4,5-Trichlorophenol	10	1600
2-Nitroaniline	25	800
3-Nitroaniline	25	800
Dibenzofuran	10	330
4-Nitroaniline	25	800

TABLE 2

PASSIVE SOIL GAS SAMPLES

LOCATION	TOTAL NUMBER OF SAMPLING LOCATIONS	MODIFIED 8260
INVESTIGATIVE SAMPLES		
Soil Gas Samples	20	20
QA/QC SAMPLES		
Field Duplicates		1
Trip Blank		1
TOTALS	20	22

TABLE 3

SOIL BORING SAMPLES

LOCATION	TOTAL NUMBER OF SAMPLING LOCATIONS	TCL	TAL
INVESTIGATIVE SAMPLES			
Soil Borings	15	15	15
QA/QC SAMPLES			
Field Duplicates		1	1
Matrix Duplicates		1	1
Matrix Spike Duplicates		1	1
Field Blanks		3	3
TOTALS	15	21	21

TABLE 4

GROUNDWATER SAMPLES

LOCATION	TOTAL NUMBER OF SAMPLING LOCATIONS	TCL	TAL
INVESTIGATIVE SAMPLES			
Well Points	5	5	5
QA/QC SAMPLES			
Field Duplicates		1	1
Matrix Duplicates		1	1
Matrix Spike Duplicates		1	1
Field Blanks		1	1
Trip Blanks		1*	0
TOTALS	5	10*	9

* Trip blanks analyzed for TCL volatile organics only

Passive Soil Gas Samples

Passive soil gas samples will be collected and analyzed to define the extent of subsurface volatile organic contamination. To be useful in meeting these objectives, the data from the soil gas samples must be of known quality. To support the DQOs, analytical Level III will be used. This level is capable of producing high quality data characterized by rigorous QA/QC protocols and documentation. There are no known critical samples currently identified.

Groundwater

Groundwater will be sampled and analyzed to characterize the nature and extent of groundwater contamination at the site. The data will be used to identify the location of any groundwater contamination, to aid in determining contaminant source locations, to determine if any SDGs have been exceeded. In order to meet these objectives, the data from the groundwater samples must be of known quality. Therefore data quality objective Level IV has been chosen. This level is characterized by rigorous QA/QC protocols and documentation, which historically have provided high quality data able to meet the DQOs for this data.

Samples from the upgradient monitoring wells, and the wells at the downgradient property boundary will be critical samples.

Soil

The objective of the soil sampling program is to define the nature and extent of contamination in soils. To be useful in meeting these objectives, the data from the soil samples must be of known quality. To support the DQOs, analytical Level IV will be used. This level is capable of producing high quality data characterized by rigorous QA/QC protocols and documentation.

There are no known critical samples currently identified.

3.0 FIELD INVESTIGATION PROCEDURES

3.1 SAMPLING PROCEDURES AND EQUIPMENT

The field investigation procedures which will be followed during this Site Investigation are summarized below.

3.1.1 Decontamination of Sampling Equipment

Cross contamination of samples from any source is to be avoided. All sampling equipment must be clean and free from the residue of any previous samples. To accomplish this, the following procedures will be followed:

- All non-dedicated sampling equipment must be cleaned initially and prior to being reused. The following is the procedure for decontamination and does not apply to heavy equipment or drilling equipment, with the exception of split-spoon samplers. All heavy equipment and drilling equipment will be steam cleaned in a predesignated location prior to use and between locations. Well point casings and screens will also be steam cleaned.

- Wash and scrub with low phosphate detergent,

- Rinse with tap water,

- Rinse with 10 percent HNO_3, ultra-pure (1 percent HNO_3 for carbon steel)

- Rinse with tap water,

- Rinse with Hexane (solvents shall be pesticide grade or better),

- Rinse thoroughly with deionized water,

- Air dry, and

- Wrap in aluminum foil for transport.

Well point evacuation tubing and equipment such as peristaltic pumps, will be decontaminated by thoroughly washing all internal and external surfaces with soapy water and rinsing with deionized water prior to use. All tubing must be dedicated to individual well points, i.e., tubing cannot be reused.

Field instrumentation should be cleaned per manufacturer's instructions. Probes, such as those used in pH and conductivity meters, and thermometers must be rinsed prior to and after each use with deionized water.

3.1.2 Passive Soil Gas Sampling

3.1.2.1 Sampling Objectives

Passive soil gas samples will be collected to evaluate the possible presence of subsurface volatile organic compounds throughout the site. Specific passive soil gas sampling objectives are presented in the Work Plan.

3.1.2.2 Sampling Equipment

- Passive soil gas sampler (GORE-SORBER)
- Field logbook and pen
- Passive soil gas modules
- Latex gloves (disposable)
- Flagging
- Slam bar
- Rotary-Hammer Drill
- Photoionization Detector (PID).

3.1.2.3 Sampling Procedures

Prior to any surface disturbance underground utilities will be checked by notifying the Underground Facilities Protection Organization (UFPO). Small flags or markers will be used to locate the proposed module locations. Utilities in the vicinity of the proposed locations will be checked.

When the module locations have been cleared of all utilities, installation may begin. Module locations that are located in concrete or asphalt will require a pre-drilled hole through the surface material. The pilot hole will be approximately 1-inch in diameter, which will later be plugged by a small (1 1/8-inch) cork.

For modules that will be installed directly into soil, a hole (approximately 1/2 to 3/4-inch in diameter) will be made with a slam bar or a rotary-hammer drill to a depth of 2 to 3 feet below grade. The installation date and time (along with any anomalous site conditions) will be noted in the field book, and the field data form provided by the laboratory. The sample location and module serial number are also recorded in the field book.

After a period of approximately two weeks, the sampling modules will retrieved and placed in the original coded shipping containers provided by the laboratory. The date and time of retrieval will be recorded in the field book and field data form provided by the laboratory. Once removed.from the subsurface, the passive samplers will be held at <4°C. This will ensure a minimal loss of volatile organics during shipment to the laboratory.

3.1.3 Soil Borings and Subsurface Soil Sampling

3.1.3.1 Soil Sampling Objectives

Subsurface soil samples will be collected to evaluate the vertical and horizontal extent of contamination at the site and to document the underlying stratigraphy. Specific sampling objectives are outlined in the Work Plan.

3.1.3.2 Soil Sampling Equipment

The following equipment will be used to collect split-spoon soil samples:

- Photoionization Detector (PID)
- Roll of polyethylene sheeting
- Stainless steel spatula or spoon
- Stainless steel bowl
- Latex gloves (disposable)

- Neoprene gloves
- Certified, precleaned sample containers
- Aluminum foil
- Field logbook and pen
- Decontamination equipment.

3.1.3.3 Soil Sampling Procedures

A concrete coring device or apparatus sufficient to penetrate 4 to 6-inches of asphalt or concrete may be required to advance the soil borings in certain areas of the site. Following the opening of the soil boring hole, a Macro Core soil sampler, blind probe, or similar direct push system will be driven into the subsurface to create a borehole approximately 1-1/2-inch to 2 inches in diameter. Subsurface soil samples will be removed from the borehole in approximately 4-foot intervals in plastic tubes. A qualified inspector will characterize the soil samples and record his/her observations on a field boring log.

After soil characterization and logging, the plastic tube will be cut along its length and the soil core will be screened for volatile organic compounds (VOCs) using a PID. Based on PID readings and field observations, the volume of soil required for VOC analysis will be transferred to the appropriate sample container. After collecting the sample for VOC analysis, the plastic tube will be cut in half and the soil from the separate two-foot plastic tube halves will be emptied into a stainless steel bowl and homogenized for additional analyses.

3.1.4 Well Point Installation

After completion of soil sampling and upon reaching the bottom of the soil boring, a two-inch outside diameter (O.D.) temporary casing with an expendable tip will be driven to the base of the borehole with a hydraulic ram. A minimum of two inches of clean filter pack sand will be emplaced into the casing. The well point assembly, consisting of one-inch I.D. PVC casing with five feet of continuous 0.01-inch slot PVC screen, will be inserted through the two-inch PVC. Well point screens will be placed at the intervals as described in the Work Plan.

Clean filter pack sand will then be poured into the annular space between the temporary casing and the well point assembly as the temporary casing is slowly removed. The filter pack sand will extend approximately two feet above the top of the screened interval. A minimum one-foot thick layer of bentonite pellets will be placed above the filter pack by slowly dropping the pellets along the side of the well point casing. If the bentonite pellets are emplaced above the water table, they will be hydrated with potable water. After allowing sufficient time for the bentonite to hydrate, the temporary casing will continue to be removed and the remainder of the annulus will be tremie grouted to the surface with a cement-bentonite grout. The cement-bentonite grout will consist of a mixture of portland cement and water in the proportion of 5 to 6 gallons of water per 94-pound bag of cement, with approximately three to five percent bentonite powder.

The PVC riser will be sealed at the ground surface with bentonite pellets. The riser will extend above ground surface approximately two to three feet and will be capped with a PVC cap.

3.1.4.1 Installation Objectives

Well points will be installed at the site to collect groundwater samples for chemical quality analysis. In addition, in-situ hydraulic conductivity tests will be conducted in the well points to characterize soil properties. Groundwater elevations will be measured to evaluate the horizontal components of groundwater flow.

3.1.4.2 Installation Equipment

A geoprobe environmental sampler will be utilized to advance the soil borings and Macro Core soil sampler equipment. The PVC well point and riser pipe will be advanced through the borehole to the water table by hand and with the use of the geoprobe sampler. Probes and any other large pieces of equipment which come into contact with the soil must be steam cleaned before use and between boreholes. If visibly contaminated with free phase products or any other contaminants, probes and other equipment must be decontaminated by the following procedure:

- Wash and scrub with low-phosphate, laboratory grade detergent.
- Tap water rinse.
- Rinse with pesticide-grade isopropanol or pesticide-grade hexane.
- Thoroughly rinse with deionized, demonstrated analyte free water.
- Air dry.

Decontamination solutions shall be provided by the selected subcontractor and will be included in the mobilization/demobilization cost. Decontamination fluids shall be handled in accordance with Section 3.2, Investigation Derived Waste.

3.1.5 Water Level Measurements

3.1.5.1 Measurement Objectives

Water levels in well points will be measured and used in conjunction with horizontal and vertical ground survey data to determine horizontal and vertical components of groundwater flow. Water level measurements will also be used to determine the volume of standing water in well points for development and purging activities.

3.1.5.2 Measurement Equipment

The following equipment will be used for the measurement of water levels:

- Electronic water level indicator
- Field logbook and pen
- Photoionization Detector (PID)
- Deionized Water
- Low Phosphate Detergent

3.1.5.3 Measurement Procedure

At each well point, the PVC cap will be removed and the head space and breathing zone's air quality will be monitored with a PID. This step may be omitted in subsequent rounds of water level measurements in those well points which yielded no detectable amounts of vapors or gases from prior sampling rounds.

The battery of the electric water level indicator will be checked by pushing the battery check button, and waiting for the audible signal to sound or the instrument light to come on. The water level indicator will be decontaminated before collecting a measurement in each well point by using an alconox wash and deionized water rinse. The instrument will then be turned on and the probe will be slowly lowered into the well point, until the audible signal is heard or the instrument light goes on, indicating that the sensor in the probe has made contact with the water surface in the well point.

The depth to water will be recorded to the nearest one-hundredth of a foot, from the top of the measuring mark on the well point riser. The date, time, well point number, and depth to water will be recorded in the field book.

3.1.6 Well Point Development

3.1.6.1 Development Objectives

Well points installed at the site will be developed to improve their hydraulic properties by removing sediment from the well point and clearing the well point screen of fine particles.

3.1.6.2 Development Equipment

The following equipment will be needed to develop the well points:

- Electric water level indicator
- Polyethylene or nalgene tubing and foot-valve
- Bottom-filling PVC bailer
- Bailer cord
- Temperature, pH, dissolved oxygen, specific conductivity and turbidity meters
- Photoionization Detector (PID)
- Field logbook and field logs
- Roll of polyethylene sheeting
- Decontamination equipment

3.1.6.3 Development Procedures

Well point development will be conducted using one or more of the following techniques:

- Bailing
- Inertial Pumping

Well point development will be conducted at least 24 hours after installation. Prior to developing each well point, the initial water level and total depth will be measured. Following well development, the total depth will again be measured to determine the quantity of sediment removed.

All equipment placed into the well point will be either decontaminated prior to its introduction into the well point, in accordance with Section 3.1.1, or it will be dedicated. Well point development will proceed with repeated alternating sequences of surging and removal of water from the well point, until the discharge water is relatively sediment free.

The effectiveness of the development procedure will be monitored after each well volume has been removed by field parameter measurements such as turbidity, pH, temperature, and conductivity measurements. These field measurements and other observations will be recorded on a Well Development/Purging Log, presented in Appendix B.

In general, well point development will be discontinued after a minimum of 10 well volumes have been removed and stabilization of field parameter measurements has occurred, or when the turbidity of the discharge water reaches 50 Nephelometric Turbidity Units (NTUs) or less. Due to the presence of fine grained soils at the site it is unlikely that the 50 NTU goal will be attained.

Water generated during the development process will be disposed of in accordance with Section 3.5.

3.1.7 Groundwater Sampling

3.1.7.1 Sampling Objectives

Groundwater samples will be collected for chemical quality analysis. Specific sampling objectives are outlined in the Work Plan. Samples will be collected at least 24 hours after the well points have been developed.

3.1.7.2 Sampling Equipment

The following equipment will be needed to collect groundwater samples for analysis:

- Electric water level indicator
- Peristaltic pump
- Polyethylene or nalgene tubing and foot-valve
- Bottom-filling PVC bailer
- Dedicated, disposable bailer cord
- Temperature, pH, dissolved oxygen, specific conductivity and turbidity meters
- Photoionization Detector (PID)
- Field logbook and field logs
- Preservatives
- Laboratory prepared sample containers
- Roll of polyethylene sheeting
- Decontamination equipment

3.1.7.3 Sampling Procedures

A piece of polyethylene sheeting will be fitted over the well point and laid on the ground. The sampling equipment will be placed on the polyethylene sheeting. The well cap will be removed, and the concentration of volatile organic vapors emanating from the well point will be measured with the photoionization detector. This step may be omitted in those well points which have already demonstrated in the previous rounds of water level measurement that they contain no or insignificant amounts of vapors or gases. The PID will be calibrated before the start of each sampling event by following the procedures described in Section 5.0.

The water volume in the well point will be calculated using the following equation:

$$V = 7.48\ \pi r^2 h$$

(NOTE: 1 ft^3 = 7.48 gal)

where:

v = volume of water in well point casing (gal.)
h = height of water column (feet)
r = casing internal radius (feet)

Clean, new polyethylene tubing will be attached to the centrifugal or positive placement pump, which will be decontaminated between well point locations, as described in Section 3.1.1. The tubing will be lowered into the well point to the top of the water column. A foot-valve will be used in conjunction with the tubing to eliminate back flushing from the pump to the well point. The well point will be purged from the top of the water column. A typical Well Development/Purging Log Field Form is presented in Appendix B.

Each well point will be purged until three to five volumes of standing water are evacuated or until the well point is dry. Steps, such as an adjustment of the flow rate, will be taken to prevent the well point from purging to dryness. The volume of water removed from each well point that is not purged dry is dependent upon field measurements of pH, temperature, turbidity, and specific conductivity; three to five volumes, minimum, will be removed. The well points may be purged with tubing with a foot valve or a PVC bailer in place of a peristaltic pump. When the field parameters have stabilized, the volume of water will be recorded, and groundwater in the well point will be sampled. The purge water will be discharged in accordance with Section 3.5.

Any well points which do not yield three to five well volumes during purging will be purged to dryness. Water level recovery will be monitored on at least an hourly basis. If sufficient volume is present in the well point, all samples will be collected within two hours of the completion of purging (not to exceed three hours). If insufficient volume is present for all samples to be collected, samples for volatile organic analysis will be collected first and additional time will be provided for water level recovery. The remaining samples will be collected as soon as sufficient water is present in the well point. The order of sample collection at each well point is discussed below.

The groundwater samples will be collected from the peristaltic pump, the tubing with a foot valve, or with a PVC bailer. The two 40 ml vials for volatile organic analysis will be filled first, without leaving any head space. All other sample bottles will be filled such that some headspace remains in the bottle. The analytical parameters and order of sample collection for groundwater samples will be:

1. In-situ measurements: temperature, pH, specific conductance, turbidity, and PID;
2. Volatile organics;
3. Extractable organics: semi-volatiles and pesticides/PCBs; and
4. Total metals, etc.

The sample bottles will be pre-preserved by the laboratory. The preservation requirements are presented in Table 5. The sample bottles will be immediately placed in a cooler held at 4°C.

The soluble metals will be collected if the turbidity at the time of sample collection is greater than 50 NTUs. The groundwater samples will be filtered in the field using a borosilicate filter apparatus with 0.45 micron filters.

Field measurements of pH, specific conductance, temperature and water level will be made in each well point prior to, during, and after purging (just before sampling). Both the pH and the specific conductivity meters will be calibrated for water temperature before each sampling event. The calibration procedures are provided in Section 5.0.

Disposable gloves will be worn by the sampling personnel and changed between sampling points. While performing any equipment decontamination, phthalate-free gloves (neoprene or natural rubber) will be worn in order to prevent phthalate contamination of the sampling equipment by interaction between the gloves and the organic solvent(s).

TABLE 5

SAMPLE CONTAINER, PRESERVATION AND HOLDING TIME REQUIREMENTS

MATRIX	ANALYSIS	CONTAINER	PRESERVATION	HOLDING TIME
Soil	TCL Volatiles	2-60 ml glass	Cool to 4°C	7 days
	TCL Semi-Volatiles	8 oz. glass jar	Cool to 4°C	5 days from verified time of sample receipt (VTSR) to extraction; 40 days from VTSR to analysis
	TCL Pesticides/ PCBs			
	TAL Metals	8 oz. glass jar	Cool to 4°C	180 days
	Mercury			26 days
	Cyanide			12 days
Groundwater	TCL Volatiles	2-40 ml glass w/septum cap	Cool to 4°C	7 days
	TCL Semi-Volatiles	2-2 liter amber glass	Cool to 4°C	5 days from VTSR to extracting; 40 days from VTSR to analysis
	TCL Pesticides/ PCBs			
	TAL Metals	1 liter polyethylene	HNO_3 to pH 2 Cool to 4°C	180 days
	Mercury			26 days
	Cyanide	1 liter polyethylene	NaOH to pH > 2 Cool to 4°C	12 days

Data to be recorded in the field logbook will include the information presented in Section 3.4 and purging and sampling methods, depth to water, volume of water removed during purging, pH, temperature and specific conductivity values, and PID readings.

3.1.8 Hydraulic Conductivity Testing

3.1.8.1 Testing Objectives

Rising head hydraulic conductivity tests will be conducted in newly installed well points to estimate soil properties for their screened intervals.

3.1.8.2 Testing Equipment

The following equipment will be needed to perform hydraulic conductivity testing:

- Data logger and transducer
- Electronic water level indicator
- Field logbook and pen
- PVC or stainless steel slug

3.1.8.3 Testing Procedures

Equipment being introduced into the well point to conduct hydraulic conductivity tests will be decontaminated using the procedures outlined in the Section 3.1.1. Water level readings will also be taken prior to conducting the test and recorded in the field log book and Water Elevation Field Logs presented in Appendix B.

Hydraulic conductivity testing will only be conducted on well points which have achieved static equilibrium after development or purging.

Water level fluctuations will be monitored using either a water level probe to record the water level change, or a pressure transducer linked to a data logger. The method of measurement is similar for both cases in that they both measure the change in water levels from a static condition after an initial perturbation. The static water level will be taken and recorded on the field log before conducting the test.

When using a data logger and transducer, the transducer will be placed approximately 5 to 10 feet below the static water level (where possible) and the slug will be introduced. The slug will be constructed of stainless steel or PVC and will measure approximately 0.15 feet in diameter and three to five feet in length. The data logger will then have the necessary initial input parameter data entered (i.e., well point identification, static water level, etc). As the slug enters the water, the water level will rise. Once the groundwater in the well point has returned to static conditions the slug will be removed from the water, lowering the water level (rising head test). If the data logger is used, the pressure above the transducer will change and the pressure change will be recorded. This change in pressure will be calculated internally to true water levels based on the original static water level entered. If a transducer and data logger are used, the frequency of readings will follow a logarithmic scale as shown below:

ELAPSED TIME	INTERVAL
0-5 seconds	0.5 seconds
5-20 seconds	1.0 seconds
20-120 seconds	5.0 seconds
2-10 minutes	30 seconds
10-100 minutes	2 minutes
100-1,000 minutes	10 minutes

The test will continue until either the water level recovers fully to static, until approximately 70 percent of the original static level is reached or for a total of two hours, whichever comes first.

If a water level probe is used in place of the pressure transducer and data logger, manual readings of water level change will be recorded. The readings will be collected on a separate logarithmic time scale and recorded on field logs.

The data collected will be reduced and analyzed using analytical methods such as Bouwer and Rice, 1976 and Bouwer, 1989.

3.2 FIELD QUALITY CONTROL SAMPLES

Quality control procedures will be employed to check that sampling, transportation and laboratory activities do not bias sample analytical quality. Trip blanks, field blanks, duplicate samples, matrix spike samples and matrix spike duplicates will provide a quantitative basis for validating the analytical data. A summary of the anticipated QA/QC samples for each media is included in Table 2 through 4.

3.2.1 Trip Blanks

The trip blanks will be prepared by the laboratory by filling 40 ml vials with a Teflon-lined septum with deionized, analyte-free water. The trip blank will accompany the day's sample containers at all times. One trip blank will be returned to the laboratory with each cooler containing aqueous samples for VOC analysis. The trip blank will be analyzed for volatile organic compounds, to detect possible contamination during shipment. Similar trip blanks will be prepared by the laboratory conducting the passive soil gas analysis. However, these trip blanks will consist of the same porous sampling media as the sampling modules themselves. These trip blanks will remain in the shipping cooler from the time of packing, in the laboratory, to arrival back at the laboratory. These trip blanks will be analyzed for the same parameters as the field samples.

3.2.2 Field Blanks

A field blank consists of an empty set of laboratory-cleaned sample containers. At the field location, deionized, analyte-free water is passed through decontaminated sampling equipment and placed in the empty set of sample containers for analysis of the same parameters as the samples collected with the sampling equipment. One field blank will be collected per decontamination event per day, per type of equipment, not to exceed one per day.

3.2.3 Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample pairs are analyzed by the laboratory to provide a quantitative measure of the laboratory's precision and accuracy. When performing NYSDEC ASP volatile organic or organic extractable analysis, the laboratory must be supplied with triple sample volume for each Sample Delivery Group (SDG) in order to perform matrix spike and matrix spike duplicate analyses. This does not include field or trip blanks. Blanks do not require separate matrix spike or duplicate analyses regardless of their matrix.

The limits on an SDG are:

- Each Case for field samples, or
- Each 20 field samples within a Case, or
- Each fourteen calendar day period during which field samples in a Case are received (said period beginning with receipt of the first sample in the SDG), whichever comes first.

Non-ASP analyses will include MS/MSDs at an equal rate. Field personnel will specify samples for MS/MSD analysis.

Aqueous samples for extractable organics (semi-volatiles and pesticides/PCBs) require that three times the volume of the sample selected for each MS/MSD sample be collected and submitted to the laboratory for analysis. Extra sample volume is not required for volatile organic analysis unless low level detection methods are used. Extra volume is not required for aqueous samples for inorganic analysis. A matrix spike and matrix duplicate can be obtained from standard sample volumes. Non-aqueous samples (soils/sediment) do not require that any extra volume of sample be submitted to the laboratory for MS/MSD samples.

