A MEMBER OF THE ENVIRONMENTAL RESOURCES MANAGEMENT GROUP

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Glen Cove, New York

Remedial Program
Operation and Maintenance Manual

December 1994

Prepared For:

Konica Imaging, USA
71 Charles Street
Glen Cove, New York 11542

Prepared By:

ERM-NORTHEAST
175 Froehlich Farm Boulevard
Woodbury, New York 11797

STATE OF NEW YORK
BRIAN P. MORRISSEY
N 062617
LICENSED PROFESSIONAL ENGINEER

Brian P. Morrissey

ERM

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

This Manual has been prepared to provide guidance to personnel responsible for operating and maintaining the recovery and treatment system at the Former Columbia Ribbon and Carbon Company Disposal Site located at 71 Charles Street in Glen Cove, New York. It is intended to serve as the primary reference for treatment system monitoring, sampling, recordkeeping, equipment maintenance, safety emergency procedures and general operating procedures.

This Manual should be considered supplementary to the specific and detailed operating, maintenance and repair procedures furnished with each major item of equipment by the equipment manufacturers. This Manual and each manufacturer's detailed technical literature complement each other and provide operating personnel with information necessary to understand the techniques, basic principles and procedures necessary to effectively operate and maintain this remedial treatment system.

This Manual is not comprehensive nor does it provide information to deal with all possible situations. If the system is not operating as designed or technical assistance is required, ERM's Woodbury Office (Telephone No. (516) 921-4300) should be contacted.

1.2 GUIDE TO MANUAL FORMAT

This Manual is organized into 12 Sections. Each Section is divided into sections and subsections for ease of access to specific items of information. Refer to the Manual's Table of contents for more detailed information regarding the contents of each Section.

Although each Section contains valuable information necessary for the efficient, orderly, and safe operation of the Plant, Sections 7.0, 9.0, and 10.0 are of particular importance to the Plant operator because these Sections contain detailed information on each major item of Plant equipment.

The other Sections contain important information on permits, personnel, reports, safety, and other administrative and procedural matters. These Sections must also be carefully read, and thoroughly understood.

Since potentially hazardous chemicals may be present in the Plant process streams (ground water and extracted soil vapors) and within the remediation area, special attention should also be paid to Section 6.0, "General Health and Safety", and the Health and Safety Plan included as Appendix F to this Manual.

For ready reference, the appendices also include general information items such as a summary of equipment design criteria, applicable operating permits, a valve schedule and an updated Instrumentation and Control Equipment list. Operation and maintenance manuals provided by the manufacturers of the major Plant equipment items are also included as the final appendix to this Manual.

1.3 SITE BACKGROUND INFORMATION

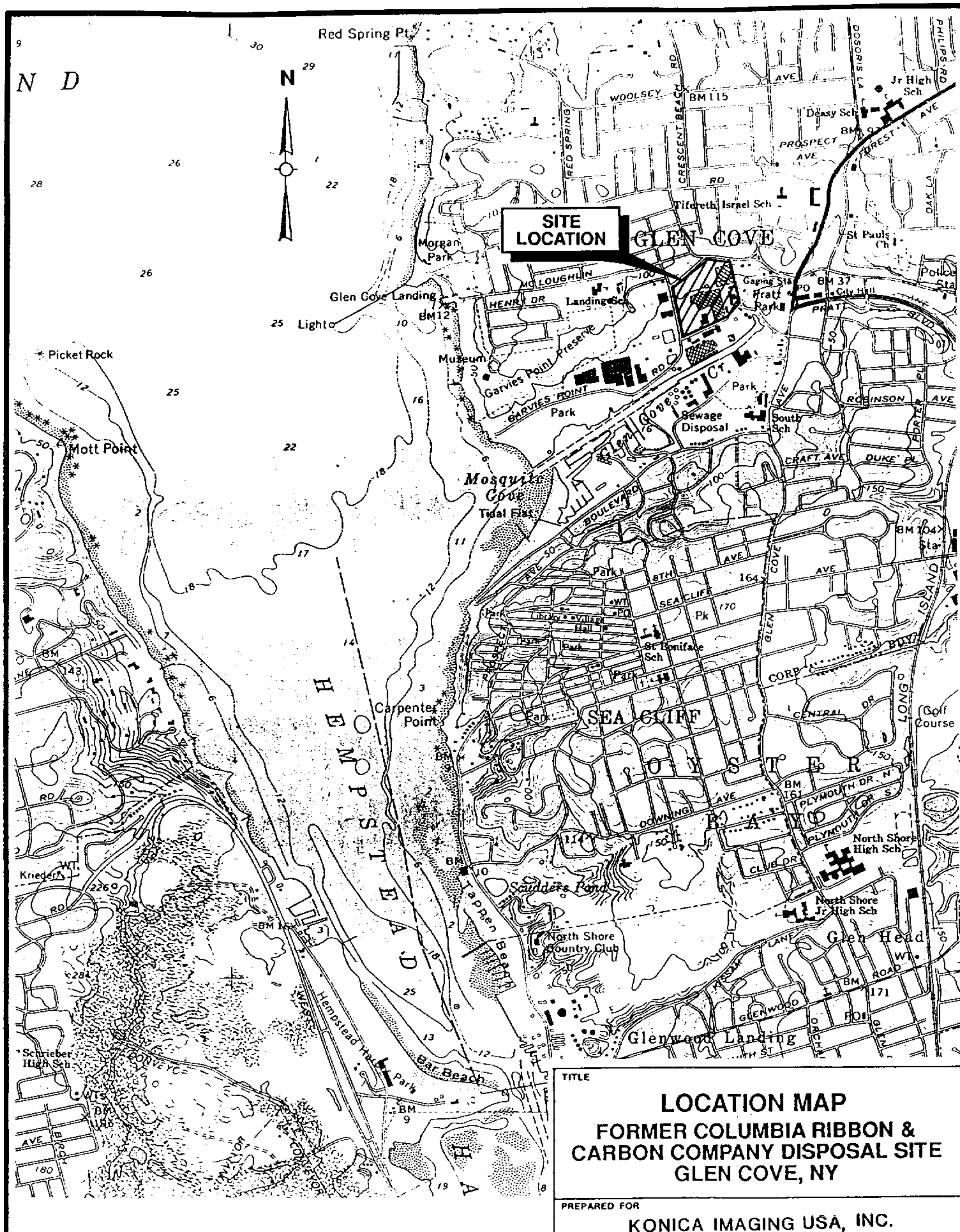
The Remediation Site is situated in the Konica Imaging, USA north parking lot located at 71 Charles Street in the City of Glen Cove located in Nassau County, New York.