3.2.4 Field Duplicates

For each sample matrix, a field duplicate sample will be collected at a rate of one sample per twenty environmental samples. The duplicate sample is collected at the same location as the environmental sample. The field duplicate sample is identified using the sample designation system described in Section 3.3. The identity of the field duplicate is not revealed to the laboratory. The analytical results of the environmental sample will be compared to the field duplicate sample, to evaluate field sampling precision.

3.3 SAMPLE DESIGNATION

A sample numbering system will be used to identify each sample. This system will provide a tracking procedure to allow retrieval of information about a particular sample, and will assure that each sample is uniquely numbered. The sample identification will consist of at least three components as described below. Identification numbers for soil boring samples will also have a fourth component.

- ***Project Identification:*** The first component consists of a two letter designation which identifies the project site. For this project, the two letter designation will be AC for the Ashland Chemical.

- ***Sample type:*** The second component, which identifies the sample type, will consist of a two letter code as follows:

  WP - Well Point (Groundwater Sample)
  SB - Soil Boring
  SG - Soil Gas Sample

- ***Sample Location:*** The third component identifies the sample location using a two digit number.

- ***Sample Identification:*** The fourth component will only be used for soil boring samples, to indicate the interval from which the sample was collected.

- ***Quality Assurance/Quality Control Samples***: The samples will be labeled with the following suffixes:

  FB - Field Blank
  MS - Matrix Spike
  MSD - Matrix Spike Duplicate
  TB - Trip Blank.

Duplicate samples will be numbered uniquely as if they were samples. A record of identification for duplicate samples will be maintained.

Examples of identification numbers are given below:

AC-SB-02-10:	Soil boring, boring location number 2, 10 feet below ground surface.
AC-WP-3-MSD:	Well point groundwater sample, well point sample location 3, matrix spike duplicate.
AC-SG-TB:	Trip blank for soil gas sample.

3.4 FIELD DOCUMENTATION

3.4.1 Introduction

Documentation of an investigative team's field activities often provides the basis for technical site evaluations and other such related written reports. All records and notes generated in the field will be considered controlled evidentiary documents and may be subject to scrutiny in litigation. Consequently, it is essential that the site manager or his/her designee, either of whom may be called to testify, pay attention to detail, and document to the extent practicable every aspect of the inspection.

Personnel designated as being responsible for documenting field activities must be aware that all notes may provide the basis for preparing responses for legal interrogatories. Field documentation must provide sufficient information and data to enable reconstruction of field activities. Numerically serialized field logbooks provide the basic means for documenting field activities. The following information must be provided on the inside front cover of each field logbook:

- Project Name (Site Name)
- Site Location
- Site Manager
- Date of Issue

Control and maintenance of field logbooks is the responsibility of the Field Team Leader.

3.4.2 Documentation of Field Activities

Field logbook entries must be legibly written and provide an unbiased, concise, detailed picture of all field activities. Use of preformatted data reporting forms must be identifiable and referenced to field notebook entries.

Step-by-step instructions and procedures for documenting field activities are provided below and in following sub-sections. These instructions and procedures are organized as follows:

Instruction and procedures relating to the format and technique in which field logbook entries are made are as follows:

- Leave the first two pages blank. They will provide space for a table of contents to be added when the field logbook is complete.
- The first written page for each day identifies the date, time, site name, location, MPI personnel and their responsibilities, other non-personnel and observed weather conditions. Additionally, during the course of site activities, deviations from the work plan must also be documented.
- It is recommended that entries be made on a new page at the start of each day's field activities.
- All photos taken must be traceable to field logbook entries. It is recommended to reference photo locations on the site sketch or map.
- All entries must be made in ink. Waterproof ink is recommended.
- All entries must be accompanied by the appropriate military time (such as 1530 instead of 3:30).
- Errors must be lined through and initiated. No erroneous notes are to be made illegible.
- The person documenting must sign and date each page as it is completed.
- Isolated logbook entries made by a team member other than the team member designated responsible for field documentation, must be signed and dated by the person making the entry.
- Additions, clarifications, or corrections made after completion of field activities must be dated and signed.

3.4.3 General Site Information

General site characteristics must be recorded. Information may include

- Type of access into facility (locked gates, etc.)
- Anything that is unexpected on site (e.g., appearance of drums that have not been previously recorded)
- Information obtained from interview with access or responsible party personnel (if applicable), or other interested party contact on site.
- Names of any community contacts on site.
- A site map or sketch may be provided. It can be sketched into the logbook or attached to the book. If it is attached, make sure that the project name is on the map.

3.4.4 Sample Activities

A chronological record of each sampling activity must be kept.

- Explanation of sampling at the location identified in the sampling plan (e.g., discolored soil, stressed vegetation).
- Exact sample location, using permanent recognizable landmarks and reproducible measurements.
- Sample matrix
- Sample descriptions, i.e., color, texture, odor (e.g., soil type, murky water) and any other important distinguishing features.
- Decontamination procedures, if used.

As part of chain-of-custody procedures, recorded on-site sampling information must include sample number, date, time, sampling personnel, sample type, designation of sample as a grab or composite, and any preservative used. Sample locations should be referenced by sample number on the site sketch or map. The offer and/or act of providing sample splits to a thirty party (e.g., the responsible party representative; state, county, or municipal, environmental and/or health agency, etc.) must be documented.

3.4.5 Sample Dispatch Information

When sampling is complete, all sample documentation such as chain-of-custody forms shall be copied and copies placed in the project files. A notation of numbers of coolers shipped, carrier and time delivered to pick-up point should be made in one field notebook, preferably that of the Field Operations Leaders.

3.5 CONTROL AND DISPOSAL OF INVESTIGATION DERIVED WASTE

Investigation derived wastes will be handled in accordance with the NYSDEC Proposed Decision Technical and Administrative Guidance Memorandum (TAGM). Disposal of contaminated groundwater generated during Site Investigations and the Final TAGM - Disposal of Drill Cuttings. As borings are advanced, spillage and disposal of potentially contaminated soils and water will be minimized through the implementation of the procedures described below.

Drill cuttings and spoils generated at each boring will be placed (shovelled) on polyethylene sheeting (6 mil.) After completing the boring, the cuttings/spoils will be disposed of within the borehole provided that the borehole will not be used for the installation of a monitoring well, that it did not penetrate an aquitard or aquiclude and that the cuttings/spoils do not contain oily (product) substances. The boring will then be topped off with a cement/bentonite grout cap.

Excess cuttings/spoils which are not returned to the borehole will be spread out and dewatered (dewatering will be allowed to infiltrate the ground) next to the borehole. Groundwater that is purged from monitoring wells or discharged during drilling activities may be disposed of at each site and allowed to infiltrate into the ground based on the following conditions:

1. There is a defined site which is the source of the groundwater contamination;
2. There is no free product observed such as LNAPLs and DNAPLs;

3. Recharge pits are used to preclude run-off from the site and the pits are covered with clean soil when no longer needed;

4. The infiltrating groundwater is being returned to the same water bearing zone from which it is being purged.

If the above criteria are not met the materials will be containerized in U.S. Department of Transportation (DOT)-approved, 55-gallon steel drums. Soils and water will be drummed separately; the contents will be identified on weather-resistant labels attached to drum exteriors. Open-topped drums will be used to containerize soils and close-topped drums will be used to containerize water.

Depending on the levels of personal protection used during the field investigation, some disposable personal protective equipment (PPE) and decontamination fluids will be generated. Attempts will be made to wash surface contamination off so that PPE (e.g., Tyvek coveralls, gloves, and other disposable items) may be disposed of as ordinary solid waste. If contamination is suspected, these materials will be collected and containerized in DOT-approved, 55-gallon steel drums (separately from contaminated soils and water); the contents will be identified with weather-resistant labels attached to drum exteriors. Decontamination fluids, except those containing solvents and/or nitric acid, will be disposed of with drilling fluids and cuttings generated at the site. Decontamination fluids containing solvents or nitric acid will be containerized separately from drilling fluids.

Containerized materials will be transported to, and staged at, a designated location. Malcolm Pirnie will maintain a log of the containers and their contents; the contents will be evaluated upon receipt of results of the analytical data obtained during field investigations. Handling, transportation, and disposal of these materials will be in accordance with requirements of RCRA and other applicable federal, state, and local regulations. Nonhazardous disposable items will be contained and disposed of in a dumpster or via a licensed waste hauler, as appropriate.

4.0 SAMPLE AND DOCUMENT CUSTODY PROCEDURES

4.1 SAMPLE HANDLING

The analytical laboratory will provide the sample containers necessary for all soil, groundwater, and passive soil gas samples. Container closures will be screw-on type, made of inert materials. Sample containers will be cleaned and prepared by the laboratory prior to being sent to the site. Trip blanks will be used to check for false positives due to laboratory cleaning procedures or cross contamination during sample shipment.

All samples collected will be identified with a sample label. A label will be attached to each bottle and each sample will be identified with a unique sample number.

Immediately following sample collection, each sample container will be marked with the following information:

- Sample Code
- Project Number
- Date/Time
- Sample Type
- Preservative, if used
- Sampler's Initials

The sample code will indicate the site location, media sampled and the sample station.

After all sample identification information has been recorded, each sample label will be covered with waterproof clear plastic tape to preserve its integrity. All samples will be recorded and tracked under strict chain-of-custody protocols. In the field, each sample will be checked for proper labeling. The samples will then be packed into coolers with ice and shipped to the laboratory. A chain-of-custody form will be completed for each cooler. The form will be signed and dated by the person who collected the samples, the person the samples were relinquished to for transport to the laboratory, and the laboratory sample controller/custodian who receives the samples.

4.2 COMPLETION OF CHAIN-OF-CUSTODY RECORD

A chain-of-custody record is a printed form that accompanies a sample or group of samples as custody is transferred from person to person. A sample chain-of-custody form is included in Appendix B. It documents custody transfer from person to person and sample information recorded on bottle labels. A chain-of-custody record is a controlled document.

As soon as practicable after sample collection, preferably after decontamination, the following information must be entered on the chain-of-custody form. All information is to be recorded in black ink.

1. ***Malcolm Pirnie project number.*** Enter the seven-digit alphanumeric designation assigned by Malcolm Pirnie that uniquely identifies the project site.
2. ***Project name.*** Enter site name.
3. ***Samplers.*** Sign the name(s) of the sampler(s).
4. ***Station number.*** Enter the sample number for each sample in the shipment. This number appears on the Malcolm Pirnie, Inc. sample identification label.
5. ***Date.*** Enter a six-digit number, indicating the year, month, and day of sample collection; for example, 830115.
6. ***Time.*** Enter a four-digit number indicating the military time of collection; for example, 1354.
7. ***Composite or grab.*** Indicate the type of sample.
8. ***Station location.*** Describe the location where the sample was collected.
9. ***Number of containers.*** For each sample number, enter the number of sample bottles that are contained in the shipment.
10. ***Remarks.*** Enter any appropriate remarks.

4.2.1 Transferring Custody From Malcolm Pirnie, Inc. Shipper to Common Carrier

Instructions for Malcolm Pirnie, Inc. shipper transferring custody of samples to a common carrier are given below.

1. Sign, date, and enter time under "Relinquished by" entry.
2. Enter name of carrier (e.g., UPS, Federal Express) under "Received by."
3. Enter bill-of-lading of Federal Express airbill number under "Remarks."
4. Place the original of the chain-of-custody form in the appropriate sample shipping package. Retain a copy with field records.
5. Sign and date the custody seal. The custody seal is part of the chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field.
6. Wrap the seal across filament tape that has been wrapped around the package at least twice.
7. Fold the custody seal over on itself so that it sticks together.
8. Complete other carrier-required shipping papers.

Common carriers will usually not accept responsibility for handling chain-of-custody forms; this necessitates packing the record in the sample package.

4.2.2 Transferring Custody From Malcolm Pirnie, Inc. Sampler Directly to Carrier

To transfer custody of samples from the Malcolm Pirnie, Inc. sampler directly to a carrier, proceed as above, except eliminate the Malcolm Pirnie, Inc. shipper's signature.

5.0 CALIBRATION PROCEDURES AND FREQUENCY

5.1 INTRODUCTION

Instruments must be properly calibrated to produce technically valid data. Documented calibration and calibration check results verify that the instruments used for measurement are in proper working order and the data produced is reliable. The calibration requirements described or referenced in this section are necessary to support the data quality objectives for this project. When calibration requirements are met, the data will support the focussed investigation decisions dealing with the nature and extent of contamination and safety concerns. In the event that the data is used in court, documented calibrations are necessary to ensure that the data is legally defensible.

5.2 CALIBRATION PROCEDURES FOR FIELD EQUIPMENT

5.2.1 Field Equipment

The following table provides a list of the tasks that will require field equipment, and the specific field instruments that will be used for each task and which require calibration.

TASK	FIELD INSTRUMENT
Passive Soil Gas Sampling	HNu Photoionization Detector
Soil Sampling	HNu Photoionization Detector
Groundwater Sampling	HNu Photoionization Detector pH Meter Temperature Probe Specific Conductivity Meter Turbidimeter Pressure Transducer and Data Logger

5.2.2 General Procedures

The operation and maintenance of the field equipment to be used during these tasks are provided in Appendix C. General calibration procedures and requirements are described below:

- All instruments will be calibrated at least once a month.
- All instruments will have the calibrations checked at a minimum at the start of each day before measurements are made.
- The calibration and calibration checks will indicate that the sensitivity of the instrument (practical detection limit) is adequate to meet project needs and that the instrument is accurate over the working range.
- All calibration information will be recorded in the field log book. This includes date and time, technician signature, calibration procedure, calibration results, calibration problems, recalibration and maintenance, and instrument serial numbers.
- All calibration standards will be of National Bureau of Standards (NBS) quality and their sources listed and documented so that standards are traceable. In addition, only technicians trained in the use of the field instruments will operate them. If the instrument readings are incorrect at the time of the initial calibration, the instrument will either be calibrated by the technician or returned to the manufacturer for calibration. If the instrument readings are incorrect after a continuing calibration check, the preceding sample results will be reviewed for validity, and reanalyzed if necessary.

5.3 LABORATORY CALIBRATION PROCEDURES

All samples (with the exception of the passive soil gas samples) analyzed according to the NYSDEC ASP shall follow the procedures described in the Statement of Work (SOW). The calibration procedures and frequency are specifically described for each analysis contained in the SOW. All calibration results shall be recorded and kept on file, and will be reviewed and evaluated by the data validator as part of analytical data evaluation procedures.

Instrument calibration will be checked with a reference standard prior to the analysis of any sample. The standards used for calibrations will be traceable to the National Bureau of Standards (NBS), and each calibration will be recorded in the laboratory notebook for the particular analysis. Any printouts, chromatograms, etc., generated for the calibration will be kept on file.

6.0 ANALYTICAL PROCEDURES

Environmental samples collected for laboratory analysis during the initial sampling phases of the focussed SI will be analyzed by Chemtech, Inc., a NYSDOH ELAP-certified laboratory, for Target Compound List (TCL) compounds and Target Analyte List (TAL) compounds according to the latest SOW. The procedures are fully described in the SOW and are written specifically for environmental samples. Table 1 summarizes the analytical procedures and their sources that will be utilized for this site. The analytical methods listed in Table 1 are sufficient to support the DQOs for this project. In particular, the detection limits of these methods are adequate to support the DQOs. Volatile and semi-volatile organic compounds will be analyzed using Method 8260 + 10 tentatively identified compounds (TICs) and Method 8270 +20 TICs. Passive soil gas samples will be analyzed for modified EPA Method 8260 for the compounds presented in the Work Plan.

7.0 DATA REDUCTION, EVALUATION AND REPORTING

7.1 INTRODUCTION

The purpose of this section is to ensure that the large amount of data produced by the laboratory are presented in a clear and useable format. In addition, data quality and technical validity must be verified prior to data use. The majority of samples collected at this site will be analyzed according to the NYSDEC Analytical Services Protocol (ASP) in which data reduction and reporting schemes are well developed and clearly defined. The employment of these methods ensures comparability with other similarly analyzed environmental samples. Other samples will be analyzed via non-ASP methodologies. Reduction, evaluation and reporting specifications for these analyses are detailed below.

7.2 DATA REDUCTION

Data reduction is the process by which raw analytical data generated from the analytical instrument systems is converted into useable concentrations. The raw data, which takes the form of area counts or instrument responses, is processed by the laboratory and converted into concentrations expressed in terms of mg/l, parts per million (ppm), or µg/l, parts per billion (ppb). These concentrations are the standard method for expressing the level of contamination present in environmental samples.

The process used to convert the instrument output into useable concentrations is clearly defined in the NYSDEC ASP-SOW for TCL and TAL analyses. The SOW presents in detail all information, equations, and calculations used. The resulting concentrations are comparable to other environmental samples in general and will be comparable to data previously collected for this site.

7.3 DATA EVALUATION

Although rigorous evaluation of the data generated by the laboratory will be performed by a third party data evaluation subcontractor consistent with the 1997 NYSDEC Department of Environmental Remediation Data Usability Summary Report (DUSR) Guidelines, the laboratory will be responsible for reviewing data to determine if any analytical problems exist. Specifically, the laboratory will develop a case narrative describing how closely the data meet the DQOs presented in this QAPP.

7.4 DATA REPORTING

The laboratory will report TCL data using NYSDEC ASP Category B deliverables. Reporting of volatile and semi-volatile organic compounds will include tentatively identified compounds (TICs). The information supplied in the non-ASP data packages will be sufficient to conduct a thorough evaluation of the data. The QA reporting for any non-ASP data packages will consist of the following accuracy and precision protocols as performed on the appropriate QA samples.

For precision, the relative percent difference (RPD) and the percent relative standard deviation (% RSD) will be calculated:

$$\text{RPD} = \frac{D_1 - D_2}{(D_1 + D_2)/2} \text{ X } 100$$

RPD = Relative Percent Difference
D_1 = First Sample Value
D_2 = Second Sample value (Duplicate)

For accuracy, the percent recovery (%R) of spikes will be calculated:

$$\%\text{R} = \frac{SSR - SR}{SA} \text{ X } 100$$

SSR = Spiked Sample Result
SR = Sample Result
SA = Amount Spike Added

Field sample precision will be assessed through analysis of duplicate samples and the above RPD equations. Accuracy will be assessed through the analysis of check standards and the above percent recovery equation. Field data will also be assessed in relation to specific project needs.

One copy of the data package will be delivered to a third party data evaluation subcontractor for data assessment. The data package will include the case narrative. The laboratory summary report will be submitted to the NYSDEC as part of the corresponding RI Report. This package will include sampling analysis and summary forms. Section 14.0 provides greater details on the reporting requests for data assessment and evaluation.

8.0 INTERNAL QUALITY CONTROL CHECKS

8.1 INTRODUCTION

In order to monitor the quality of the analytical data generated for this focussed investigation, an appropriate number of quality control (QC) methods will be employed for all field and laboratory measurement systems. The employment of QC methods permits the evaluation of the analytical methodology utilized and provides a measure of the suitability of the methodology to meet the DQOs prior to the beginning of measurement or analysis. Once the measurement and analysis has begun, the employment of QC methods permits the monitoring of the system output for quality. The QC results, presented with the environmental sample data, allows the data to be assessed for quality, and a determination made on how well the data has met the DQOs.

Laboratory generated data is used to accurately identify and quantify hazardous substances, while field generated data is used in conjunction with the laboratory data for further investigation of contamination at the site. Both laboratory and field internal QC programs include steps to assure the data are reliable for the extent they will be used in the focussed investigation. In general, laboratory QC programs are more rigorous than field QC programs.

8.2 FIELD QUALITY CONTROL

The intended data uses have been identified and the DQOs established for all field measurement activities in Sections 3 and 5 of this QAPP. Section 3 contains SOPs which describe the use and calibration of field instruments. QC methods will be used to demonstrate that the instruments are capable of producing reliable data. The QC checks employed for field instruments are as follows:

QC METHOD	PURPOSE	FREQUENCY
Calibration Check Sample	Insures proper working order of instrument. Measures instrument accuracy and sensitivity.	Daily
Background Sample	Provides measure of instrument reliability.	Daily
Duplicate Sample	Measures instrument precision.	5%
Trip Blanks	Measures potential contamination from sample transport, the environment and/or shipping.	Minimum of one per cooler of aqueous volatile samples
Field Blanks	Measures potential contamination due to poor sampling device decontamination procedures.	One per decontamination event or one per day per matrix, whichever is less

The calibration check samples will be analyzed daily and duplicate samples will be analyzed at a minimum frequency of five percent. The calibration check verifies that the instrument is capable of accurately identifying and quantifying contaminants of concern. The duplicates provide a quantitative measurement of the precision of the instrument. Background samples are similar to blanks and provide information regarding instrument reliability. The information is recorded in field logbooks. The results from these QC methods are used by field technicians to monitor the instrument at the time of the analysis. If QC results indicate a problem with the instrument, corrective action will be taken and, if necessary, the samples will be reanalyzed. Because field measurements are generally easy to repeat, measurements should be repeated as necessary so the data are as complete as possible. The QC results are used as an indication of data quality and reliability when the data are being reviewed.

8.3 LABORATORY QUALITY CONTROL

8.3.1 ASP Samples

The scope and description of QC samples and QC methods are well detailed in the NYSDEC ASP Statement of Work (SOW) for the particular analysis. TCL and TAL samples are characterized by rigorous QC and documentation. The SOW for organic and inorganic analyses describe the type of QC samples and required QC methods, and the required frequency of analysis. QC limits have been established for standards, blanks, duplicates, matrix spikes, and surrogates, and are contained in the SOWs. QC data will be reviewed by Malcolm Pirnie personnel to assess the quality of the data and determine if the DQOs have been met.

8.3.2 Non-ASP/CLP Quality Control

All non-ASP/CLP analyses that are conducted for this investigation shall include the following QC procedures, if applicable:

		FREQUENCY
1.	Calibration	As required
2.	Standards	Daily
5.	Method Blanks	Daily
6.	Duplicates	5%
7.	Surrogates	Each sample
8.	QC Check Samples	Daily

8.3.3 Non-ASP/CLP Quality Control Checks

The specific laboratory QC procedures will be similar to the procedures outlined in the specific laboratory subcontract agreement whenever possible. For analyses where ASP/CLP QC procedures cannot be adapted to the analysis, a written procedure of quality control checks will be developed, referencing appropriate USEPA documents such as SW-846. Malcolm Pirnie will be responsible for ensuring that QA/QC objectives are equivalent to ASP objectives when possible. Data evaluation and review will be performed in accordance with the 1997 NYSDEC DER DUSR Guidelines. The evaluation process should ensure that quality assurance objectives have been met by the QC procedures and will comply with the requirements of the State Superfund Contract. The laboratory internal QC checks will include the following:

(1) Duplicates
(2) Control Charts
(3) Blanks
(4) Internal Standards
(5) Reference Check Standards
(6) Surrogate Standards

9.0 QUALITY ASSURANCE AUDITS

9.1 INTRODUCTION

To monitor the capability and performance of all investigation activities, audits may be conducted by Malcolm Pirnie QA personnel. Audits are conducted to determine the suitability and capability of project activities to meeting project quality goals. On-site field audits will be conducted to monitor the field techniques, procedures and the overall implementation of the QAPP procedures. These may be conducted periodically by the Site Quality Assurance Officer (QAO), Christopher Gaule, whose resume is provided in Appendix D. Data quality audits (DQAs), are conducted to determine if the data generated by the sampling and analysis satisfies the predetermined DQOs. The site QAO will be responsible for conducting DQAs of all data generated from project activities.

9.2 FIELD AUDITS

Field audits will include an evaluation of:

1. Sample collection and analytical activities.
2. Equipment calibration techniques and records.
3. Decontamination and equipment cleaning.
4. Equipment suitability and maintenance/repair.
5. Background and training of personnel.
6. Sample containers, preservation techniques and chain-of-custody.
7. Data log books.

Field audit forms are provided in Appendix B. A written QA audit report will be prepared by the Site QAO and submitted to the Project Officer and Project Manager. The report will identify any deficiencies found and recommend corrective action. Follow-up reports describing corrective actions which have been completed will be submitted to the Project Officer and Project Manager.

9.3 PERFORMANCE AUDITS (PAs)

Data Quality Audits (DQAs) are conducted to determine if the data is adequate to support the DQOs and to determine the cause of deficiencies in the event that the data quality is not adequate. This audit will be conducted by the Site QAO after the data has been fully evaluated. The Site QAO will first determine to what extent the data can be used to support the decision-making process. Secondly, the Site QAO will identify the cause of any deficiencies in the data, whether technical, managerial, or both.

10.0 PREVENTATIVE MAINTENANCE

10.1 PURPOSE

The purpose of the preventative maintenance program is to ensure that the sampling, field testing and analytical equipment perform properly thereby avoiding erroneous results, and minimizing equipment downtime. The preventative maintenance program also provides for the documentation of all maintenance to be used as evidence of instrument maintenance and for scheduling of future maintenance. This section describes the equipment maintenance program for field instruments and those responsible for implementation of the program at the Ashland Chemical site. The specific equipment maintenance procedures are given in the equipment SOPs and the preventative maintenance SOPs presented in Appendix C. The laboratory preventative maintenance program is the responsibility of the laboratory and only the minimum requirements are mentioned here.

10.2 RESPONSIBILITIES

TITLE	RESPONSIBILITIES
Field Team Leader	Keeping all maintenance records. Development and implementation of maintenance program.
Equipment Manager	Maintaining storage of equipment within the Malcolm Pirnie equipment inventory. Carrying out all maintenance according to schedule. Informing field team members of specific maintenance requirements. Keeping records of all maintenance performed under his care. Sending out equipment for service/repair. Maintaining adequate supply of spare parts.
Field Personnel	Maintenance of all equipment located on-site on a regular basis and after each use. Keeping supply of spare parts on-hand.

10.3 PREVENTATIVE MAINTENANCE PROGRAM

The preventative maintenance program consists of three parts, normal upkeep, service and repair, and formal recordkeeping. Normal upkeep consists of daily procedures that include cleaning, lubrication and checking the batteries of the equipment. The following is a partial list of normal upkeep procedures and a partial list of important spare parts:

- Normal upkeep for environmental monitoring equipment performed daily or after each use:
  1) Cleaning
  2) Lubrication of moving parts
  3) Check/charge battery
  4) Inspect for damage
  5) Check for operation problems
  6) Inspect all hoses and lines

- Partial list of important spare parts for environmental monitoring instruments planned for use at the Ashland Chemical site:
  1) Fuses
  2) HNu-UV lamp
  3) Probes
  4) Spare battery

The normal upkeep is performed daily after each use and includes inspecting for damage, signs of problems, and charging the batteries if necessary. Specific equipment upkeep procedures are described in the SOP for each instrument in Appendix C.

Minor service and repair will be performed by the Equipment Manager who is trained in the service and repair of field instruments. Equipment in need of major or more complex repair and service will be sent to the manufacturer.

All maintenance, servicing and repair of equipment shall be recorded and kept on file. Field personnel shall record maintenance and instrument problems in the field instrument log books. These will ultimately be kept on file by the Field Team Leader. The Equipment Manager shall keep a record of all equipment released to the field and a record of all maintenance and service on file.

10.4 LABORATORY INSTRUMENT MAINTENANCE

For ASP laboratories, preventative maintenance procedures will be clearly defined and written for each measurement system. Maintenance activity, preventative or repair, will be documented on standard forms which are maintained in log books. Written procedures will include maintenance schedules, problem identification procedures, space for describing problems and repair notes, and failure analysis protocols. Service contracts and regularly scheduled in-house maintenance will be included, along with a list of critical spare parts.

10.5 RENTAL EQUIPMENT

Rental equipment will be obtained only from known, reputable rental suppliers. The equipment will require a pre-receipt to verify accuracy, maintenance and upkeep of the equipment.

11.0 DATA ASSESSMENT

11.1 OVERVIEW

All analytical data received by Malcolm Pirnie from the analytical laboratories will be assessed to determine to what extent the data can be used in making sound project decisions. The goal of data assessment is to characterize the data so that project decisions are made using data that is of sufficient quality to support those decisions. The levels of quality needed to support the various project decisions have been stated in the form of the DQOs. Where the DQOs are met, the data is useful in making necessary decisions.

In order to determine how well the DQOs have been met, all ASP Level IV and Level V data will be reviewed and evaluated by a qualified data evaluation in accordance with the 1997 NYSDEC DER Guidelines for Data Usability Summary Reports (DUSRs). The data will be reviewed and evaluated with the intended data uses and DQOs being utilized to aid in decisions regarding data usefulness.

The data obtained through the ASP program, Level IV (TCL/TAL) and Level V will be subjected to rigorous review according to the following protocols. The uses of Level IV and Level V data require this rigorous review so that the data quality is known.

11.2 DATA ASSESSMENT

11.2.1 Task I – Completeness

Data assessment will include a review of the data package to determine completeness. A complete data package will consist of the following eight components.

1. All sample chain-of-custody forms.

2. The case narrative(s) including all sample/analysis summary forms.

   These forms appear as an addendum to the NYSDEC CLP forms package and will be required for all data submissions regardless of the protocol requested.

3. Quality Assurance/Quality Control summaries including all supporting documentation.

4. All relevant calibration data including all supporting documentation.

5. Instrument and method performance data.

6. Documentation showing the laboratory's ability to attain the contract specific method detection limits for all target analytes in all required matrices.

7. All data report forms including examples of the calculations used in determining final concentrations.

8. All raw data used in the identification and quantitation of the contract specified target compounds.

All deficiencies in the requirement for completeness shall be reported to the consultant immediately. The laboratory shall be contacted by the Project QAO or data evaluator and shall be given ten calendar days to produce the documentation necessary to remove the deficiencies.

11.2.2 Task II – Compliance

The Evaluator shall review the submitted data package to determine compliance with those portions of the work plan that pertain to the production of laboratory data. Compliance is defined by the following criteria.

1. The data package is complete as defined in Task 1 above.

2. The data has been produced and reported in a manner consistent with the data requirements of the QAPP and the laboratory subcontract.

3. All protocol required QA/QC criteria have been met.

4. All instrument tune and calibration requirements have been met for the time frame during which the analytes were completed.

5. All protocol required initial and continuing calibration data is present and documented.

6. All data reporting forms are complete for all samples submitted. This will include all sample dilution/concentration factors and all premeasurement sample cleanup procedures.

7. All problems encountered during the analytical process have been reported in the case narrative along with any and all actions taken by the laboratory to correct these problems.

The data evaluation task requires that the Evaluator conduct a detailed comparison of the reported data with the raw data submitted as part of the supporting documentation package. It is the responsibility of the Evaluator to determine that the reported data can be completely substantiated by applying protocol defined procedures for the identification and quantitation of the individual analytes. To assist the Evaluator in this determination the following documents are recommended; however, the EPA Functional Guidelines will be used for format only. The specific requirements noted in the Project Quality Assurance Project Plan are prerequisite, for example, holding times or special analytical project needs, to those noted in the Functional Guidelines.

1. The particular protocol(s) under which the data was generated, e.g., NYSDEC Contract Laboratory Protocol; EPA SW-846; EPA Series 500 Protocols.

2. Data evaluation guidance documents such as:
    a. "Guidance for the Development of Data Usability Summary Reports" September 1997 revision, NYSDEC Division of Environmental Remediation.
    b. "Functional Guidelines for Evaluation Inorganic Data" (published by EPA Region 2), or latest revision.
    c. "Functional Guidelines for Evaluation Organics Analyses" Technical Directive Document No. HQ-8410-01 (published by EPA), or latest revision.
    d. "Functional Guidelines for Evaluating Pesticides/PCB's Analyses" Technical Directive Document No. HG-8410-01 (published by EPA), or latest revision.

11.3 REPORTS

The Evaluator shall submit a final report covering the results of the data review process. This report shall include the following:

1. A general assessment of the data package as determined by the accomplishment of Section 11.2, above.

2. Detailed descriptions of any and all deviations from the required protocols. (These descriptions must include references to the portions of the protocols involved in the alleged deviations).

3. Any and all failures in the Evaluator's attempt to reconcile the reported data with the raw data from which it was derived. (Again, specific references must be included). Telephone logs should be included in the evaluation report.

4. A detailed assessment by the Evaluator of the degree to which the data has been comprised by any deviations from protocol, QA/QC breakdowns, lack of analytical control, etc., that occurred during the analytical process.

5. The report shall include, as an attachment, a copy of the laboratory's case narrative including the NYSDEC required sample and analysis summary sheets.

6. The report shall include an overall appraisal of the data package.

7. The evaluation report shall include a chart presented in a spreadsheet format, consisting of site name, sample numbers, data submitted to laboratory, year of CLP or analytical protocol used, matrix, fractions analyzed, e.g., volatiles, semi-volatiles, Pest/PCB, Metals, CN. Space should be provided for a reference to the NYSDEC CLP when non-compliancy is involved and a column for an explanation of such violation.

12.0 CORRECTIVE ACTION

12.1 NON-CONFORMANCE REPORTS

Corrective action will be undertaken when a non-conforming condition is identified. A non-conforming condition occurs when QA objectives for precision, accuracy, completeness, representativeness or comparability are not met, or when procedural practices or other conditions are not acceptable.

A non-conformance report will be prepared by the Site QAO, approved by the Technical Manager, and issued to the Project Manager and other appropriate parties. The non-conformance report will describe the unacceptable condition and the nature of corrective measures recommended. A schedule for compliance will also be provided.

12.2 CORRECTIVE ACTION

The non-conformance report will be transmitted to a responsible officer of the ASP laboratory, the City of Johnstown Representative, the Project Officer and the Project Manager. The non-conformance report will specify, in writing, the corrective action recommended including measures to prevent a recurrence of the original deficiency. Appropriate documentation of corrective action will also be prepared. The Site QAO will monitor implementation of the corrective action, and provide written record as to whether the original problem has been resolved.

12.3 STOP-WORK ORDER

A Stop-Work Order may be issued, upon authorization, by the Site QAO, if corrective action does not adequately address a problem or if no resolution can be reached. To issue a Stop-Work Order, written authorization is required from the Project Manager and the City of Johnstown Representative. If disagreement occurs among these individuals, it will be brought before successively higher levels of management until the issue is resolved.

12.4 DOCUMENTATION OF THE STOP-WORK ORDER

The conditions and need for a Stop-Work Order will be documented in sufficient detail to permit evaluation of the deficiency and determination of proper corrective action. Pertinent communications will be attached to the Stop-Work Order and referenced in the appropriate spaces. Such communications include discussions, correspondences, or telephone conversations which pertain to evaluation of the problem and potential solutions, and implementation of the preferred solution.

12.5 RESUMPTION OF WORK

In order for work to resume following a Stop-Work Order, the Project Manager and the City of Johnstown Representative must rescind it in writing.

12.6 COURSE AND ACTION TO PREVENT RECURRENCE

The Site QAO is responsible for tracking non-conforming conditions, evaluating the effectiveness of corrective measures, and assuring that the necessary steps have been taken to prevent recurrence of the original problem.

12.7 FIELD CHANGES

The Project Manager is responsible for all site activities. In this capacity the Project Manager will at times be required to modify site programs in response to changing site conditions. At such times the responsible Field Team Leader will notify the Project Manager of the anticipated change, and obtain the approval of the Project Manager and implement the necessary changes. The Project Manager will notify in writing the Site QAO, the Project

Officer, and the City of Johnstown Representative. A copy of the notification will be attached to the file copy of the affected document. If an unapproved action has been taken during a period of deviation, the action will be evaluated to determine the significance of any departure from established procedures.

Changes in the program will be documented on a field change request which is signed by the Field Team Leader and the Project Manager. The Project Manager will maintain a log for the control of field change requests.

The Project Manager is responsible for controlling, tracking and implementing the identified changes. Completed field change requests are distributed to affected parties which will include as a minimum: Project Officer, Project Manager, Site QAO, Field Team Leader, and the City of Johnstown Representative.

13.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

13.1 FREQUENCY

Malcolm Pirnie field staff will promptly report any difficulties to the Project Manager. The laboratory will provide a written description on any quality assurance, problems to Malcolm Pirnie with submission of the analytical data packages.

Following quality assurance audits, the site QAO will submit a Quality Assurance report to the Project Manager describing the performance of the quality assurance program. Problems or issues which arise independent of audits may be identified to project management at any time.

13.2 CONTENTS

The Quality Assurance reports will contain:

- Results of system and performance audits;
- An assessment of the measurement data, including accuracy, precision, completeness, representativeness, and comparability;
- A listing of the non-conformance reports including stop-work orders issued related corrective actions undertaken, and an assessment of the results of these actions; and
- Identification of significant quality assurance problems and recommended solutions.

14.0 REFERENCES

NYSDEC, 1995, Guidance for the Development of Data Usability Summary Reports.

USEPA, 1983, Methods for Chemical Analysis for Water and Wastes, EPA-600/8-79-020

USEPA, 1984, Soil Sampling Quality Assurance User's Guide, EPA-600\4-84-043.

USEPA, 1988, Region II CERCLA Quality Assurance Manual, Final Copy, Revision O.

USEPA, 1986, Test Methods for Evaluating Solid Waste, SW-846, Third Edition.

USEPA, Contract Laboratory Statement of Work for Organic Analysis, 3/90.

USEPA, Contract Laboratory Statement of Work for Inorganic Analysis, 3/90.

USEPA, 1987, Data Quality Objectives for Remedial Response Activities, CDM Federal Programs Corporation.

USEPA, 1988, Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses.

USEPA, 1988, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final.

USEPA, 1988, User's Guide to the Contract Laboratory Program, Fourth printing.

USEPA, 1990, SOP No. HW-6, CLP Organics Data Review and Preliminary Review, Revision No. 7, 3/90.

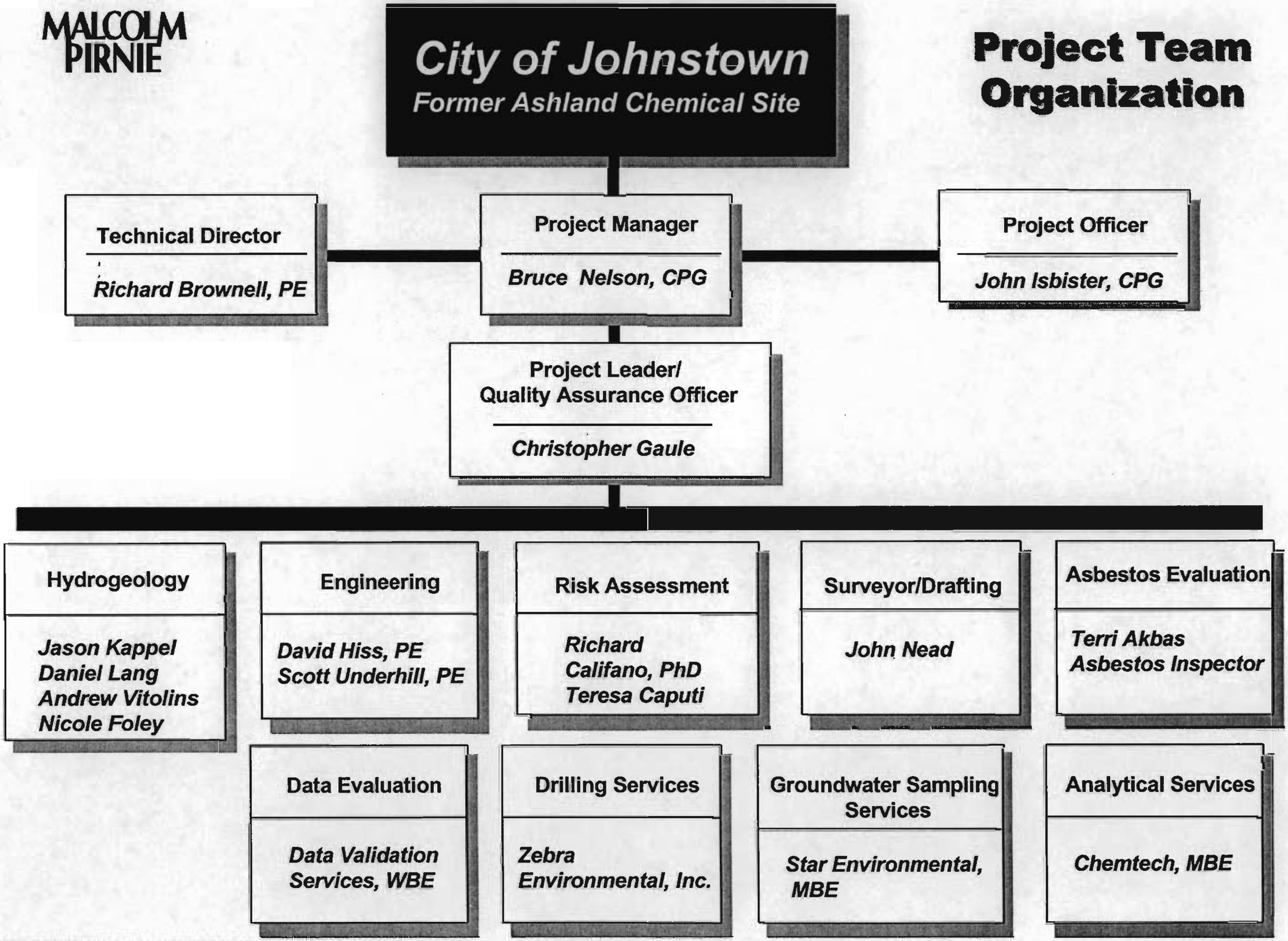
USEPA, 1990, SOP NO. HW-2, Evaluation of Metals Data for the Contract Laboratory Program Revision X, 2/90.

APPENDIX A

Project Organizational Chart

MALCOLM PIRNIE

Project Team Organization



City of Johnstown

Former Ashland Chemical Site

Technical Director

Richard Brownell, PE

Project Manager

Bruce Nelson, CPG

Project Officer

John Isbister, CPG

Project Leader/ Quality Assurance Officer

Christopher Gaule

Hydrogeology

Jason Kappel
Daniel Lang
Andrew Vitolins
Nicole Foley

Engineering

David Hiss, PE
Scott Underhill, PE

Risk Assessment

Richard Califano, PhD
Teresa Caputi

Surveyor/Drafting

John Nead

Asbestos Evaluation

Terri Akbas
Asbestos Inspector

Data Evaluation

Data Validation Services, WBE

Drilling Services

Zebra Environmental, Inc.

Groundwater Sampling Services

Star Environmental, MBE

Analytical Services

Chemtech, MBE

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APPENDIX B

Field Forms

QUALITY CONTROL FIELD AUDIT REPORT

SUMMARY INFORMATION

1. PROJECT NAME: ____________________

2. PROJECT ADDRESS: ____________________

____

3. PRELIMINARY ASSESSMENT ___ RI/FS ___ RD ___ CONSTRUCTION ___

OTHER ____________________

4. DATE(S) OF QC FIELD AUDIT ____________________

5. AUDITOR'S NAME ____________________ PHONE ________

6. FACILITY CONTACT ____________________ PHONE ________

7. CONTRACTOR CONTACT ____________________ PHONE ________

8. PERSONNEL ON-SITE

NAME	REPRESENTING	PHONE

9. AUDITOR'S COMMENTS ____________________

____

____

10. WEATHER CONDITIONS

SUNNY PARTLY SUNNY PARTLY CLOUDY CLOUDY RAIN DRIZZLE SNOW SLEET

TEMPERATURE ________ WIND SPEED ________ WIND DIRECTION ________

11. LEVEL OF PERSONNEL PROTECTION REQUIRED IN WORK PLAN LEVEL OF PERSONNEL PROTECTION ACTUALLY DONNED:

A B C D A B C D

12. FIELD SURVEY EQUIPMENT

INSTRUMENT	MODEL	CALIBRATION CHECK	CALIBRATION STANDARD	SPAN SETTING
CONDUCTIVITY METER				
DISSOLVED OXYGEN METER				
pH METER				
COMBUSTIBLE GAS INDICATOR (LEL/O_2)				
FLAME IONIZATION DETECTOR (OVA)				
PHOTOIONIZATION DETECTOR (HNU)				
TOTAL GAS INDICATOR (CO, H_2S)				
OTHER				

OBSERVATIONS ____

____

13. DID THE SAMPLING TEAM TAKE PERIODIC SURVEYS OF THE AMBIENT AIR CONDITIONS YES NO N/A

14. DID THE SAMPLING TEAM PROVIDE A DECON ZONE DESIGNATING CLEAN AND CONTAMINATED AREAS YES NO N/A

15. WERE PHOTOGRAPHS TAKEN YES NO

16. AUDITOR'S COMMENTS ____

____

____

MONITORING WELL SAMPLING SETUP AND EVACUATION

EVACUATION PROCEDURES

1. WELL CASING CONSTRUCTION STAINLESS STEEL TEFLON PVC OTHER ________
2. DIAMETER OF WELL CASING 2" 4" 6" OTHER ________
3. LOCKING CAPS ON THE WELLS YES NO N/A PROTECTIVE CASING YES NO N/A
4. METHOD UTILIZED TO DETERMINE THE STATIC WATER LEVEL WATER LEVEL INDICATOR OTHER ________
5. REFERENCE POINT THAT THE STATIC WATER LEVEL WAS MEASURED FROM:

SURVEY POINT	TOP OF INNER CASING	TOP OF PROTECTIVE CASING	HEIGHT OF CASING ABOVE GROUND SURFACE

6. WAS THE WATER LEVEL INDICATOR DECONTAMINATED ACCORDING TO STANDARD PROCEDURES BETWEEN EACH WELL:

YES NO N/A

IF NO, METHOD UTILIZED: ________

____

7. EVACUATION METHOD:

BAILER CENTRIFUGAL PUMP PERISTALTIC PUMP BLADDER PUMP SUBMERSIBLE PUMP

GAS DISPLACEMENT PUMP GAS LIFT PUMP OTHER ________

8. TYPE OF HOSE UTILIZED:

POLYETHYLENE (ASTM DRINKING WATER GRADE 2239) TEFLON SILASTIC N/A

OTHER ________

9. WAS THE HOSE DEDICATED TO EACH WELL LOCATION: YES NO N/A

IF NO, METHOD OF DECONTAMINATION ________

10. WAS THE PUMP DEDICATED TO EACH WELL LOCATION: YES NO N/A
11. WAS THE PUMP: LABORATORY DECONTAMINATED FIELD DECONTAMINATED N/A
12. WAS THE PUMP DECONTAMINATED ACCORDING TO STANDARD CERCLA PROCEDURES: YES NO

IF NO, METHOD OF DECONTAMINATION ________

13. WAS THE PUMP HEAD OR END OF HOSE WITHIN 6 FEET OF THE DYNAMIC WATER LEVEL DURING EVACUATION:

YES NO N/A

14. WAS THE DECONTAMINATION AREA LOCATED AWAY FROM THE SOURCE OF CONTAMINATION YES NO N/A
15. AUDITOR'S COMMENTS ________

____

____

AQUEOUS SAMPLING PROCEDURES

1. AQUEOUS MATRIX SAMPLED:

POTABLE WELL GROUNDWATER SURFACE WATER LEACHATE RUNOFF STORM SEWER

SANITARY SEWER OTHER: ____________________

2. TYPE OF SAMPLE: GRAB COMPOSITE IF COMPOSITE, # SAMPLES/COMPOSITE __________

3. WAS THE VOA SAMPLE COLLECTED FIRST: YES NO N/A

4. TYPE OF SAMPLING EQUIPMENT:

	MATERIAL OF CONSTRUCTION			
	STAINLESS STEEL	TEFLON	GLASS	OTHER
BAILER				
BLADDER PUMP				
SAMPLER				
COLIWASA				
KEMMERER DEPTH SAMPLER				
WHEATON DIP SAMPLER				
TUB SAMPLER				
BACON BOMB				

5. TYPE OF LEADER LINE THAT COMES IN CONTACT WITH THE WELL WATER:

TEFLON TEFLON-COATED STAINLESS STEEL N/A OTHER __________

6. LENGTH OF THE LEADER LINE ____________________

7. WAS THE SAMPLING EQUIPMENT DEDICATED: YES __________ NO __________

8. WAS THE SAMPLING EQUIPMENT: LAB DECONTAMINATED FIELD DECONTAMINATED

9. WAS THE SAMPLING EQUIPMENT DECONTAMINATED ACCORDING TO STANDARD PROCEDURES: YES NO

IF NO, METHOD OF DECONTAMINATION: ____________________

10. WAS THE DECONTAMINATION AREA LOCATED AWAY FROM THE SOURCE OF CONTAMINATION YES NO N/A

11. ARE DISPOSABLE GLOVES WORN AND CHANGED BETWEEN EACH SAMPLE LOCATION: YES NO

12. AUDITOR'S COMMENTS ____________________

____

____

____

____

NON-AQUEOUS SAMPLE INFORMATION

1. NON-AQUEOUS MATRIX SAMPLED:

SOIL SEDIMENT SLUDGE CHEMICAL SOLIDS WASTE PILE

OTHER ______________________________

2. TYPE OF SAMPLE: GRAB COMPOSITE IF COMPOSITE, # SAMPLES/COMPOSITE ______________

3. WAS THE VOA SAMPLE COLLECTED FIRST FROM A DISCRETE LOCATION PRIOR TO HOMOGENIZATION: YES NO N/A

4. WAS THE SAMPLE HOMOGENIZED PRIOR TO ACQUISTION INTO THE SAMPLE CONTAINERS: YES NO

5. TYPE OF SAMPLING EQUIPMENT:

	MATERIAL OF CONSTRUCTION			
	STAINLESS STEEL	TEFLON	GLASS	OTHER
SPOON/SPATULA				
TROWEL/SCOOP				
BUCKET AUGER				
SPLIT SPOON				
SHELBY TUBE				
TRIER				
PONAR DREDGE				

6. WAS THE DRILL RIG, AUGER FLIGHTS, RODS, ETC. DECONTAMINIATED ACCORDING TO STANDARD PROCEDURE BETWEEN EACH SAMPLE LOCATION.

YES NO N/A

IF NO, METHOD OF DECONTAMINATION ______________________________

7. IF MUD ROTARY DRILLING WAS UTILIZED WHAT WAS THE SOURCE OF THE WATER: ______________

8. WAS THE SAMPLING EQUIPMENT DEDICATED: YES ______________ NO ______________

9. WAS THE SAMPLING EQUIPMENT: LAB DECONTAMINATED FIELD DECONTAMINATED

10. WAS THE SAMPLING EQUIPMENT DECONTAMINATED ACCORDING TO STANDARD PROCEDURES: YES NO

IF NO, METHOD OF DECONTAMINATION: ______________________________

11. WAS THE DECONTAMINATION AREA LOCATED AWAY FROM THE SOURCE OF CONTAMINATION YES NO N/A

12. ARE DISPOSABLE GLOVES WORN AND CHANGED BETWEEN EACH SAMPLE LOCATION: YES NO

13. AUDITOR'S COMMENTS ______________________________

____

____

____

____

QA/QC INFORMATION

1. LABORATORIES:

NAME PHONE

NAME PHONE

CONTACT PERSON

CLP CLP CAPABLE CERTIFIED OTHER

2. SAMPLE INFORMATION:

MATRIX	PARAMETER	PRESERVATIVE	CONTAINER DESCRIPTION

3. WHAT ORDER BY ANALYTICAL PARAMETER ARE SAMPLES COLLECTED:

4. FIELD BLANKS: YES NO N/A FREQUENCY

METHOD:

WAS IDENTICAL BOTTLE TO BOTTLE TRANSFER OF WATER UTILIZED: YES NO

5. TRIP BLANKS: YES NO N/A FREQUENCY

6. WHAT WAS THE SOURCE OF THE BLANK WATER: LABORATORY DEMONSTRATED ANALYTE-FREE OTHER

7. SAMPLE PACKAGING AND HANDLING:

SAMPLE CONTAINERS LABELED	YES	NO	N/A
COC FORMS COMPLETED	YES	NO	N/A
CUSTODY SEALS	YES	NO	N/A
SAMPLES PERSERVED TO 4°C:	YES	NO	N/A

8. AUDITOR'S COMMENTS

MALCOLM
PIRNIE

CHAIN OF CUSTODY RECORD

Project Name:		Project Number:																		
Date	Time	Sample Identification	Comp.	Grab	Sample Pres.	Number of Containers														

Sampled by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks:	

MALCOLM
PIRNIE

GROUND WATER ELEVATIONS

PROJECT NAME: ____________________ SAMPLER: ____________________

PROJECT NUMBER: ____________________ INSTRUMENT: ____________________

DATE: ____________________ MEASURING POINT (M.P.): ____________________

Well No.	Elevation Top of M.P. (ft)	Water Depth Below Top of M.P. (ft)	Water Elevation (ft)	Comments

MALCOLM
PIRNIE

Well No. ______

Well Development/Purging Log

PROJECT NAME: ______

PROJECT NUMBER: ______

DATE: ______

SAMPLERS: ______

______

① Total Casing and Screen Length (ft.) ______

② Casing Internal Diameter (in.) ______

③ Water Level Below Top of Casing (ft.) ______

④ Volume of Water in Casing (gal.) ______

Well I.D.	Vol. Gal./Ft.
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

$$v = 0.0408 \, (\text{②})^2 \times (\text{①} - \text{③}) = \text{④}$$

$v = 0.0408 \, (\qquad)^2 \times (\qquad - \qquad) =$ ______ gal.

PARAMETER	ACCUMULATED VOLUME PURGED										
Gallons											
Time											
Conductivity (mohm/cm)											
Dissolved Oxygen (ppm)											
Eh (mV)											
pH											
Temp (°C)											
Turbidity (NTUs)											

COMMENTS:

APPENDIX C

Field Equipment Calibration and Maintenance Procedures

EQUIPMENT CALIBRATION AND MAINTENANCE PROCEDURES

Calibration and maintenance procedures for the equipment identified below are presented in this Appendix.

- Dissolved Oxygen Meter
- Explosimeter (Combustible Gas Indicator)
- HNu Photoionization Analyzer
- pH Meter
- Specific Conductance Meter
- Turbidmeter
- Water Quality Monitoring System

CALIBRATION AND MAINTENANCE OF DISSOLVED OXYGEN METER

Accuracy

The calibrated accuracy of the dissolved oxygen meter (YSI Model 51B Dissolved Oxygen Meter) will be better than ±0.2 mg/l when calibrated within ±5°C of actual sample temperature. Temperature which can also be measured with this instrument, has an accuracy of ±0.7°C over the full scale temperature range of -5°C to +45°C.

Calibration

1) Switch instrument to OFF and adjust meter mechanical zero.

2) Switch to ZERO and adjust to "O" on mg/l scale.

3) Switch to FULL SCALE and adjust to "15" on mg/l scale.

4) Prepare probe for operation, plug into instrument, wait up to 15 minutes for probe to stabilize. Probe can be located in calibration chamber or ambient air.

5) Switch to CALIB O_2 and adjust CALIB control until meter indicates local altitude on short scale in upper right corner of meter.
NOTE: It is desirable to calibrate probe in a high humidity environment. See instruction manual for more detail on calibration and other instrument and probe characteristics.

Maintenance

1) When not in use or between measurements, keep the dissolved oxygen probe immersed in or moist with deionized water.

2) Replace batteries after 1000 hours of operating or if full scale adjustment cannot be made. Use Eveready 935 "C" size or equal.

3) Membranes will last indefinitely depending on use. Average replacement is 2-4 weeks. Probe should be stored in humid environment to prevent drying out.

4) Calibrate daily.

Data Validation

All instrument calibrations will be documented, indicating the meter readings before and after the meter has been adjusted. Each preparation of probe and method of calibration will also be documented. This is important, not only for data validation, but also to establish maintenance schedules and component replacement.

CALIBRATION AND MAINTENANCE OF THE EXPLOSIMETER

Accuracy

The calibrated accuracy of the Mine Safety Appliances (MSA) Combustible Gas and Oxygen Alarm, Model 261, is ±0.3% oxygen at constant temperature and pressure; and ±% LEL (lower explosive limit) up to 50% of full scale, and ±5% LEL up to 100% of full scale for combustible gas. Measurement ranges are 0 to 25% oxygen, and 0 to 100% LEL, with operating temperature ranging from 0°F to 104°F. However, below 32°F, response time is longer.

Calibration

Combustible System Calibration Check - Before the calibration of the combustible gas indicator can be checked, the Model 261 must be in operating condition. Calibration check adjustment is made as follows:

1) Check and zero the instrument.
2) Attach the flow control to the recommended calibration gas tank.
3) Connect the adapter-hose to the flow control.
4) Open flow control valve.
5) Connect the adapter-hose fitting to the inlet of the instrument. After approximately 15 seconds, the LEL meter pointer should be stable and within the range specified on the calibration sheet accompanying the calibration equipment. If the meter pointer is not in the correct range, stop the flow and remove the right hand side (speaker) panel. Turn on the flow and adjust the "S" control with a small screwdriver to obtain the reading specified on the calibration sheet.
6) Disconnect the adapter-hose fitting from the instrument.
7) Close the flow control valve.
8) Remove the adapter-hose from the flow control.
9) Remove the flow control from the calibration gas tank.
10) Replace the side panel on the Model 261.

Oxygen System Calibration Check - Make an oxygen system calibration check each time a combustible gas check is made.

Note: More detailed instructions are contained in the operating manual.

Maintenance

1) Battery Pack Charging - The primary maintenance item of the Model 261 is the rechargeable, 4.0-volt lead-acid battery. Using the appropriate batter charger (120 VAC, Part No. 631664, or 240 VAC, Part No. 631712) insert charger plug into charge jack.

The POWER ON lamp indicates that the charger is receiving power from the 120 or 240 VAC line. The FAST CHARGE lamp indicates that the battery voltage is low and that the charger has automatically switched to the higher charge rate. When the battery is approximately 95% charged, the charger will change to the trickle charge rate and the FAST CHARGE lamp will be extinguished.

> Caution: Use only the chargers specified above to charge the instrument; otherwise, damage to the battery pack and/or the instrument circuitry may result.

Recommended charging time is 14 hours. The battery pack may be left on charge for longer periods without damage.

> Warning: Do not charge the battery pack in areas that may contain a flammable mixture of combustible gases, vapors, or dust and air; otherwise, an explosion may occur since a source of ignition exists during charging.

2) Extended Operation - An external Charging Adapter (Part No. 477153) can be used to charge a depleted battery while it is removed from the instrument. Use of this adapter permits extended operation by enabling the user to install a second, back-up battery into the instrument while externally charging the depleted battery.

   The batter pack may not supply full power capacity after repeated partial use between chargings; therefore, it is recommended that the battery pack be "exercised" at least once per month by operating the Model 261 for 8 to 19 hours and then recharging. The battery pack should be charged after each day of use (or prior to use if the instrument has not been operated for 30 days).

3) Battery Pack Replacement - When the rechargeable, 4.0-volt lead-acid battery pack no longer responds to recharging or no longer "holds" a charge, the pack should be replaced according to the following procedure:

   a) Loosen the knurled screws holding the handle and remove the handle.

   b) Looking at the front panel of the instrument, remove the right (audible alarm side) panel by unscrewing the four side panel screws.

   c) Gently pull the side panel loose and tilt the instrument to help slide out the battery case. Disconnect the molded nylon plug from the battery case. (NOTE: Do not disconnect the alarm speaker.)

   d) Install the new battery by reversing steps 1 through 3 above.

4) Sample Inlet Filter/Filter Element - The sample inlet filter should be examined each time the Model 261 is recharged. If the filter element appears to be coated with dust or dirt, it should be washed, dried and re-inserted or a new element substituted. If a new element is installed, also install a new filter O-ring. Make sure the inlet seal O-ring in the inlet filter cap is properly seated. If the O-ring is damaged or missing, replace it before using the Model 261 with any sampling accessories.

5) Printed Circuit Board Adjustments - The printed circuit board contains five adjustment pots, identified as follows:

Oxygen Sensor Adjustment

O_2H:	The Oxygen High Alarm Point Adjustment (factory-set at 23%).
O_2L:	The Oxygen Low Alarm Point Adjustment (factor-set at 19.5% oxygen).
O_2 OFFSET:	The Oxygen Offset controls the zero reading of the oxygen meter. The leads to the oxygen cell must be disconnected and shorted together, and the front panel CALIBRATE O_2 knob turned fully clockwise. The % oxygen meter should indicate zero; adjust OFFSET if necessary.

Combustible Gas Sensor Adjustment

CGA:	The combustible Gas Alarm Point Adjustment (factor-set at 25% LEL).
S:	After zeroing, the Span is adjusted by sampling calibration check gas and adjusting the readout accordingly.

Data Validation

All instrument calibrations will be documented, indicating the meter readings before and after the meter has been adjusted. The standard used to calibrate the meter will also be documented. This is important, not only for data validation, but also to establish maintenance schedules and component replacement.

CALIBRATION AND MAINTENANCE OF HNu PHOTOIONIZATION ANALYZER

Accuracy

The HNu PI-101 is temperature compensated so that a 20 degrees Celsius change in temperature corresponds to a change in reading of less than two percent full-scale at maximum sensitivity. The useful range of the instrument is from 0.2 to 2000 ppm. Response time is less than three seconds to 90 percent of full-scale.

Calibration

Prior to use, the HNu meter will be checked using a pressurized cylinder of isobutylene. The isobutylene will be certified by HNu Systems Inc. to be 100 ppm of isobutylene in air. The HNu meter is calibrated to benzene at the manufacturer. Thus, the 100 ppm of isobutylene check gas should deflect to 63 ppm on the meter scale.

Maintenance

1. If any of the following conditions occur, consult the troubleshooting guide provided in the Instruction Manual:

    a. No meter response in any switch position (including BATT CHK).
    b. Meter response in BATT CHK, but reads zero or near zero for all others.
    c. Instrument reads correctly in BATT CHK and STBY, but not in measuring mode.
    d. Instrument responds in all positions, but signal is lower than expected.
    e. Erratic meter movement occurs.
    f. Instrument response slow or irreproducible.
    g. Low battery indicator.

    Should the troubleshooting techniques fail to resolve the problem, send the instrument to the manufacturer for repair and maintenance.

2. The light source window will be cleaned at a minimum of every two weeks. Cleaning frequency will be based on meter performance when checked against 100 ppm of isobutylene in air.

3. The meter battery will be checked at the beginning and end of each day. If the needle is not within or above the green battery arc on the scale-plate, the battery will be recharged prior to making any measurements.

Data Validation

A daily log will be kept to document equipment and standards utilized. Recorded information for the equipment will include the name, model number, and data of calibration. Standards used in calibration of equipment will be documented by trade name, lot number and expiration date. Any unusual readings and routine maintenance procedures will also be documented.

CALIBRATION AND MAINTENANCE OF pH METER

Accuracy

An Orion SA 250 pH meter will be used for on-site pH and temperature measurement. The SA 250 meter will be equipped with a suitable combination pH electrode and automatic temperature compensation (ATC) probe. Temperature differential between the pH buffer standards and samples is automatically compensated for by the meter. The SA 250 meter has resolution capability to 0.1 or 0.01 standard pH units. Department of Transportation and Mil specifications have been met or exceeded for shock, vibration and moisture.

Check Out Procedure and Calibration

Prior to initial daily use, the SA 250 meter will be checked according to the following procedure.

<u>Meter Check Out Procedure</u>

1. Slide power switch to ON position. Attach BNC Shorting Plug to BNC connector on top of meter.

2. If LO BAT indicator on LCD remains on, the battery must be replaced.

3. Slide mode switch to mV. Display should read 0 + 0.3.

4. Slide mode switch to temp. Display should read 25.0. If 25.0 is not displayed, using , , and X10 keys, until 25.0 is displayed and press enter.

5. Slide mode switch to pH .01. Press iso. Display should read the letters ISO then a value of 7.00. If 7.00 is not displayed, scroll until 7.00 is displayed and press enter.

6. Press slope. Display should read the letters SLP then a value of 100.0. If 100.0 is not displayed, scroll until 100.0 is displayed and press enter.

7. Press sample. Observe the letters pH then a steady reading of 7.00 + 0.02 should be obtained. If not, press cal and scroll until 7.00 is displayed and press enter. Press sample and observe a reading of 7.00.

8. Remove the shorting plug. After a successful completion of steps 1-8 the meter is ready to use with an electrode.

Electrode Connections

1. Attach electrodes with BNC connectors to sensor input by sliding connector onto input, pushing down and turning clockwise to lock into position. Connect reference electrodes with pin tip connectors by pushing connector straight into reference input.
   NOTE: If using a combination electrode with a BNC connector, the reference pin-tip jack is not used.

Calibration

Calibration of the SA 250 meter will be performed using two standard buffer solutions of pH = 7.00 s.u. and pH = 4.01 s.u. Buffer solutions are standardized at 28 degrees Celsius against National Bureau of Standards certified pH = 6.88 and pH = 9.18 reference samples prior to measuring the pH of any sample. The following procedure is used for calibrations:

1. Connect electrode(s) to meter. Slide the mode switch to pH.1 4.01.

2. Place electrode(s) into pH_2, 7.00 buffer.

3. Press cal. The display will alternate between .1. and the pH value of the buffer, indicating this is the first buffer and a value has not been entered. Wait for a stable pH display and press enter. The correct display will freeze for 3 seconds then advance to .2. indicating the meter is ready for the second buffer.

4. Rinse electrode(s) and place into pH = 4.01 buffer. Wait for a stable pH display and press enter .

After the second buffer value has been entered the letters PH will be displayed. The meter is now calibrated and automatically advances to sample mode.

5. Rinse electrode(s), place into sample. Record pH directly from the meter's display.

The use of the ATC probe eliminate the need for temperature calibration.

Maintenance

1. When not in use or between measurements, the pH probe will be kept immersed in or moist with pH = 7.000 buffer solution.
2. The battery will be placed when the "LO BAT" indicator remains on during the instrument check out.
3. The pH electrode will be replaced whenever the probe is cracked or irremovable deposits build up on the junction.
4. If response time or stability problems develop and cannot be corrected the meter will be sent to the manufacturer for maintenance.

Data Validation

All instrument calibrations will be documented, indicating the meter readings before and after the meter has been adjusted. The pH buffers used to calibrate the meter will also be documented. This is important, not only for data validation, but also to establish maintenance schedules and component replacement.

CALIBRATION AND MAINTENANCE OF SPECIFIC CONDUCTANCE METER

Accuracy

The calibrated accuracy of the specific-conductance meter (YSI, Inc. Model 33 S-C-T Meter) ±4.5 percent; this represents the worst-case error resulting from errors in the instrument and probe combined. Instrument error alone ranges from ±2.5 to ±3.0%.

Calibration

The specific-conductance meter will be calibrated by turning the MODE control to REDLINE and adjusting the REDLINE control so the meter needle lines up with the redline on the meter face. If this cannot be accomplished, the batteries must be replaced. Recalibration should be done at the factory.

Maintenance

The only maintenance required is battery replacement. Two "D" size alkaline flashlight cells, such as Eveready E95 or equivalent, will provide 200 hours of operation. Accuracy will not be maintained if zinc-carbon "D" cells are used. Battery replacement is indicated when the redline adjustment cannot be accomplished.

Replace batteries every six months to reduce the danger of corrosion due to leaky batteries. To replace batteries, remove the screws from the rear cover. The batter holders are color coded. The positive end must contact the red holder.

Data Validation

All instrument calibrations will be documented, indicating the meter readings before and after the meter has been adjusted. This is important, not only for data validation, but also to establish maintenance schedules and component replacement.

CALIBRATION AND MAINTENANCE OF TURBIDIMETER

Accuracy

A Hach Model 16800 Portable Turbidimeter will be used for all turbidity measurement. The Hach 16800 will be operated in the range of 0 to 100 nephelometric turbidity units (NTU). A nickel/cadmium battery with approximately ten hours operating time per change is built into the 16800 meter. Readings are repeatable to within ±1% of full scale.

3. Fill a clean sample cell to the white line with the sample to be measured and placed it into the cell holder. Use the white dot on the sample cell to orient the cell in the same position each time. Cover the sample cell with the light shield and allow the meter to stabilize. Read the turbidity of the sample.

Operational Notes

1. The sample size for all turbidity measurements should be 18 ml. Use the line on the sample cell as a level indicator. Variations in sample volume can affect the accuracy of the determinations.

2. When operating the instrument under bright ambient light conditions, protect the detector between measurements by inserting the focusing template or covering the cell holder with the light shield.

Maintenance

1. The battery pack will be recharged overnight subsequent to its use in the field.

2. Broken or highly scratched sample cells will be replaced. Small, slight scratches may be covered with a light coat of silicone oil. Cells with a build up of matter which cannot be removed will be discarded.

3. Lamp and focusing adjustments are not considered routine maintenance and will be performed only when the instrument readings are suspect.

Data Validation

All instrument calibrations will be documented, indicating the meter readings before and after the meter has been adjusted.

CALIBRATION AND MAINTENANCE OF THE WATER QUALITY MONITORING SYSTEM

The YSI Model 3560 Water Quality Monitoring System is a flow through device which can simultaneously measure conductivity, temperature, and pH in one sample chamber. The instrument is fully described in the following sections.

YSI MODEL 3520 FLOW-THROUGH CONDUCTIVITY CELL

Description

The YSI 3520 Flow-Through Conductivity Cell is designed for use with the YSI 3560 Water Quality Monitoring System. It is constructed of rigid and durable chlorinated polyvinyl chloride (PVC).

Conductivity is measured using two stainless steel electrodes. The cell constant is K - 5.0/cm ± 2% at 25°C (77°F) at 1.00, 50.0 and 100.0 millimhos/cm, referenced to YSI standards which have been calibrated with standard solutions prepared in accordance with recommendation 56-1981 of the Organization Internationale De Metrologie Legale (OIML). Measurements above 100.0 millimhos/cm will not be within specification accuracy.

Attached to the cell body with a stainless steel bend relief is a three-foot polyurethane jacketed cable terminated with a watertight MS type connector.

The time constant of the cell is 10 seconds for registering 95% of a change in conductivity. Measurement is accurate with flow rates up to 1-1/2 gallons per minute.

Operation

The YSI 3520 Flow-Through Conductivity Cell is designed to be used in the YSI 3550 Sample Chamber Assembly. For use of the 3550, see its instruction or the 3560 Water Quality Monitoring System instructions.

1. Insert the 3520 into the designated port on the 3550 Sample Chart Assembly sensor mounting plate. Two sensor monitoring plate o-rings provide a watertight seal.

2. Press the adapter provided (or a length of 1/2" OD hard plastic tubing) into the elbow until you reach the stop. Then, press the elbow into the top of the 3520 until you reach the stop. Another two o-rings inside the top port of the 3520 provide a watertight seal.

3. Attach the MS connector to the receptacle marked **COND** on the Model 3500 and fit the lead into the cable harness.

4. Begin fluid flow as described in the 3560 system instructions.

5. To use the 3520 as a conductivity cell other than in the 3550 Sample Chamber Assembly, it is necessary to immerse the cell body in the fluid under test up to the midpoint on the knurled portion of the cell. Do not immerse the entire cell body, as this will change the cell constant (K).

Maintenance

Cleaning: The cell will be kept clean at all times to assure proper operation and accuracy. A dirty cell will contaminate the sample and cause the conductivity to change. Any of the foaming acid tile cleaners such as Dow Chemical "Bathroom Cleaner" will be used to clean the cell adequately. When a stronger cleaning preparation is required, a solution of 10 parts each of distilled water and isopropyl alcohol and one part 10 normal hydrochloric acid will be used.

The cell will be dipped into the cleaning solution and agitated for two or three minutes. A small test tube brush will be used to gently clean the electrodes and flow-through port. Careful handling will be used so not to scratch the stainless steel electrodes. The cell will then be rinsed in several changes of distilled or deionized water.

Storage: The conductivity cells will be stored in deionized water. If the 3520 cell is stored dry, it will be soaked in deionized water for a minimum of 1 hour before use.

The o-rings will be changed annually to maintain their sealing integrity.

Calibration

The YSI 3520 Flow-Through Conductivity Cell is calibrated at the factory. The cell constant may vary slightly with the conductivity of the solution being measured. Calibration may also be affected by electrode fouling, mechanical shock or scratched electrodes. The 3520 cell will be calibrated as a system with the Model 3500, using YSI 3160-3169 Conductivity Calibrator Solutions.

YSI MODEL 3510 TEMPERATURE PROBE

Description

The YSI 3510 Temperature Probe is designed for use with the YSI 3560 Water Quality Monitoring System. When it is connected to the **TEMP** receptacle on the 3500, it provides a signal for both temperature measurement and for automatic temperature compensation (ATC) of conductivity measurements. When it is connected to the **pH ATC** receptacle, it provides automatic temperature compensation for pH measurements. One 3510 probe is provided with the 3560 system; two may be used at the same time to provide these function simultaneously.

The 3510 can be used over a temperature range of -5 to 50°C with an accuracy of ±.2°C, traceable to the National Bureau of Standards. The black polyurethane cable is three feet long and is terminated at one end with a watertight MS connector. The sensor end of the probe contains a YSI Thermilinear thermistor assembly mounted in an epoxy sealed sheath 3.25" long by .15" diameter. The time constant of the probe is less than 4 seconds for registering 95% of a change in temperature.

Specifications

Temperature Measurement (using YSI 3500 and 3510)

Measurement Range:	-5 to 50.0°C
Accuracy of temperature measurements:	±0.4°C
Resolution:	0.1°C

Operation

When using the 3510 in any ATC mode, be sure it is located beside the sensor for which it is to provide ATC measurement, whether in the YSI 3550 Sampler Chamber Assembly or in any other container.

Insert the 3510 into either of the designated ports on the sensor mounting plate of the 3550. Two o-rings in each port provide a watertight seal.

Maintenance

The 3510 requires very little maintenance when used in routine operations. The durable stainless steel sheath and polyurethane cable will be cleaned with a mild soap and water solution when required. Alcohol will be used to remove stains and mineral deposits.

When storing the 3510, it will be put into the shipping box provided and kept in a dry location.

Calibration

The 3510 is assembled with a YSI Thermilinear thermistor assembly and will be checked with an ohmmeter. With the sheath submerged in a 0.0 ± 1°C ice bath, the thermistor resistances will be compared to the values in this table:

Across Pins A & B	=	94.98 K ± 482 Ohms
Across Pins B & C	=	19.59 K ± 103 Ohms
Across Pins A & C	=	114.6 K ± 585 Ohms
Across Pins B & D	=	0 ± 1 Ohms

YSI MODEL 3530 pH ELECTRODE ASSEMBLY

Description

The YSI 3530 pH Electrode is designed for use with the YSI 3560 Water Quality Monitoring System, but it may also be used with other pH measuring systems that require pH probes with similar specifications. The rugged 5.5" long by .76" diameter polymer body will withstand demanding field and laboratory use. A spin-off bulb guard is provided for easy cleaning and protection. (The silver/silver chloride reference electrode and the silver working electrode are held within a porous Teflon matrix, surrounded with a 4 molar potassium chloride gel, and sealed to eliminate the need for adding electrolyte and to prolong their working life.)

The 3530 has a 36 inch long black polyurethane cable and a retractable black BNC cover. A black end cap distinguishes it from the similar-appearing ORP probe, which has a yellow end cap. The unit is shipped in a soaker bottle containing pH 4.0 buffer. To prevent the probe from drying out, the soaker bottle should be used to store it whenever it is not in use.

Specifications

pH Range:	0 to 14.00 pH
Operating Temperature Range:	-5 to 50°C
Accuracy:	Accuracy is subject to calibration with available pH buffer solutions in the desired measurement range.
Sodium Error:	.05 pH in 0.1 Molar Na+ Ion at 12.8 pH
Response Time:	95% of reading in 10 seconds
Zero Potential:	7.00 ±0.2 pH
Impedance:	60 megohms at 25°C

Operation

The 3530 is designed to be used in the YSI 3550 Sample Chamber Assembly. Once the 3530 is calibrated, install the electrode into the 3550 in the port marked pH. Set the pH function switch on the 3500 to **pH** if manual compensation is desired, and set the temperature compensation knob to the correct temperature in °C. Set the pH function switch to **pH ATC** if a pH ATC probe is in use, and disregard the manual compensation knob setting. See the 3500 instruction manual for further instructions.

Maintenance

pH Electrode Aging: All pH electrodes age with time. The typical electrode begins to deteriorate after 3 to 6 months of use. Age is characterized by a lessened capacity for slope adjustment and slower speed of response. The best way to detect again effects is when performing a slope adjustment. For example, if you calibrate with a pH 7.0 buffer and then cannot make the slope adjustment for a pH 4.0 or pH 10 buffer, the electrode will be cleaned and retested or reconditioned (see below). If performance is not restored, the electrode will be replaced.

pH Electrode Cleaning: If a coating forms on the bulb, erroneous readings and a shortened slope adjustment may result. The type of coating will determine the cleaning technique. First, remove the bulb guard. Soft coatings will be removed by vigorous stirring or by use of squirt bottle. Organic chemicals or hard coatings will be chemically removed by soaking the probe for half an hour in an industrial strength detergent. Only in extreme cases will the bulb be mechanically, cleaned as abrasion can lead to permanent damage. If cleaning does not restore performance, reconditioning may be tried.

pH Electrode Reconditioning: When reconditioning is required due to electrode aging or severe fouling, the following chemical treatments will be tried. They are presented in the order of the severity of their attach on the glass bulb, and may not improve (and may in some cases actually further impair) electrode performance.

NOTE: USE PROPER PRECAUTIONS WHEN HANDLING THESE HAZARDOUS CHEMICALS.

1. Immerse the electrode tip in 0.1 normal hydrochloric acid for 15 seconds, rinse in tap water then immerse the tip in 0.1 normal sodium hydroxide for 15 seconds and rinse in tap water. Repeat this sequence three times and then recheck the electrode. If performance has not been restored, try the next step.

2. Immerse the electrode tip in a solution of 20% ammonium bifluoride and 80% water for two to three minutes, rinse in tap water and recheck. If performance has not been restored, try the next step.

3. Immerse the electrode tip in a solution of 5% hydrofluoric acid and 95% water for 10 to 15 seconds, rinse well in tap water, quickly rinse in 5 normal HCl, rinse well in tap water and recheck. If performance has not been restored, replace the electrode.

Calibration

A two-point calibration, between 7 and 4, or between 7 and 10 (whichever is closest to the expected pH value), will be done before sample testing.

pH Calibration (Manual Temperature Compensation):

1. Rinse the pH electrode and a YSI 3510 Temperature Probe with distilled or deionized water. Follow with a rinse of pH 7.00 buffer.

2. Pour pH 7.00 buffer into a sample cup. (Suitable cups are provided in the YSI 3565 Sample Cup Pack.) Immerse the pH electrode and temperature probe in the pH 7.00 buffer. Turn the meter on and set the function switch to pH.

3. Allow the sensors to equilibrate in the buffer.

4. Read the temperature and adjust the manual temperature compensation knob to the same value.

5. Adjust the CAL knob for a 7.00 ±.01 display reading. Discard the buffer.

6. Rinse the sensors with deionized or distilled water, followed by a rinse of the next desired buffer.

7. Immerse the sensors in the next buffer.

8. Allow the sensors to equilibrate. Adjust the Slope control until the display is within 0.01 units of the buffer's stated value. This complete calibration.

ATC pH Calibration: ATC calibration is achieved the same way described above, except that the temperature probe is connected for automatic compensation, and manual compensation adjustment is not performed.

YSI MODEL 3550 SAMPLE CHAMBER ASSEMBLY

Description

The YSI 3550 Sample Chamber Assembly is an integral part of the YSI 3560 Water Quality Monitoring System. It is designated to be attached to a pump outlet, but it can also be used as a non-flowing sample chamber. It will hold up to five sensors and provide inlet and outlet ports for fluid movement through the chamber. The sample circulates through the chamber at up to 1-1/2 gallons per minute. The chamber provides good mixing of fluids so residual sample is not a problem. Clear acrylic sides allow the user to see fluids flowing through the chamber.

Two black EPR gaskets keep fluids from leaking around the sensor mounting plate and base plate assemblies, and two orange silicone o-rings in each of the sensor ports provide excellent seals. The sensor mounting plate is permanently marked to indicate the port for each sensor. This sample chamber holds approximately one liter in volume and operates with flowing sample over a temperature range of -20 to 50°C. A convenient handle is provided for carrying the chamber between test sites.

Operation

To use the 3550, first install the sensors to be used with the system into their respective ports. Two o-rings in each port provide effective water seals. The sensor ports not in use should be plugged to close the system. Plugs are provided with the 3550 package. Next, connect the chamber to a pump. Push an adaptor onto the tubing provided, then press the adapter into an elbow. Insert the elbow into the top of the YSI 3520 Flow-Through Conductivity Cell and push down on the elbow until it stops (see 3560 Water Quality Monitoring System Instruction Manual). To finish the installation, insert the remaining tubing and adapter into the second elbow provided and install that assembly in the **OUT** port of the sensor mounting plate. Push the elbow down until it stops and place the other end of the tubing where the fluid under test is to be collected or drained. The pump can now be turned on and regulated so that it does not exceed the chamber maximum flow rate of 1-1/2 gallons per minute.

-----WARNING-----

Do not block the outlet port or crimp the outlet hose. Pressure within the sample chamber must not exceed 10 psi or else sample will leak or sensors will be pushed out of the sensor mounting plate.

Maintenance

The 3550 is easy to disassemble and clean. The O-ring seals in the ports and the chamber gaskets will be replaced annually. The tweezers provided in the O-ring maintenance kit will be used to remove the old O-rings and install new ones, making sure they are properly seated all the way in the back of the grooves. When reassembling the sample chamber after replacing the gaskets, the thumb screws will be resecured only finger-tight. Use of any tool could cause the gaskets to be cut and fail to seal.

The disassembled chamber and all of its associated parts will be cleaned with a mild soap solution or isopropyl alcohol for tough stains. The cleaned components will be thoroughly rinsed with water to remove any residual soap or alcohol which would cause interference with measurements. The plugs and elbows of the 3550 will also be cleaned this way.

HORIBA

INSTRUCTION MANUAL

WATER QUALITY CHECKER

U-10

CODE: 040801000HK-5

WARNING

The DO sensor contains a strong alkaline solution. Should any of this solution come in contact with your clothing or skin, wash it away immediately with plenty of water.

Be especially careful not to allow any of the alkaline liquid in the DO sensor to get in your eyes.

⚠CAUTION

Insert the battery with ample care to the polarity. Reverse insertion on the polarity will make damage to the inner PCB.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provede reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The U-10 Water Quality Checker is a state-of-the-art instrument for simultaneous multiparameter measurement of water quality. The HORIBA U-10 measures six different parameters of water samples: *pH, conductivity, turbidity, dissolved oxygen, temperature,* and *salinity.*

The U-10 is compact enough to be held in one hand while taking measurements. It has a large easy-to-read LCD readout.

Measurements are taken simply by immersing the probe right into the water sample.

The U-10 is extremely versatile and sophisticated, yet easy to use. You will find it a valuable addition to on-site water control operations, whatever your needs – from testing factory discharges to urban drainage, river water, lake and marsh water, aquatic culture tanks, agricultural water supplies, and sea water.

To get the most out of your U-10 Water Quality Checker, please read this *Instruction Manual* carefully before you begin to take measurements.

Note that Horiba cannot be held responsible for any equipment malfunction or failure should the U-10 Water Quality Checker be operated incorrectly or in a manner other than specified in this *Instruction Manual.*

Horiba's aim is to produce the best possible equipment and documentation for our products. We welcome comments, questions, or suggestions for improvement concerning both our products and the accompanying documentation, such as this *Instruction Manual.*

Second edition: November, 1991
First edition: July, 1991

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Section 2 Making Measurements

Section 3 Calibrating the U-10

Section 4 Data Storage and Printout

Section 5 Daily Maintenance and Troubleshooting

Section 6 Reference Materials

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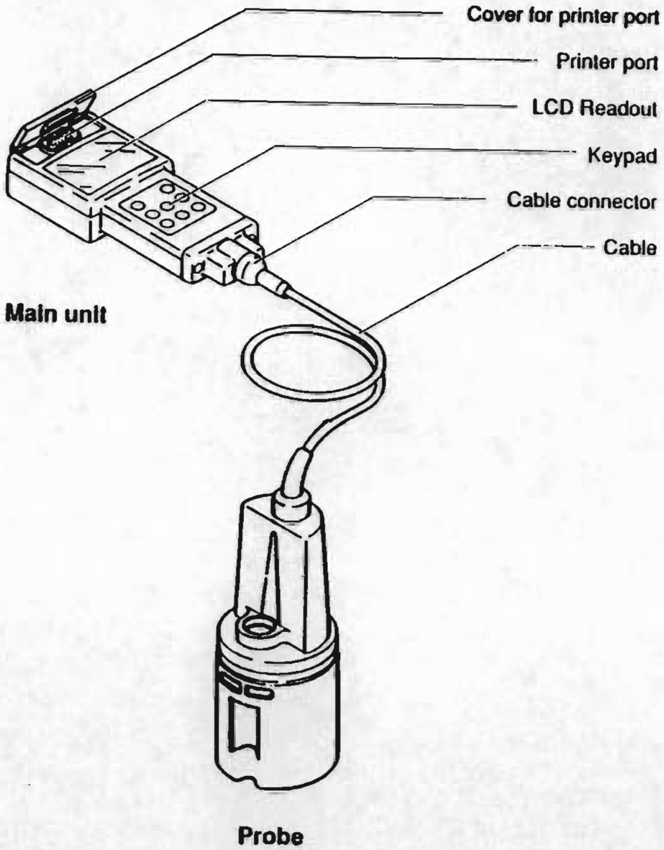
Section 1

Getting Started

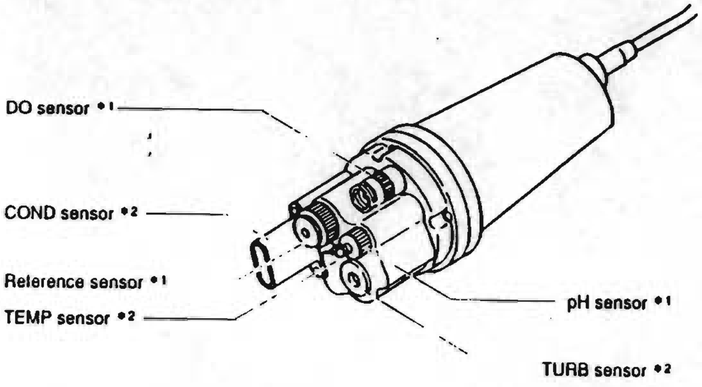
This section first gives an overview of the U-10. It then shows how to set up your U-10 by inserting the DO sensor and the battery.

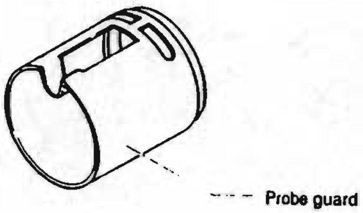
Configuration of the U-10

Main unit



Probe



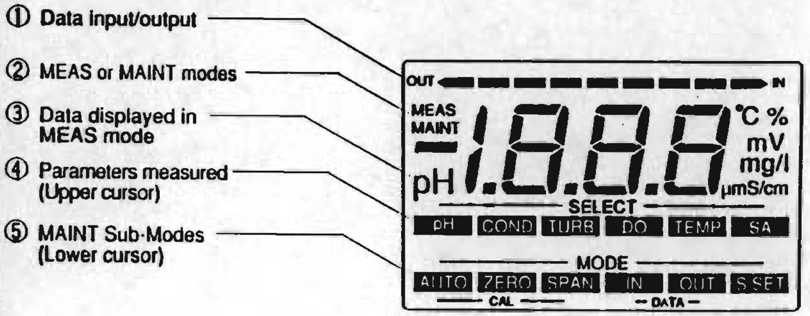


*1. Removable
DO (Dissolved oxygen)
Reference
pH

*2. Non-removable
COND (Conductivity)
TEMP (Temperature)
TURB (Turbidity)

The Readout

The readout has two main functions: (1) it displays the results of measurements, and (2) it serves as a message board to show the operating status of the U-10.



① Data input/output

OUT -- Data output
-- IN Data input

② MEAS or MAINT modes

The U-10 may be used in one of two modes: Measurement (MEAS) mode or Maintenance mode.

MEAS	the U-10 is ready to make 6-parameter measurements
MAINT	the U-10 is ready for other operations, e.g., calibration, data input/recall, or salinity setting

③ **Data displayed in MEAS mode**

- 6-parameter results:
  pH, conductivity, turbidity, DO, temperature, and salinity
- Designated value for salinity setting
- Error codes

④ **Parameters measured**

Value displayed on readout is highlighted by upper cursor.

pH	pH
COND	Conductivity
TURB	Turbidity
DO	Dissolved-Oxygen
TEMP	Temperature
SAL	Salinity

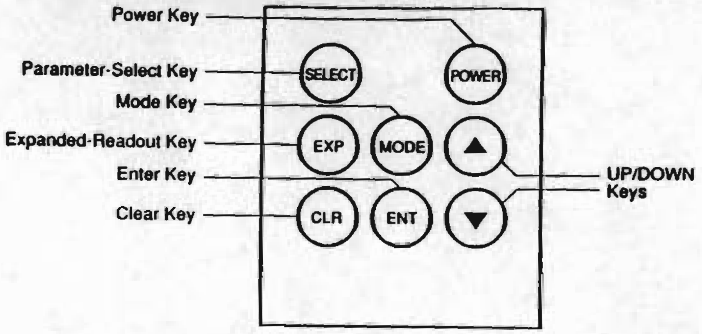
⑤ **MAINT Sub-Modes**

One of six Sub-Modes selected is highlighted by lower cursor.

AUTO	Automatic 1-point calibration
ZERO	Manual zero calibration
SPAN	Manual span calibration
IN	Data input
OUT	Data output (recall)
S.SET	Salinity setting correction

The Keypad

The U-10 is operated by the keypad on the main unit, which has eight surface-sealed keys, as illustrated.



Power Key (POWER)
Turns the main unit ON/OFF.

When this key is pressed to turn the U-10 ON, the readout comes in the MEAS mode, showing the parameter last displayed in the previous measurement. If the U-10 is left with the power ON for 30 minutes without any of the keys being activated, the power will be turned OFF automatically.

Parameter-Select Key (SELECT)
Use this key to move the upper cursor to the measured parameter you want to show on the readout. It toggles through the six parameters in order:

pH – COND – TURB – DO – TEMP – SAL

Mode Key (MODE)
Toggles back and forth between MEAS and MAINT modes. When in the MAINT mode, this key toggles the lower cursor through the six maintenance Sub-Modes.

AUTO – ZERO – SPAN – IN – OUT – S.SET

EXP

Expanded-Readout Key (EXP)
Toggles between (1) standard readout value and (2) expanded readout, for greater resolution, with decimal point moved one digit to the left.

ENT

Enter Key (ENT)
This acts like the RETURN Key or Enter Key on a computer keyboard. The U-10 Enter Key has four main functions, depending on which mode the unit is in.

1. In the AUTO Sub-Mode: Press this key to start automatic calibration.
2. In either the ZERO or SPAN Sub-Modes: Used in manual calibration to set the value for the standard solution being used.
3. In the IN Sub-Mode: Inputs data being measured to memory.
4. In the OUT Sub-Mode: Recalls values from one of the 20 Data-Set Nos. that is now shown on the readout. Prints data when a printer is connected.

CLR

Clear Key (CLR)
This acts like the ESCAPE Key on a computer keyboard. It has three main functions, depending on which mode the unit is in.

1. In the AUTO Sub-Mode: Aborts the auto-calibration now in progress.
2. In the IN Sub-Mode: Deletes data in memory from all 20 Data-Sets.
3. When the readout shows an error code: Clears the error code from the readout.

▲ ▼

UP/DOWN keys
Use these keys to select values when in one of the MAINT Sub-Modes. They have two main functions.

1. In either the ZERO or SPAN Sub-Modes: Use these keys to select value for the standard solution.
2. In the OUT mode: Used to toggle through the 20 Data-Set Nos. to select the one you wish to recall.

Setting up the U-10

Preparations of the pH sensor and the reference sensor

1. Remove the protective rubber cap from the pH sensor.
2. Remove the sealing tape from the reference sensor.

Inserting the DO sensor

WARNING

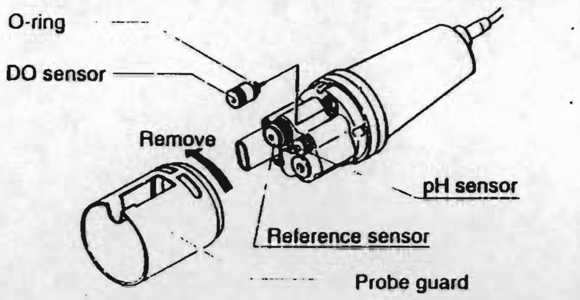
The DO sensor contains a strong alkaline solution. Should any of this solution come in contact with your clothing or skin, wash it away immediately with plenty of water.
Be especially careful not to allow any of the liquid in the DO sensor to get in your eyes.

The Dissolved-Oxygen (DO) sensor has a delicate membrane that can easily be ruptured. For safety's sake, the U-10 is shipped to you with the DO sensor packed separately. You should insert the DO sensor when you unpack your U-10 unit.

1. Make sure that the DO sensor has the correct O-ring, as shown.

2. First, fit the DO sensor lightly into its socket, and then put on the probe guard to align it correctly.

3. Then, tighten the DO sensor securely to the probe body. When doing this, be especially careful not to damage the membrane, which is located in the front of the DO sensor.



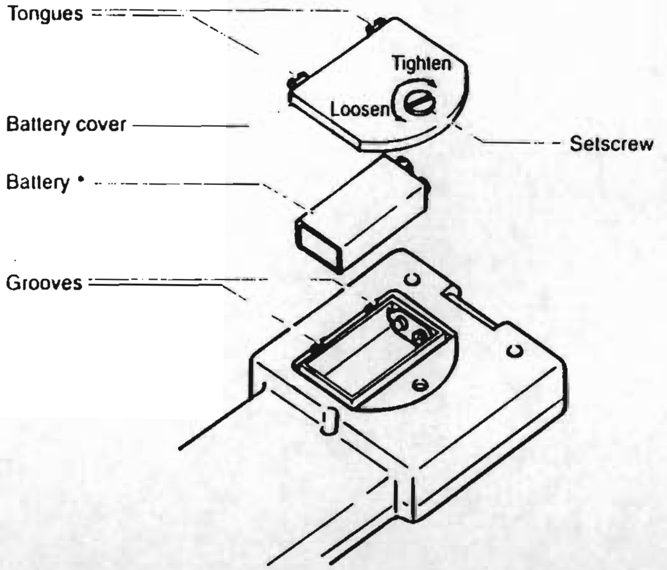
Inserting the battery

The U-10 is shipped from the factory with the battery packed separately.

The battery may be inserted by loosening the set-screw on the battery cover and pulling up the cover. Make sure that the plus and minus poles of the battery match the terminals correctly.

If the readout shows the message Er 1, it means that the battery is defective or exhausted and should be replaced.

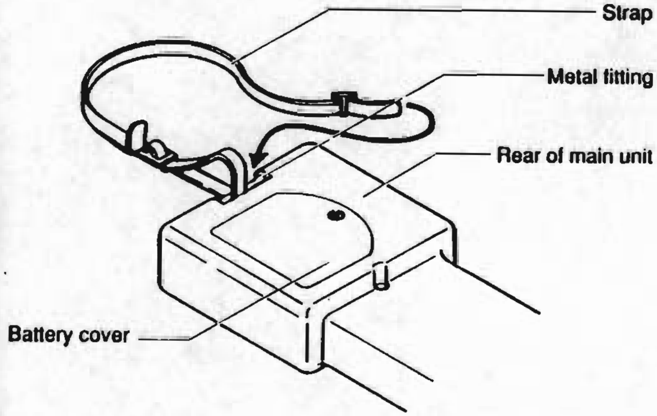
If you are replacing the battery and already have data stored in the U-10 memory that you wish to save, be sure to turn OFF the POWER Key before you remove the old battery. This will assure that data stored in memory will be maintained by the internal backup battery.



• Use a 9V-battery.

Attaching the carrying strap

Hook both ends of the strap through the metal fitting on back of the main unit, as illustrated.



Section 2

Making Measurements

Making a measurement with the U-10 Water Checker is extremely simple. Just turn on the power and place the probe in the sample of water you wish to measure.

All six parameters are measured simultaneously. These parameters may be stored in memory, printed out, or viewed one-by-one on the LCD readout. For printing and data storage, see the appropriate sections following this one. To view the parameters one-by-one on the readout, use the SELECT Key to toggle the upper cursor through them.

While the U-10 is both rugged and precise, the key to accurate measurements is cleanliness and frequent calibration. It is essential to clean the U-10 thoroughly after each measurement, and it is recommended that you re-calibrate your U-10 as frequently as possible. For best results, you should recalibrate it before each measurement session. Cleaning and calibration procedures are described below in this section and in the following one.

How to make a measurement

POWER **1** Turn the power on.

2 Gently place the probe into the water sample.

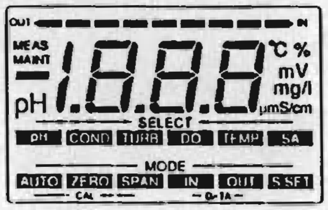
Basically, that's all there is to it: just turn it on and put the probe in the sample. Of course, the U-10 can do many sophisticated things with the sample data, and for best results, you should be careful about calibrating the unit and maintaining it in good condition. This is explained in detail below and in the next section.

Be careful!
Never drop or throw the probe into the water. It is a precision instrument containing five delicate sensors and five pre-amps; you can damage it beyond repair by unnecessary rough handling.

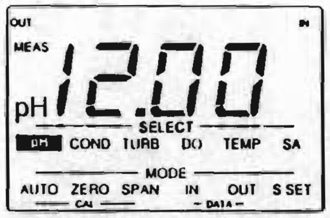
Initial readout

POWER

When you first turn the power on, the U-10 will be in the MEAS mode, the readout will look like this, with all the LCD segments activated.



After about two seconds, the readout will change to show that a new measurement is being made. The readout will show the last parameter that the upper cursor was on when the previous measurement was made, i.e., pH as illustrated here.



(Expanded readout shown)

The display of the decimal point in the readout mode will also be in the same format as was selected with the EXP Key in the previous measurement, i.e., standard or expanded (as illustrated here).

Select the parameter you want shown on the readout of the measured data

SELECT

All six parameters are automatically measured at once. Use the SELECT Key to toggle the upper cursor to the parameter you want.

pH : pH
COND : Conductivity
TURB : Turbidity
DO : Dissolved oxygen
TEMP : Temperature
SAL : Salinity

To get a uniform reading, slowly move the probe up and down to circulate the water through it. (Move it 1 foot (30 cm) per sec.) Then wait for the readout to stabilize while doing this.

Expanded readout

Use the EXP readout mode when you wish to see the results with one additional decimal place of accuracy. The EXP Key toggles the readout back and forth between standard to expanded display. The table below shows the result of using the EXP readout mode for each of the six parameters.

Table 1. Accuracy of expanded readout

Parameter	Range of measurement	Accuracy	
		Standard readout	Expanded readout
pH	0-14 pH	0.1 pH	0.01 pH
COND	0-1 mS/cm 1-10 mS/cm 10-100 mS/cm	0.01 mS/cm 0.1 mS/cm 1 mS/cm	0.001 mS/cm 0.01 mS/cm 0.1 mS/cm
TURB	0-800 NTU	10 NTU	1 NTU
DO	0-19.9 mg/*l*	0.1 mg/*l*	0.01 mg/*l*
TEMP	0-50°C	1°C	0.1°C
SAL	0-4%	0.1%	0.01%

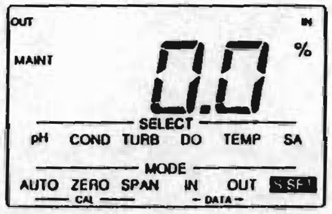
Note that the salinity parameter is the only value not measured directly with its own sensor. The U-10 obtains salinity by converting the conductivity value. If large amounts of conductive ions other than salt-water components are present in the sample, an error may occur. Be cautious when interpreting the salinity results.

Measuring fresh water or salt water?

The U-10 can be set to the salinity for either fresh water or salt water when measuring DO. This is done by using the S.SET Sub-Mode.

Measuring fresh water

1. First, use the MODE Key to put the U-10 in the MAINT mode. Keep pressing the MODE Key to toggle the lower cursor to the S.SET Sub-Mode.
2. Once you are in the S.SET Sub-Mode, use the UP/DOWN Keys to select the salinity value. For fresh water, set the salinity to 0.0%.



3. Finally, press the ENT Key to complete the salinity setting while in the S.SET Sub-Mode.
4. When the salinity setting has been made, switch back to the MEAS mode by pressing the the MODE Key.

Measuring salt water

MODE

1. First, use the MODE Key to put the U-10 in the MAINT mode. Keep pressing the MODE Key to toggle the lower cursor to the S.SET Sub-Mode.

▲ ▼

2. For salt water, set it to A *i.e.*, for auto-salinity. The A setting should be sufficient for measurements of normal sea water with a salinity value close to 3.3%. For sea water of an unusual salinity, however, and where the value is otherwise known, you may wish set the value manually to any salinity within the range of 0.0%-4.0%. (You may also possibly want to use a manual setting if, for example, the COND sensor is malfunctioning but it is still desirable to take readings of the other parameters.)

ENT

3. Finally, press the ENT Key to complete the salinity setting while in the S.SET Sub-Mode.

MODE

4. When the salinity setting has been made, switch back to the MEAS mode by pressing the the MODE Key.

After measurement: Cleaning and storing the U-10

POWER

1. Turn OFF the power.
2. Wash the probe thoroughly with tap water. Be sure to flush off all of sample solution from the probe.

Storing the U-10 for brief periods, *i.e.*, about 1 week or less:
Fill the calibration beaker with tap water and fit the probe over it.

For longer storage
The pH sensor must always be kept moist. Fill the small rubber cap with water and use it to cover the pH sensor.

The KCl internal solution in the reference sensor may seep out over time. Place vinyl tape around the O-ring portion to prevent this.

If you are going to store the U-10 for a prolonged period without using it, remove the battery from the main unit.

Section **3**

Calibrating the U-10

The U-10 Water Checker may be calibrated either manually or automatically. The 4-parameter auto-calibration procedure is quite handy and should be sufficient for most measurement operations.

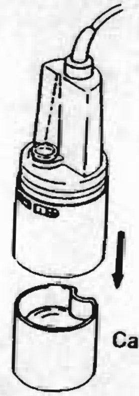
Manual calibration for each of the four parameters is more accurate but, of course, also more time-consuming. This method should be used for more precise measurement. The manual calibration procedure is explained below in detail, following the description of the auto-calibration procedure.

The auto-calibration procedure is extremely simple. The U-10 Water Checker uses just a single solution to do a simultaneous calibration of four parameters: *pH, COND, TURB*, and *DO*. Your U-10 comes with a bottle of standard phthalate pH solution and a calibration beaker for this purpose.

Auto-calibration procedure

Fill the calibration beaker to about 2/3 with the standard solution. Note the line on the beaker.

Fit the probe over the beaker, as illustrated. Note that the beaker is specially shaped to prevent the DO sensor from being immersed in the standard solution. This is because the DO auto-calibration is done using atmospheric air.



MODE

With the power on, press the MODE Key to put the unit into the MAINT mode. The lower cursor should be on the AUTO Sub-Mode; if it is not, use the MODE Key to move the lower cursor to AUTO.

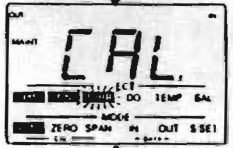
ENT

With the lower cursor on AUTO, press the ENT Key. The readout will show CAL. Wait a moment, and the upper cursor will gradually move across the four auto-calibration parameters one-by-one: *pH, COND, TURB*, and *DO*. When the calibration is complete, the readout will briefly show End and then will switch to the MEAS mode.

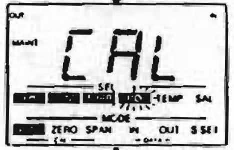
The upper cursor will blink while the auto-calibration is being made. When the auto-calibration has stabilized, the upper cursor will stop blinking.

First, pH is being auto-calibrated

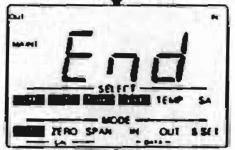
Then, COND is being auto-calibrated



Next, TURB is being auto-calibrated



Finally, DO is being auto-calibrated



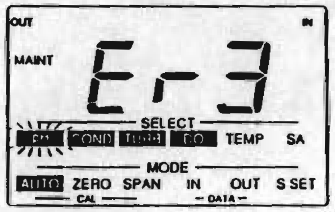
Auto-calibration now ends

And the readout switches to the MEAS mode

Note: If you wish to abort the auto-calibration for any reason, press the CLR Key. The parameters auto-calibrated so far will be stored in memory.

Auto-calibration error

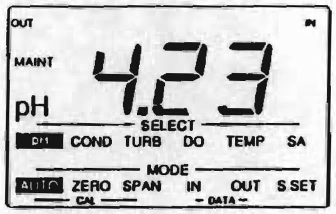
After the DO auto-calibration, if the unit does not switch to the MEAS mode as it should, and the readout shows either Er-3 or Er-4, an auto-calibration error has occurred. Parameters will blink where an error occurred.



pH auto-calibration error

CLR

If this happens, re-do the auto-calibration. First, press the CLR Key to cancel the error code.



ENT

Then press the ENT Key to re-start the auto-calibration. Restart the auto-calibration beginning again with pH.

Manual (2-point) calibration procedures

For normal measurements, the 4-parameter auto-calibration described above is sufficiently accurate. However, you may wish to do a parameter-by-parameter, 2-point manual calibration of one or more of the four parameters. This is recommended either for high-accuracy measurements, especially when using the expanded readout mode. It is necessary if a new probe is being used for the *first time*.

Parameters to be calibrated manually.

pH	• Zero	(see page 24.)
	• Span	(see page 25.)
COND	• Zero	(see page 28.)
	• Span	(see page 29.)
TURB	• Zero	(see page 31.)
	• Span	(see page 31.)
DO	• Zero	(see page 32.)
	• Span	(see page 33.)

Parameters not to be calibrated.

Sample temperature
Salinity

pH calibration

pH calibration on the U-10 is done using two commercially-available standard solutions of different pH values, one for the zero calibration, the other for the span calibration. Note that the temperature characteristics of the various standard solutions that are available may differ; therefore, before using these two solutions to make the pH calibration, carefully measure the temperature and determine the temperature characteristics of each.

Preparation

Wash the probe 2-3 times, using de-ionized or distilled water. Place it in a beaker of each standard solution.

1. Zero calibration

Use a pH7 standard solution for the zero calibration.

Operation

MODE

1. With the power on, press the MODE Key to put the unit into the MAINT mode.

MODE

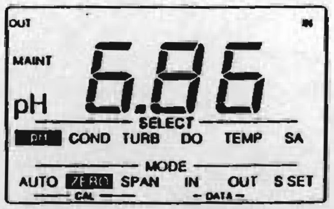
2. Press the MODE Key again to move the lower cursor to ZERO.

SELECT

3. Use the SELECT Key to move the upper cursor to pH.

▲ ▼

4. When the readout has stabilized, use the UP/DOWN Keys to select the value of the pH 7 standard solution at the temperature of the sample. Refer to Table 2 for pH values of standard solutions at various temperatures.



ENT

5. Press the ENT Key to complete the zero calibration for pH.

2. Span calibration

Use either a pH4 or a pH9(10) standard solution for the span calibration.

Operation

MODE

1. Use the MODE Key to move the lower cursor to SPAN.

▲ ▼

2. As in Step 4. above in zero calibration, when the readout has stabilized, use the UP/DOWN Keys to select the value of the standard solution (i.e., either pH4 or pH9) at the temperature of the sample. Again, refer to Table 2 for pH values of standard solutions at various temperatures.

ENT

3. Press the ENT Key to complete the span calibration for pH.

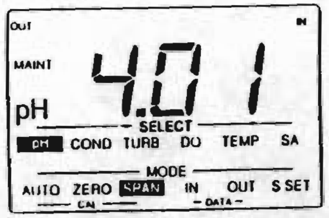


Table 2 pH values of standard solutions at various temperatures*

Temperature ˚C / ˚F	pH2[a]	pH4[b]	pH7[c]	pH9[d]	pH10[e]	pH12[f]
0 / 32	1.67	4.01	6.98	9.46	10.32	13.43
5 / 41	1.67	4.01	6.95	9.39	10.25	13.21
10 / 50	1.67	4.00	6.92	9.33	10.18	13.00
15 / 59	1.67	4.00	6.90	9.27	10.12	12.81
20 / 68	1.68	4.00	6.88	9.22	10.06	12.63
25 / 77	1.68	4.01	6.86	9.18	10.01	12.45
30 / 86	1.69	4.01	6.85	9.14	9.97	12.30
35 / 95	1.69	4.02	6.84	9.10	9.93	12.14
40 / 104	1.70	4.03	6.84	9.07	9.89	11.99
45 / 113	1.70	4.04	6.83	9.04	9.86	11.84
	1.71	4.06	6.83	9.01	9.83	11.70

a : oxalate, b : phthalate, c : neutral phosphate, d : borax,
e : carbonate, f : Sat.calcium hydroxide solution

* These pH valves are for Japanese standard solutions. Should you prefer to use different standard solutions, be sure to make the proper adjustments in calibration.

COND calibration

The U-10 can measure conductivity in the range of 0-100 mS/cm. Depending on the sample concentration, however, the U-10 automatically selects the proper range out of its three possible ranges of 0-1 mS/cm, 1-10 mS/cm, and 10-100 mS/cm.

Therefore, if you are doing a manual calibration for COND, this must be done for each of the three ranges. However, since the zero point is common for all three ranges, only the three one-point span calibrations need be done separately.

Preparing the standard solution for COND span calibration

This solution uses a potassium chloride as a reagent. For greater accuracy, the solution should be freshly prepared each time. If it is unavoidable to use a stored solution, be sure to keep it tightly capped in a polyethylene or hard glass bottle. The shelf life of this solution is six months. Date-stamp the bottle for reference. Never use a KCl standard solution that has been stored for more than six months: the calibration accuracy may be adversely affected.

Use potassium chloride powder of the best quality commercially available. Dry the powder for two hours at 105°C, and cool it down, in a desiccator. Weigh out an appropriate amount of dried and cooled potassium chloride powder according to the table below. Make the potassium chloride standard solution as shown.

Table 3 Making the potassium chloride standard solution

KCl standard solution	KCl weight g	Conductivity* mS/cm	Range to be calibrated mS/cm
0.005N	0.373	0.718	0-1
0.05N	3.73	6.67	1-10
0.5N	37.28	58.7	10-100

* Value at the temperature, 25°C

To prepare the standard solution, use a 1-liter volumetric flask. First, dissolve the KCl in a small amount of de-ionized or distilled water. Then fill the flask with de-ionized or distilled water up to the 1-liter line. Finally, shake the solution to mix it thoroughly.

1. Zero calibration

This calibration is carried out in atmospheric air; no solution is needed.

Preparation

Wash the probe 2-3 times, using de-ionized or distilled water. Shake the probe to remove any water droplets from the COND sensor. Then allow it to dry by exposing it to fresh air.

Operation

MODE

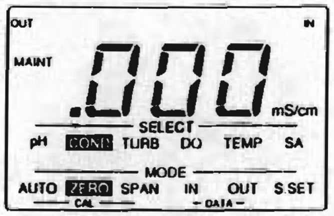
1. Use the MODE Key to move the lower cursor to ZERO.

SELECT

2. Use the SELECT Key to move the upper cursor to COND.

▲ ▼

3. Use the UP/DOWN Keys to set the readout to zero.



ENT

4. Press the ENT Key. This completes the zero calibration for COND.

2. Span calibration

This procedure uses a standard solution of potassium chloride. For best results, a fresh batch of the solution should be prepared each time. See page 27 for details.

Preparation

Wash the probe 2-3 times using de-ionized or distilled water. Following this, wash it 2-3 times in the KCl standard solution you have prepared. Then place the probe in a beaker of the KCl solution maintained at a temperature of 25±5°C.

Operation

MODE

1. Use the MODE Key to move the lower cursor to SPAN.

▲ ▼

2. After the readout stabilizes, as you did for the pH calibration, use the UP/DOWN Keys to select set the value of the KCl standard solution, referring to the KCl table.

ENT

3. Press the ENT Key to complete the span calibration for this COND range.
4. Repeat this procedure for the three ranges, using each of three values of KCl standard solutions.

TURB calibration

Use good-quality de-ionized water, which may be considered as having a turbidity of zero. If that is not readily available, distilled water may be used instead. When doing the turbidity zero calibration, it is particularly crucial that you clean the probe thoroughly. Never use a dirty probe; otherwise the calibration will be unreliable.

Preparing the standard solution for TURB span calibration

1. Weigh out 5.0 g of hydrazine sulfate.
2. Dissolve this in 400 m*l* of de-ionized or distilled water.
3. Then weigh out 50 g of hexamethylenetetramine, and dissolve it in 400 m*l* of de-ionized or distilled water.
4. Mix these two solutions, add enough de-ionized or distilled water to make 1,000 m*l*, and stir the mixed solution thoroughly.
5. Allow this solution to stand for 24 hours at a temperature of 25 ±3°C.

   The turbidity of this solution is equivalent to 4000 NTUs. The shelf-life of this solution is six months; i.e., this 4,000-NTU value will remain accurate for a maximum of six months.

   Each time you carry out this calibration, it is necessary to dilute the 4,000-NTU standard solution to prepare an 800-NTU standard solution for calibration. To do this, measure out 50 m*l* of the 4,000-NTU solution into a 250-m*l* measuring flask.

   It is recommended that you use a rubber pipette aspirator for this. Then add de-ionized or distilled water up to the 250-m*l* line.

   The standard solution used here for the turbidity calibration will precipitate easily. Therefore, be sure to stir the solution thoroughly before use.

1. Zero calibration

Preparation

- Wash the probe thoroughly 2-3 times using de-ionized or distilled water. Shake off excess water droplets, and then place it in a beaker of de-ionized or distilled water.

Operation

MODE

1. Use the MODE Key to move the lower cursor to ZERO.

SELECT

2. Use the SELECT Key to move the upper cursor to TURB.

▲ ▼

3. After the readout has stabilized, set it to 0.0, using the UP/DOWN Keys.

ENT

4. Press the ENT Key to complete the zero calibration for TURB.

2. Span calibration

Preparation

Wash the probe thoroughly, using de-ionized or distilled water. Shake off excess water droplets. Then place it in a beaker of the 800-NTU solution you have prepared for this purpose.

Operation

1. Stir this 800-NTU span standard solution thoroughly.

MODE

2. Use the MODE Key to move the lower cursor to SPAN.

3. After readout has stabilized, i.e., about 60 to 90 seconds, set the readout to "800" NTU, which is the value for this standard solution.

ENT

4. Press the ENT Key to complete the span calibration for TURB.

DO calibration

Unlike the other calibration procedures, the solution for the DO calibration cannot be stored for use; because the amount of dissolved oxygen in the solution is crucial, a fresh batch must be prepared each time, just before it is used in the DO calibration.

1. Zero calibration

Use a solution of sodium sulfite dissolved in either de-ionized water or tap water.

Preparation

1. Add about 50g of sodium sulfite to 1,000 ml of water (either de-ionized water or tap water will do). Stir this mixtuer to dissolve.
2. Wash the probe 2-3 times in tap water, and place it in the zero standard solution.

Operation

MODE

1. Use the MODE Key to move the lower cursor to ZERO.

SELECT

2. Use the SELECT Key to move the upper cursor to DO.

▲ ▼

3. After the readout has stabilized, set it to 0.0, using the UP/DOWN Keys.

ENT

4. Press the ENT Key. This completes the zero calibration for DO.

2. Span calibration

Use either de-ionized water or tap water that has been saturated with oxygen in air.

Preparation

1. Put 1 or 2 liters of water in a container (either de-ionized water or tap water will do). Use an air pump to bubble air through the solution until it is oxygen-saturated.
2. Wash the probe 2-3 times in tap water, and put it in the span calibration solution.

Operation

1. First, be sure the U-10 is set for fresh water readings. To do this, set the S.SET Sub-Mode to 0.0%.

MODE

2. Then, use the MODE Key to move the lower cursor to SPAN.
3. After the readout has stabilized, while slowly moving the probe up and down in the solution, set the readout value to the appropriate DO value for the temperature of this solution. For DO values at various temperatures, refer to Table 4.

ENT

4. Press the ENT Key to complete the span calibration for DO.

Table 4 Amounts of saturated dissolved oxygen in water at various temperatures, salinity = 0.0%

Temperature	DO	Temperature	DO
0 °C	14.16 mg/l	21 °C	8.68 mg/l
1	13.77	22	8.53
2	13.40	23	8.39
3	13.04	24	8.25
4	12.70	25	8.11
5	12.37	26	7.99
6	12.06	27	7.87
7	11.75	28	7.75
8	11.47	29	7.64
9	11.19	30	7.53
10	10.92	31	7.42
11	10.67	32	7.32
12	10.43	33	7.22
13	10.20	34	7.13
14	9.97	35	7.04
15	9.76	36	6.94
16	9.56	37	6.86
17	9.37	38	6.76
18	9.18	39	6.68
19	9.01	40	6.59
20	8.84		

Section 4

Data Storage and Printout

The U-10 can store up to 20 sets of data, 120 data points, of the values measured for each of the six parameters: pH, COND, TURB, DO, TEMP, and SALINITY. Values stored in memory can be recalled to the readout as desired.

If a printer is connected to the U-10 printer port, whenever a Data-Set is either stored in memory or recalled to the readout, it can also be simultaneously output to the printer.

Storing data

MODE

1. Press the MODE Key to put the U-10 in the MAINT mode.

MODE

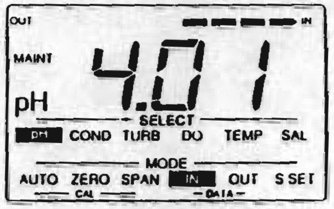
2. Continue to press the MODE Key to move the lower cursor to IN, the *Input* Sub-Mode.

SELECT

3. Use the SELECT Key to move the upper cursor to the parameter you wish to see on the readout.

ENT

4. When the readout stabilizes on a value, press the ENT Key. This will automatically input the set of six parameters for this measurement into memory.



The readout will first show the Data-Set No. for about two seconds. At the top right-hand corner, a dashed arrow points to IN, showing that data is being input. Then each parameter is automatically read into memory, one-by-one from pH to salinity. The upper cursor skips along to show this. If a printer is connected, these six values will also be printed out at the same time.

The upper cursor then returns to pH, with the U-10 still in the IN Sub-Mode.

ENT

5. You may now continue and input another set of data: simply press the ENT Key again.

   The Data-Set No. will automatically advance one digit, and the next set of six parameters will be read into memory in the same manner. This procedure can be repeated for up to a total of 20 Data-Sets.

If 20 Data-Sets have been read into memory, the storage capacity is full and no more data may be input. The U-10 will beep three times to indicate the memory is full.

MODE

6. To return the readout to the previous setting in the MEAS mode, press the MODE Key again.

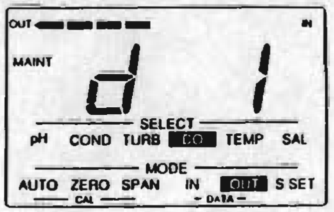
Recalling data

MODE

1. Press the MODE Key to put the U-10 in the MAINT mode.

MODE

2. Continue to press the MODE Key to move the lower cursor to OUT, the *Output* Sub-Mode. The readout will show d.1, meaning Data-Set No. 1.
   At the top left-hand corner, a dashed arrow points to OUT, showing that data can be output now to the readout.



▲ ▼

3. Use the UP/DOWN Keys to display the Data-Set No. of the values you wish to recall.

SELECT

4. Use the SELECT Key to move the upper cursor to the parameter you wish to view.

ENT

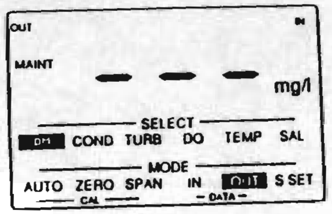
5. Press the ENT Key to display the data on the readout.

If a printer is connected, all six parameters in this Data-Set will also be printed out at the same time.

ENT

6. When the ENT Key is pressed again, the next Data-Set No. is displayed in order, i.e., *d2*, if two data sets are in memory. At this point, you can either press the ENT Key again to view the contents of this Data-Set, or you can use the UP/DOWN Keys to go up or down to another Data-Set No.

   If a particular Data-Set is empty, three dashes appear on the readout.



MODE

7. To return the readout to the previous setting in the MEAS mode, press the MODE Key again.

Deleting data

Set the U-10 as if you were going to input data:

MODE

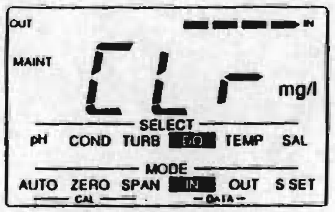
1. Press the MODE Key to put the U-10 in the MAINT mode.

MODE

2. Continue to press the MODE Key to move the lower cursor to IN, the Input Sub-Mode.

CLR

3. Then, to erase all the data from all the Data-Sets in memory, press the CLR Key. The readout will show the message *CLr* for about two seconds.

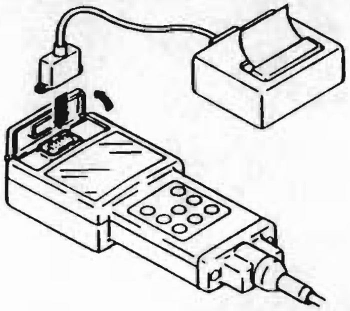


Be careful!
You cannot delete individual Data-Sets. The CLR Key always erases all data from memory.

Printing out data

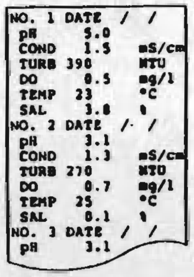
If a printer is connected to the U-10 printer port, whenever a Data-Set is either stored in memory or recalled to the readout, it is also simultaneously output to the printer.

The U-10 printer port is a standard Centronics parallel port. To connect a parallel printer to the U-10: Open the rubber printer-port cover, located directly over the readout on the main unit, and connect the printer cable.



Note:
When a printer is not being used, disconnect the cable from the U-10 printer port, and close the cover tightly.

- **Sample printout**



```
NO. 1 DATE   /   /
  pH       5.0
  COND     1.5    mS/cm
  TURB 390        NTU
  DO       0.5    mg/l
  TEMP  23        °C
  SAL      3.8    %
NO. 2 DATE   /   /
  pH       3.1
  COND     1.3    mS/cm
  TURB 270        NTU
  DO       0.7    mg/l
  TEMP  25        °C
  SAL      0.1    %
NO. 3 DATE   /   /
  pH       3.1
```

Section **5**

Daily Maintenance and Troubleshooting

For accurate measurements and prevention of malfunction, routine careful maintenance of the U-10 is important. In particular, failure to maintain the sensors properly can lead to serious trouble or incorrect measurements. The U-10 is provided with error-code functions for the ready detection of potential problems.

Error Codes

The U-10 has an easy-to-understand error message function so you can spot trouble readily. Error codes are displayed on the readout and the unit will beep if an error occurs.
(Note that if you press an incorrect sequence of keys, the unit will beep three times to indicate you have pushed the wrong key.)

Error Code	Cause	Action
Bad battery Er 1	• Defective or low battery	• Replace battery
Failure in main unit Er 2	• Malfunction of memory backup IC	• Push POWER Key to turn the U-10 ON again. If this error code is still displayed, contact your Horiba dealer for repair or replacement.
Zero-calibration error Er 3	*for all parameters* • Poor connection in probe-to-main unit cable	• Connect the cable securely.
	• Water in one of the sensor sockets	• Dry out the sensor sockets.
	• Temperature of sample exceeds maximum scale of U-10	• Replace the probe.
	for pH • Contaminated pH sensor.	• Clean the pH sensor.
	• Improper concentration of reference solution in reference sensor	• Replace the reference solution.
	for COND • Contaminated COND sensor	• Clean the sensor, using tooth brush and neutral detergent.

Error Code	Cause	Action
	for TURB • Contaminated or defective LED sensor	• Clean out the tube containing the LED turbidity sensor, using test tube brush and neutral detergent. Never use an abrasives or cleansers for this.
	for DO • Broken DO sensor membrane.	• Check the LED turbidity sensor. If it defective, the entire probe must be replaced. Check DO sensor. If defective, replace.
Span-calibration error Er 4	*for all parameters* • Poor connection in probe-to-main unit cable	• Connect the cable securely.
	• Water in one of the sensor sockets	• Dry out the sensor sockets.
	• Temperature of sample exceeds maximum scale of U-10	• Replace the probe.
	for pH • Contaminated pH sensor.	• Clean the pH sensor.
	• Improper concentration of reference solution in reference sensor	• Replace the reference solution.
	for COND • Contaminated COND sensor	• Clean the sensor, using tooth brush and neutral detergent.
	for TURB • Contaminated or defective LED sensor	• Clean out the tube containing the LED turbidity sensor, using test tube brush and neutral detergent. Never use an abrasives or cleansers for this. • Check the LED turbidity sensor. If it defective, the entire probe must be replaced.

Error Code	Cause	Action
Span-calibration error Er4	*DO Auto-calibration*	
	• Broken DO sensor membrane.	• Check DO sensor membrane. If defective, replace.
	• Excessive difference between DO sensor temperature and atmospheric temperature.	• Leave DO sensor in atmosphere for 30-60 min.
	DO aqueous solution calibration	
	• Broken DO sensor membrane.	• Check DO sensor membrane. If defective, replace.
	• Contaminated electrode.	• Clean the electrode using a soft brush, taking care not to scratch membrane.
	• Insufficient agitation of solution.	• Agitate solution thoroughly.
Memory full Er5	• Data-sets for 20 samples are already in memory.	• To delete all data from memory, put the U-10 in the IN Sub-Mode mode and press the CLR Key.
Printer error Er6	• Jammed printer paper.	• Eliminate jamming of printer paper.
	• Poor cable connection .	• Replace the cable.
	• Wrong printer.	• Use proper parallel Centronics printer.
	• Defective printer.	• Replace the printer as necessary.

Normal probe maintenance

Washing the turbidity sensor

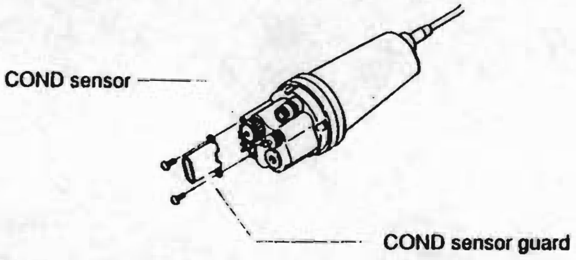
The sensor is a glass tube. Wash out the tube and remove stains carefully, using tap water and a test tube brush.

Be careful not to scratch the inside of the glass tube. Never use abrasives or cleansers.

Cleaning the conductivity sensor

Remove COND sensor guard, and carefully use a soft brush to clean off any dust from the sensor unit.

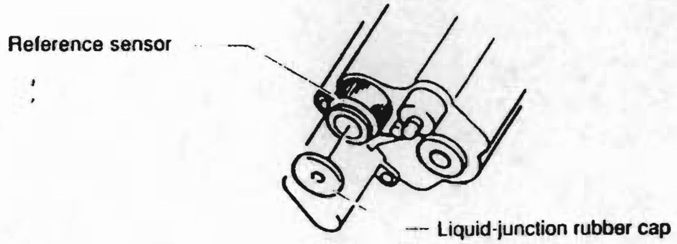
Be sure to replace the COND sensor guard before taking measurements.



Recharging the reference sensor with reference solution

Recharge the reference sensor with reference solution about once every two months, as follows.

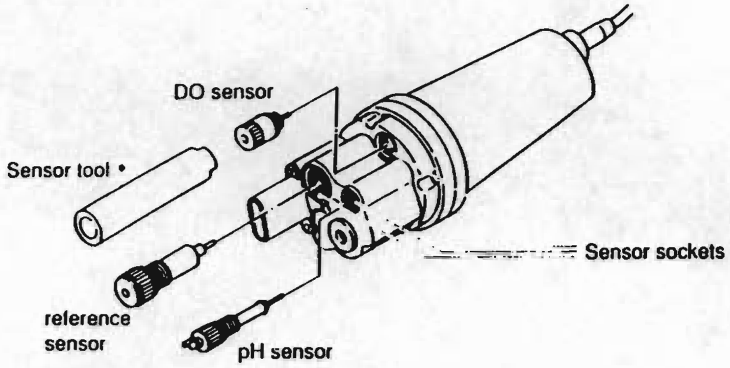
1. Remove the liquid-junction rubber cap from the reference sensor, and pour out the old solution.
2. Fill the reference sensor completely with new reference solution. Make sure there are no air bubbles.
3. Replace the liquid-junction rubber cap.
4. Carefully wash off all excess reference solution from the probe.



Replacing faulty sensors

Three of the U-10's sensors are replaceable: the *pH sensor*, the *reference sensor*, and the *DO sensor*.
These may be replaced as follows.

1. Wipe off any water droplets from the probe.
2. Remove faulty sensor.
3. Insert the new sensor carefully with your fingers.
4. Be careful not to let the sensor sockets get wet.

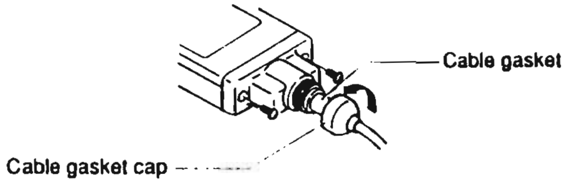


- When replacing the DO sensor, use the sensor tool provided as an accessory.

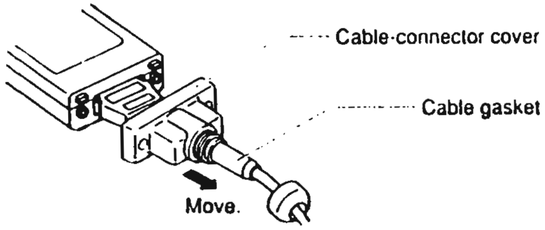
Replacing a faulty probe

Disconnect the cable from the main unit

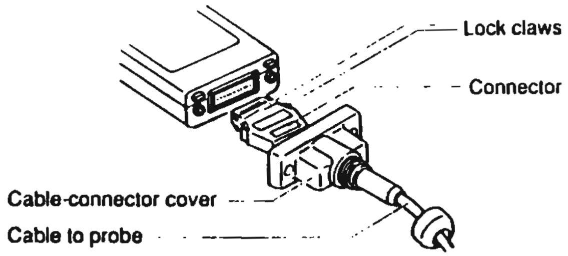
1. Loosen the cable gasket cap, and remove cap from gasket.



2. Slide back the gasket.
3. Back off the two screws on the cable-connector cover.



4. Slide off the cable-connector cover to expose the connector lock claws.
5. Press lock claws on both sides with your fingers to release the connector. Pull out the connector from the main unit.



Connect the new probe

1. Insert the connector until it clicks.
2. Re-attach the cable-connector cover to the main unit.
3. Slide the cable gasket toward the cable-connector cover, and screw on the cable gasket cap.

   Before you use a new probe for the first time, it is necessary to calibrate it manually for all four parameters. Refer to Section 3, "Calibrating the U-10," for instructions on manual calibration.

FINAL

HEALTH AND SAFETY PLAN

BROWNFIELDS SITE INVESTIGATION/ REMEDIAL ALTERNATIVES STUDY

Former Ashland Chemical Company
Johnstown, New York

CITY OF JOHNSTOWN, NEW YORK

Prepared by:

Malcolm Pirnie, Inc.
15 Cornell Road
Latham, New York 12110

September 1998
2384007

SECTION 13. EMERGENCY INFORMATION

TO BE POSTED IN SITE-TRAILER/OFFICE AND IN FIELD VEHICLES

(1) LOCAL RESOURCES

Ambulance (name):	Fulton County 911	Phone:	911
Hospital (name):	Fulton County 911	Phone:	911
Police (local or state):	Fulton County 911	Phone:	911
Fire Dept. (name):	Fulton County 911	Phone:	911
HAZ MAT Responder:	Fulton County 911	Phone:	911
Nearest phone:	pay phone Townsend Ave		
On-Site CPR/FA(s):	Nicole Foley		

The hospital is 30 minutes from the site and the ambulance response time is 15 minutes. A representative of Littaver Hospital was contacted on 03 /26 / 98 and briefed on the situation, the potential hazards, and the substances involved. When IDLH conditions exist, arrangements should be made for onsite standby of emergency services.

(2) DIRECTIONS TO NEAREST HOSPITAL - ATTACH MAP:

Exit the Former Ashland Chemical property, turn right onto Townsend Avenue. Take Townsend Ave. To Route 30 N to the City of Gloversville. Follow Route 30 N to East State Street, take a left onto East State Street. Follow East State Street to Meadow Street, take a right onto Meadow Street, the hospital will be on the right.

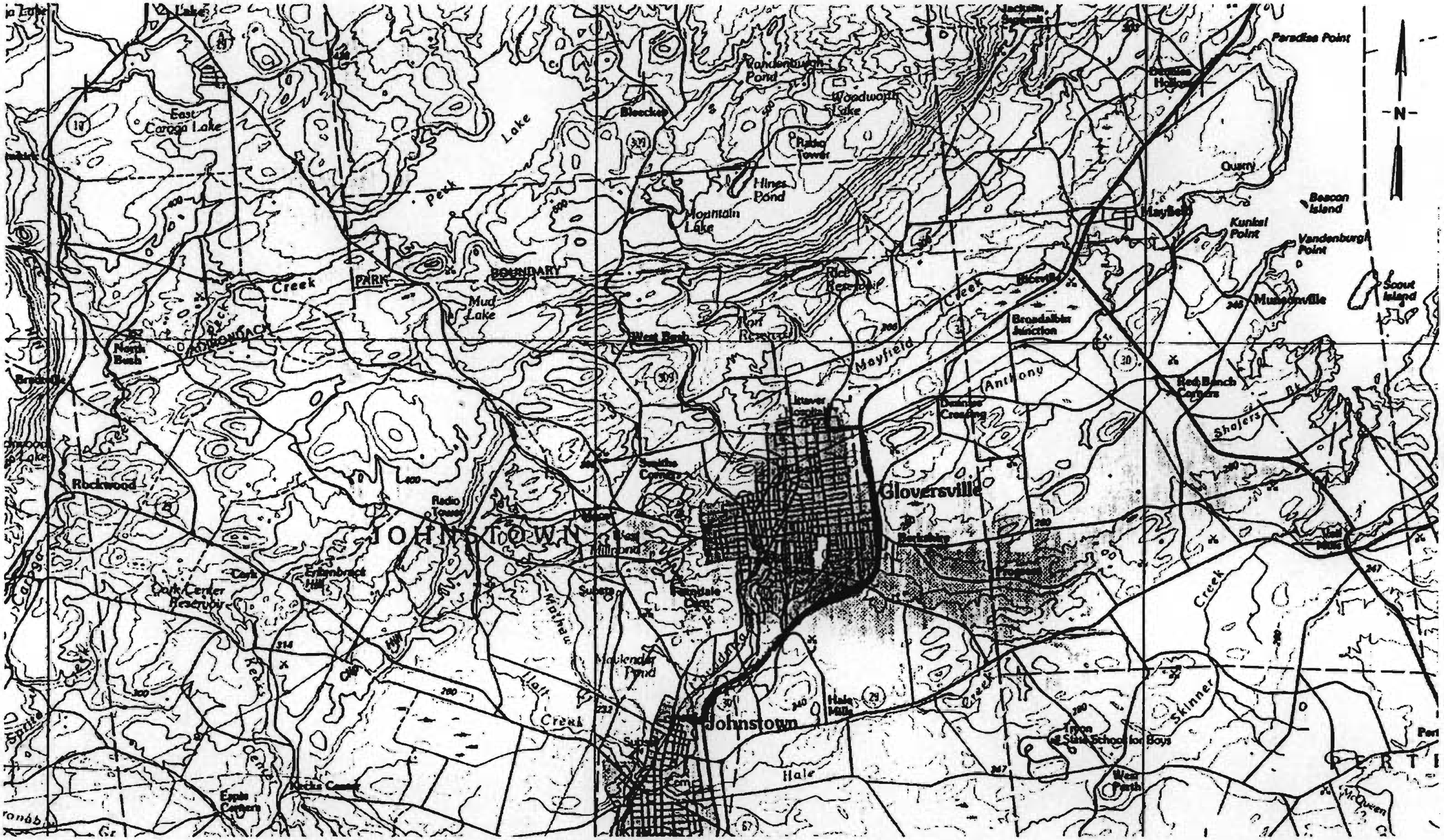
(3) CORPORATE RESOURCES

Mark A. McGowan, CIH, CSP Manager, Corporate Health & Safety	914-641-2484 Work
Joseph M. Golden, CET, REMT-P	914-641-2978 Work
Alan Fellman, PhD Corporate Health Physicist	201-529-4700 Work
Bruce Nelson (Branch Health & Safety Coordinator)	(518) 786-7349 (W) ; (518) 861-6345 (H)
Elayne F. Theriault, M.D. Environmental Medicine Resources, Inc. (Corporate Medical Consultant)	800-229-3674 24 Hour Number
Occupational Medical Services (Branch Medical Consultant)	(518) 482-0666
MPI Emergency Contact Number:	**800-478-6870**

(4) WHOM TO NOTIFY IN CASE OF ACCIDENT:

Bruce R. Nelson (518) 786-7349 (518) 861-6345 (home)

Also notify: Brenda Verdesi, MPI Benefits Administrator (914) 641-2551
MPI Legal Department (914) 694-2100



MALCOLM PIRNIE

ASHLAND CHEMICAL
JOHNSTOWN, NEW YORK

EMERGENCY ROUTE SITE TO LITTAUER HOSPITAL

MSDS1011

Material Safety Data Sheet

May be used to comply with
OSHA's Hazard Communication Standard,
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List) ALCONOX	Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name ALCONOX, INC.	Emergency Telephone Number (212) 473-1300
Address (Number, Street, City, State, and ZIP Code) 215 PARK AVENUE SOUTH	Telephone Number for Information (212) 473-1300
NEW YORK, N.Y. 10003	Date Prepared JANUARY 1, 1991
	Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
THERE ARE NO INGREDIENTS IN ALCONOX WHICH APPEARED ON THE OSHA STANDARD 29 CFR 1910 SUBPART Z.				

Section III — Physical/Chemical Characteristics

Boiling Point	N.A.	Specific Gravity (H_2O = 1)	N.A.
Vapor Pressure (mm Hg.)	N.A.	Melting Point	N.A.
Vapor Density (AIR = 1)	N.A.	Evaporation Rate (Butyl Acetate = 1)	N.A.

Solubility in Water
APPRECIABLE (GREATER THAN 10 PER CENT)

Appearance and Odor
WHITE POWDER INTERSPERED WITH CREAM COLORED FLAKES - ODORLESS

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used) NONE	Flammable Limits	LEL N.A.	UEL N.A.

Extinguishing Media
WATER, CO_2, DRY CHEMICAL, FOAM, SAND/EARTH

Special Fire Fighting Procedures
FOR FIRES INVOLVING THIS MATERIAL DO NOT ENTER WITHOUT
PROTECTIVE EQUIPMENT AND SELF CONTAINED BREATHING APPARATUS

Unusual Fire and Explosion Hazards
NONE

ion V — Reactivity Data

y	Unstable		Conditions to Avoid NONE
	Stable	XX	

patibility (Materials to Avoid)
AVOID STRONG ACIDS

dous Decomposition or Byproducts
MAY RELEASE CO. GAS ON BURNING

dous erization	May Occur		Conditions to Avoid NONE
	Will Not Occur	XX	

tion VI — Health Hazard Data

e(s) of Entry:	Inhalation? YES	Skin? NO	Ingestion? YES

h Hazards (Acute and Chronic)
INHALATION OF POWDER MAY PROVE LOCALLY IRRITATING TO MUCOUS MEMBRANES. INGESTION MAY CAUSE DISCOMFORT AND/OR DIARRHEA.

inogenicity:	NTP? NO	IARC Monographs? NO	OSHA Regulated? NO

s and Symptoms of Exposure
EXPOSURE MAY IRRITATE MUCOUS MEMBRANES.
MAY CAUSE SNEEZING.

dical Conditions
erally Aggravated by Exposure
RESPIRATORY CONDITIONS MAY BE AGGRAVATED BY POWDER.

ergency and First Aid Procedures
ES-FLUSH WITH PLENTY OF WATER FOR 15 MINUTES. SKIN-FLUSH WITH PLENTY OF WATE
GESTION-DRINK LARGE QUANTITIES OF WATER. GET MEDICAL ATTENTION FOR DISCOMFORT

ection VII — Precautions for Safe Handling and Use

ps to Be Taken in Case Material is Released or Spilled
MATERIAL FOAMS PROFUSELY. SHOVEL AND RECOVER AS MUCH AS POSSIBLE. RINSE REMAINDER TO SEWER. MATERIAL IS COMPLETELY BIODEGRADABLE.

aste Disposal Method
SMALL QUANTITIES MAY BE DISPOSED OF IN SEWER. LARGE QUANTITIES SHOULD BE DISPOSED OF ACCORDING TO LOCAL REQUIREMENTS FOR NON-HAZARDOUS DETERGENT.

recautions to Be Taken in Handling and Storing
STORE IN A DRY AREA TO PREVENT CAKING.

Other Precautions
NO SPECIAL REQUIREMENTS OTHER THAN THE GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES EMPLOYED WITH ANY INDUSTRIAL CHEMICAL.

Section VIII — Control Measures

Respiratory Protection (Specify Type)
DUST MASK

Ventilation	Local Exhaust NORMAL	Special N.A.
	Mechanical (General) N.A.	Other N.A.

ctive Gloves USEFUL-NOT REQUIRED	Eye Protection USEFUL-NOT REQUIRED

Other Protective Clothing or Equipment
NOT REQUIRED

Work/Hygienic Practices
NO SPECIAL PRACTICES REQUIRED

• USGPO 1986-491-529/45775

APPENDIX B

Community Health and Safety Plan

COMMUNITY HEALTH AND SAFETY PLAN

In addition to the continuous on-site air monitoring outlined in Section 6 of the Health and Safety Plan (HASP), Malcolm Pirnie will periodically monitor for the presence of organic vapors at the perimeter of the former Ashland Chemical Company property. Off-site air monitoring will consist of the following:

- A Malcolm Pirnie field team member will monitor for the presence of organic vapors at the nearest property boundaries during any intrusive activities. At a minimum, this perimeter monitoring will take place immediately following the initiation of intrusive activities and periodically during such activities.
- All monitoring will be conducted using the equipment and procedures presented in Section 6 of the HASP.
- The field team member will document the location, time, wind direction, and organic vapor concentration in the project field log book during each round of off-site monitoring.
- If the total organic vapor concentration exceeds 5 ppm above background at the nearest downwind property boundary, all operations will be halted until the source of the vapors has been located and addressed.

FINAL

CITIZEN PARTICIPATION PLAN

BROWNFIELDS SITE INVESTIGATION/ REMEDIAL ALTERNATIVES REPORT

Former Ashland Chemical Company
Johnstown, New York

CITY OF JOHNSTOWN, NEW YORK

Prepared by:

Malcolm Pirnie, Inc.
15 Cornell Road
Latham, New York 12110

September 1998
2384007

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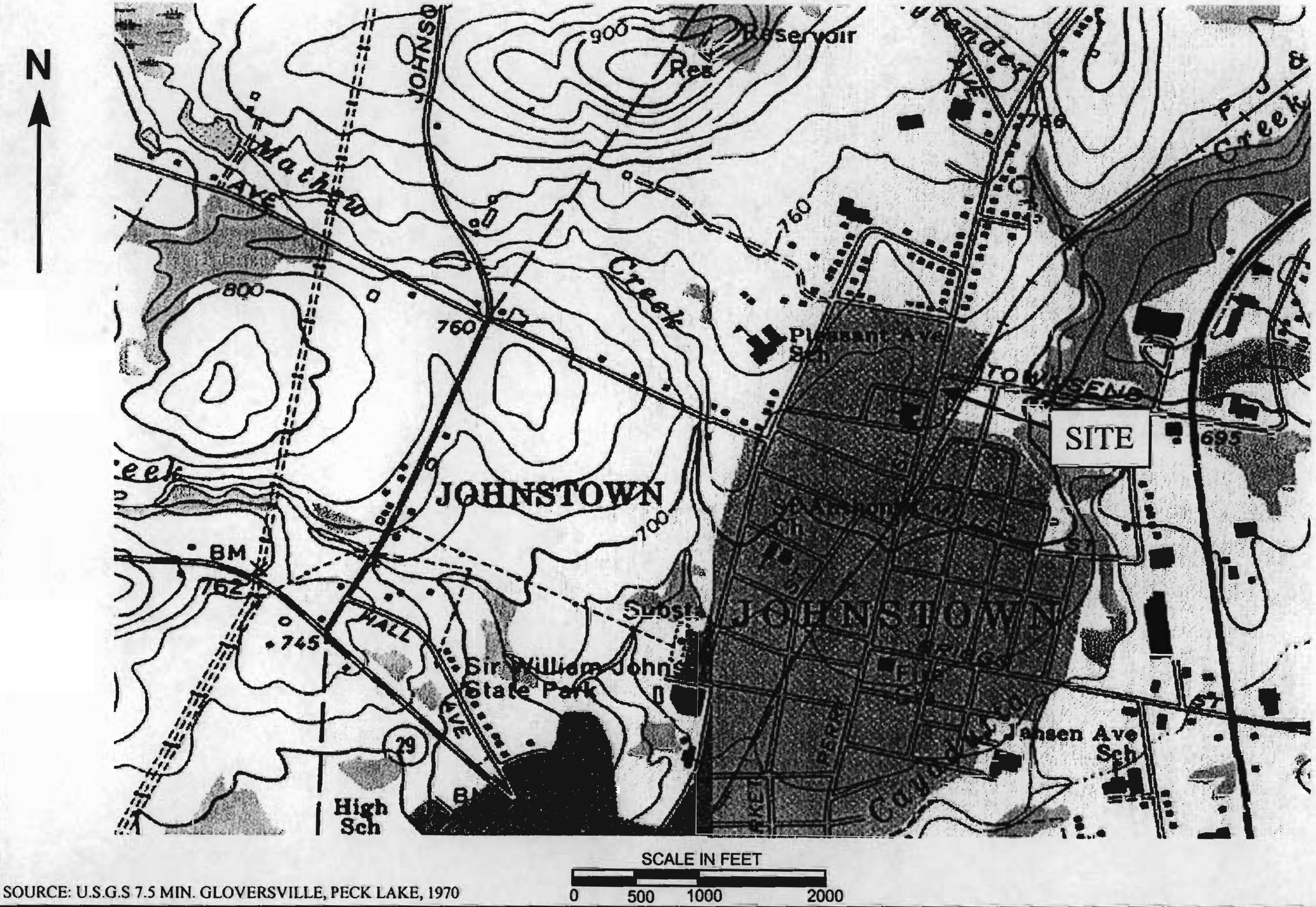


SOURCE: U.S.G.S 7.5 MIN. GLOVERSVILLE, PECK LAKE, 1970

MALCOLM PIRNIE

ASHLAND CHEMICAL CO. BROWNFIELD REDEVELOPMENT
CITY OF JOHNSTOWN, NEW YORK

SITE LOCATION MAP

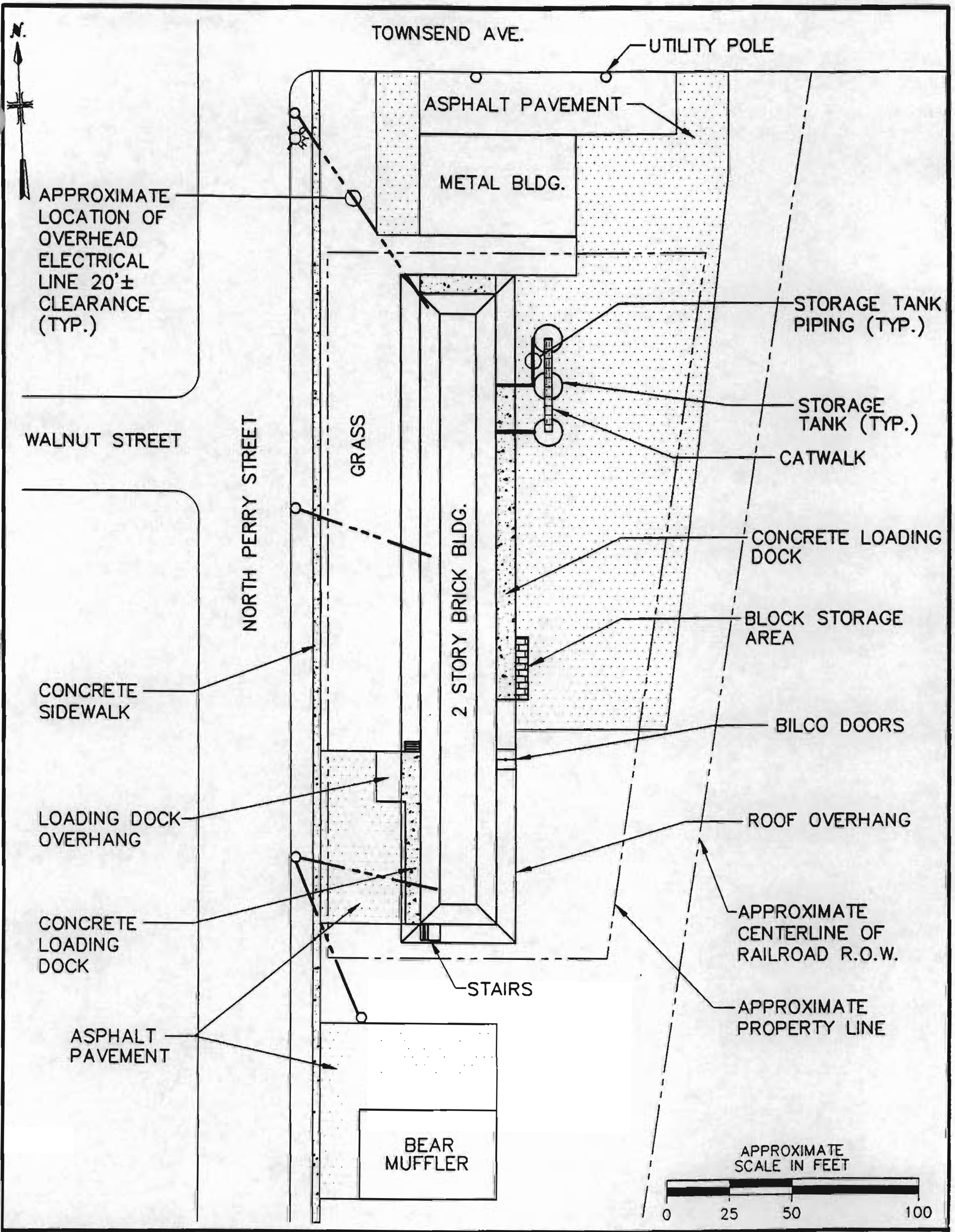
Figure 1-1

2.2 Site History

Based on a review of historical information, the main facility at the site was used as a warehouse prior to 1902. Ashland Chemical Company acquired the site sometime after 1947 and abandoned the facility in the 1980s. The preliminary review of historical information suggests that the operational history of the site under the ownership of Ashland Chemical Company was as follows: Chemicals arrived at the site in railroad tanker cars adjacent to and east of the main facility building. Chemicals were transferred from the tanker cars to three above ground storage tanks (ASTs) located on the northeastern side of the main facility building (Figure 1-2). From the ASTs, chemicals were transferred to 55-gallon drums for subsequent sale to businesses and industries. Based on existing labels affixed to the ASTs, it is believed that chemicals shipped to, stored at, and distributed from the site included, but may not have been limited to, sulphuric acid, naphtha, and mineral spirits.

3.0 PROJECT DESCRIPTION

The focus of the SI/RAR is to identify the distribution of potential chemical contamination in the soil and groundwater surrounding areas where chemicals were previously stored, handled, and transported. A review of existing historical maps will provide a chronology of chemical storage and handling practices on the site and help delineate areas of potential concern. Based on the results of the map review, a passive soil gas survey will be conducted across the site at locations which are suspected areas of concern and known areas of chemical transfer and handling. The soil gas survey will aid in focusing subsequent investigations which will include soil borings to aid in determining the vertical and horizontal extent of contamination, installation of monitoring well points to help define the site geology and hydrogeology, and groundwater sampling to provide information on groundwater quality. As part of the land redevelopment, the two-story brick structure totaling approximately 30,000 square feet will undergo an asbestos and lead paint assessment. The assessment will involve an inspection of all readily available asbestos containing building materials and lead-based paints, as well as the identification of readily



MALCOLM PIRNIE

FORMER ASHLAND CHEMICAL CO. BROWNFIELD REDEVELOPMENT
CITY OF JOHNSTOWN

SITE PLAN

FIGURE 1-2

accessible mercury switches. In addition, the three above ground storage tanks (ASTs) will be removed in accordance with New York State requirements for disposal of hazardous wastes.

The information gathered during the Site Investigation will be used to develop the Remedial Alternatives Report which will evaluate remedial alternatives for the contaminated soil and groundwater, if any.

4.0 CITIZEN PARTICIPATION ACTIVITIES

Citizen participation activities are planned to promote communication, understanding and involvement between the community surrounding the former Ashland Chemical Company site, the City of Johnstown, and the NYSDEC. The citizen participation activities are intended to address the following questions.

- What concerns does the public have about the site?
- Who is interested in or affected by the site?
- What information does the public need to know about the site?
- What information can the public contribute about the site?

These four questions will be re-addressed at the beginning of each major project element to determine if the planned citizen participation activities are adequate to meet the needs of the community or if additional activities should to be planned.

4.1 Document Repository

A local document repository (Appendix B) will be established at the Johnstown Public Library at the start of SI activities. Documents related to the SI/RAR and citizen participation activities will be placed at the document repository for public review.

4.2 Site Investigation Work Plan

A copy of the Site Investigation Work Plan will be placed in the local document repository. A fact sheet which will briefly describe the site, SI objectives and activities planned for the SI will be mailed to the Contact List (Appendix A). In addition, the fact sheet will indicate the location of the local document repository and identify appropriate points of contact. Prior to initiating field work, a public meeting will be held to review the proposed Work Plan and to address any questions or concerns. This meeting will be attended by representatives of the City of Johnstown and the NYSDEC.

4.3 Site Investigation Report

When the SI has been completed, an SI report will be placed in the local document repository. This type of report typically presents the results of environmental sampling and describes conditions at the site.

4.4 Remedial Alternatives Report

If remedial action is determined to be necessary, an RAR will be developed and a copy will be placed in the local document repository. This type of report typically evaluates the remedial alternatives for the contaminated soil and/or groundwater.

4.5 Proposed Remedial Action Plan

The NYSDEC will prepare the Proposed Remedial Action Plan (PRAP) which will summarize the remedial options for the site and propose a specific remedial alternative for implementation. A copy of the PRAP will be placed in the local document repository and a copy will be mailed to the Contact List (Appendix A). There will be a 30-day comment period prior to implementing the proposed remedial alternative. A public meeting will be held during the comment period to review the PRAP and to address any questions or concerns. This meeting will be attended by representatives of the City of Johnstown and the NYSDEC.

4.6 Record of Decision

Following the selection of a remedial alternative for the site, the NYSDEC will prepare the Record of Decision (ROD). A copy of the ROD will be placed in the local document repository and a fact sheet briefly describing the selected remedy will be mailed to the Contact List (Appendix A). The fact sheet will also indicate the location of the local document repository and identify appropriate points of contact.

5.0 SCHEDULE

The SI/RAR Project Schedule is presented below.

ACTIVITY	TIME FRAME
Mailing describing SI activities	Fall 1998
Begin field activities	Late Fall 1998
Mailing announcing availability of SI/RAR	Late Spring 1999
Mailing describing the Proposed Remedial Action Plan (PRAP) and announcing comment period	Early summer 1999
45-day comment period for PRAP	Completion of PRAP
Public Meeting to discuss PRAP	During 45-day PRAP Comment period
Mailing describing Selected Site Remedy and Response to Comments	After remedy is selected and Finalized

APPENDIX A

Contact List

APPENDIX A

CONTACT LIST

Adjacent Property Owners

Raymond J. and Barbara Dalmata
Extension Steele Avenue
Gloversville, NY 12078

Richard C. Putman
P.O. Box 105
Caroga Lake, NY 12032

Sophie Kruk
36 Pinion Pine Lane
Queensbury, NY 12804-9000

Johnstown Reformed Church
North Perry Street
Johnstown, NY 12095

William J. and Amelia Feerick
349 North Perry Street
Johnstown, NY 12095

Shirley Stock
347 North Perry Street
Johnstown, NY 12095

Buanno Warehouse, Inc.
11 Townsend Avenue
Johnstown, NY 12095

Louis Blanchard
RD 1 Box 159
Johnstown, NY 12095

City of Johnstown
41 East Main Street
Johnstown, NY 12095

Adjacent Property Owners (Con't)

William R. Kazmierski
321 North Perry Street
Johnstown, NY 12095

Eleanor and Fred Komornik
406 Parkwood Avenue
Johnstown, NY 12095

Fred Hepfer and Joan Putman
46 Whitney Drive
Woodstock, NY 12498

Marcus Farrant, Jr.
402 Parkwood Avenue
Johnstown, NY 12095

Joyce and Frank Stefic
7 Pine Avenue
Johnstown, NY 12095

Dals Hollow Body Works
414 North Perry Street
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520 Hart Office Building
Washington, DC 20510
(202) 224-6542

also:
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Albany, NY 12207
(518) 472-4343

Senator Daniel Patrick
Moynihan (D)
464 Russell Senate Office Building
Washington, DC 20510
(202) 224-4451

also:
Guarantee Building #203
28 Church Street
Buffalo, NY 14202
(716) 551-4097

U.S. House of Representatives

Representative John M. McHugh (R)
Rayburn Office Building
Room 2441
Washington, DC 20515
(202) 225-4611

also:
Fulton County Office Building
223 West Main Street
Johnstown, NY 12905
(518) 762-0379

State of New York

Governor George E. Pataki (R-C)
Office of the Governor
Executive Chamber, State Capitol
Albany, NY 12224
(518) 474-8390

Lieutenant Governor Elizabeth
McCaughey Ross (D)
Office of the Lieutenant Governor
State Capitol, Room 326
Albany, NY 12224
(518) 474-4623

Senator Hugh T. Farley (R-C)
Legislative Office Building
Room 412
Albany, NY 12247
(518) 455-2181

Assemblyman Marc Bulter (R-C)
Legislative Office Building
Room 628
Albany, NY 12248
(518) 455-5393

Senator Carl Marcellino, Chairman
Environmental Conservation Committee
Legislative Office Building
Room 812
Albany, NY 12247
(518) 455-2390

Senator Kemp Hannon, Chairman
Health Committee
Legislative Office Building
Room 707
Albany, NY 12247
(518) 455-2200

State of New York (Continued)

Assemblyman Richard L. Brodsky,
Chairman
Environmental Conservation Committee
Legislative Office Building
Room 625
Albany, NY 12248
(518) 455-5753

Assemblyman Richard N. Gottfried,
Chairman
Health Committee
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Room 822
Albany, NY 12248
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Fulton County

Supervisor Bessy Floyd, Chairperson
Fulton County Board of Supervisors
Fulton County Office Building
Johnstown, NY 12095

Jon Stead, Clerk
Fulton County Board of Supervisors
Fulton County Office Building
Johnstown, NY 12095

Jeff Bouchard, Director
Fulton County Dept. of Solid Waste
P.O. Box 28
Johnstown, NY 12095

City of Johnstown

Johnstown City Hall
33-41 East Main Street
Johnstown, NY 12095
(518) 736-4011

Mayor: William M. Pollak
Aldermen: Russell Barter
Laurence Yerdon
Christopher Foss
Neil Empie
Kaye B. Cole

1.0 INTRODUCTION

The Citizen Participation Plan (CPP) for the former Ashland Chemical Company site in Johnstown, New York has been developed to provide a site-specific outline and guidance for citizen participation. The CPP was prepared in accordance with 6 NYCRR Part 375 and the New York State Department of Environmental Conservation (NYSDEC) guidance document, New York State Inactive Hazardous Waste Site Citizen Participation Plan (August, 1988).

The City of Johnstown and the NYSDEC are committed to a citizen participation program as a part of the Site Investigation/Remedial Alternatives Study (SI/RAR) process at the former Ashland Chemical Company site. Citizen participation promotes public understanding of the responsibilities, planning activities, and remedial activities associated with this process. Citizen participation provides the City of Johnstown and the NYSDEC with an opportunity to gain public input to support a comprehensive remedial program which is protective of both public health and the environment.

2.0 SITE BACKGROUND

2.1 Site Location

The former Ashland Chemical Company site is located at the southeast corner of the intersection of Townsend Road and North Perry Street in the City of Johnstown, Fulton County, New York (Figure 1-1). The approximately 0.9-acre site is bounded by Bruno Trucking and Townsend Street to the north, North Perry Street to the west, a railroad right-of-way to the east, and Bear Muffler to the south. An approximately 250-foot long by 50-foot wide brick building is located in the western portion of the site. This building was the main operations building for the Ashland Chemical Company and consisted of offices and a warehouse where chemicals were handled and stored.

APPENDIX B

Document Repository

APPENDIX B

LOCATION FOR DOCUMENT REPOSITORY

Johnstown Public Library
38 South Market Street
Johnstown, NY 12095
(518) 762-8317

Hours:	Monday	1:00 pm - 8:00 pm
	Tuesday and Wednesday	10:00 am - 8:00 pm
	Thursday	1:00 pm - 8:00 pm
	Friday	10:00 am - 5:00 pm
	Saturday	10:00 am - 1:00 pm
	Sunday	1:00 pm - 4:00 pm

APPENDIX C

Glossary

APPENDIX C

GLOSSARY OF COMMONLY USED CITIZEN PARTICIPATION TERMS

Community Participation - A process to inform and involve the interested/affected public in the decision-making process during identification, assessment and remediation of inactive hazardous waste sites. This process helps to assure that the best decisions are made from environmental, human health, economic, social and political perspectives.

Citizen Participation Plan - A document that describes the site-specific community participation activities that will take place to complement the "technical" (remedial) activities. It also provides site background and rationale for the selected community participation program at the site. A plan may be updated or altered as public interest or the technical aspects of the program change.

Consent Order - A legal and enforceable negotiated agreement between the NYSDEC and the potentially responsible party in which the potentially responsible party agrees to undertake investigation and remediation, if necessary, at the site. The Consent Order includes a description of the remedial actions to be taken and a schedule for implementation.

Contact List - Names, addresses and/or telephone numbers of individuals, groups, organizations and media interested and/or affected by an inactive hazardous waste site. The contact list is used to inform and involve the interested/affected public.

Document Repository - A location, typically a public building, near a particular site at which documents related to remedial and community participation activities at the site are available for public review. The document repository provides access to documents at times and a location convenient to the public.

Fact Sheet - A written discussion of the site's history, the status of the environmental study, or the remedial process. The fact sheet may be mailed to all or part of the contact list, distributed at meetings, or sent on an "as requested" basis.

Phase I Site Investigation - Initial step in a Site Investigation to characterize hazardous substances present at a site.

Phase II Site Investigation - A Phase II investigation is performed when additional information is needed to fully characterize the site after completion of the Phase I.

Potentially Responsible Party (PRP) - Individuals, companies (e.g. site owners, operators, transporters or generators of hazardous waste) who may be responsible for an inactive hazardous waste disposal site.

Proposed Remedial Action Plan (PRAP) - A pubic document prepared by the NYSDEC after the Remedial Alternatives Report which summarizes the remedial options for a site and proposes a specific remedial alternative for implementation.

Public - The universe of individuals, groups and organizations: a) affected (or potentially affected) by the site and/or its remedial program; b) interested in the site and/or its remediation; c) having information about the site and its history.

Public Consultation/Community Meeting - A scheduled gathering which may present study findings, discuss alternatives, respond to questions and receive public comment.

Record of Decision (ROD) - A public document prepared by the NYSDEC following the selection of a remedy for a site. The ROD presents the rationale for the selected remedy and is prepared after a public comment period on the PRAP.

Registry - The NYSDEC Registry of Inactive Hazardous Waste Disposal Sites in New York State.

Remedial Alternatives Report (RAR) - A process for developing, evaluating and selecting remedial actions, using data gathered during the SI to: define objectives of the remedial program for the site and broadly develop remedial action alternatives; perform an initial screening of these alternatives; and perform a detailed analysis of a limited number of alternatives which remain after the initial screening stage.

Remedial Design - Once a remedial action has been selected, technical plans and specifications for remedial construction at a site are developed, as specified in the ROD. Design documents are used to bid and construct the selected remedial action.

Responsiveness Summary - A summary and response to public questions and comments.

Site Investigation (SI) - A process to determine the nature and extent of contamination by collecting data and analyzing the site. It includes sampling and monitoring, as necessary, and includes the gathering of sufficient information to determine the necessity for, and proposed extent of, a remedial program for the site.

APPENDIX D

Points of Contact

APPENDIX D

POINTS OF CONTACT LIST

New York State

Mr. Gary Sheffer
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50 Wolf Road
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Ms. Betsy Lowe
Regional Citizen Participation Specialist
New York State Department of
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