The Site remediation is being conducted by Konica Imaging, USA in response to a NYSDEC Draft Order on Consent, Index #W105479107, Site Code #1-30-028, dated 6/19/92.

The Remediation Site has previously been identified as the Former Columbia Ribbon and Carbon Company Disposal Site. Subsequently, it has also been identified as the Powers Chemco Site. The Remedial Investigation and Feasibility Study Report (RI/FS) for the Former Columbia Ribbon and Carbon Company Disposal Site, dated 31 January 1991 was accepted by the NYSDEC Record of Decision (ROD) dated March 1991. As part of the ROD, a Pilot Study and Additional Data Acquisition Report (Pilot Study Report), dated 2 October 1992 and modified by letter dated 12 October 1992 was prepared which recommended a remedial program for the Site. The Pilot Study Report was approved by the NYSDEC confirming selection of the final remedy for the Site on 2 March 1993.

Konica Imaging USA, Inc. (Konica) was formerly known as Powers Chemco, Inc. (Powers). In 1979, Powers purchased land from Columbia Ribbon and Carbon Co. (Columbia) for use as a parking lot (Site). A General Vicinity Map is presented as Figure 1-1. Prior to 1979, Columbia disposed of certain hazardous and industrial wastes at the Site. These hazardous and industrial wastes included toluene, ethylbenzene and other residues from the formulation of printing inks. Upon discovery of the disposed wastes, a Site investigation was conducted which determined that buried drums of waste were present at the Site and that contamination of soil and ground water had occurred. Based on the results of the investigation, interim remediation was conducted to remove and dispose of the buried drums and heavily contaminated soils at the Site. 4,645 tons of contaminated soil and crushed drums along with 267 intact drums were removed from the Site and properly disposed of.

Further investigation was conducted at the Site to assess possible contaminant migration which supported the need to evaluate further remediation. A pilot study and additional data acquisition were conducted and led to the design and construction of a ground water and vapor recovery and treatment system facility at the Site.



Scale: 1"=2000'
Source: USGS, Quadrangle, Sea Cliff, NY

TITLE

LOCATION MAP
FORMER COLUMBIA RIBBON & CARBON COMPANY DISPOSAL SITE GLEN COVE, NY

PREPARED FOR

KONICA IMAGING USA, INC.

ERM-Northeast
Environmental Resources Management

SCALE Noted
DATE 12-8-94
FIGURE 1-1

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Upon acceptance by the NYSDEC of the final remedy proposed for remediation of the Site, the preliminary design phase was initiated with he submission to the NYSDEC of a Draft Remedial Design Report dated May 1993.

The Draft Remedial Design Report submitted as part of the preliminary design package addressed all the requirements contained in the Draft Order of Consent, on an item by item basis. The Remedial Design Report also addressed in detail: 1) the construction and operation of any structures; 2) the collection, destruction, treatment and/or disposal of hazardous wastes and substances as described in the ROD and of any other material contaminated thereby; and 3) the collection, destruction, treatment and/or disposal of ground water, leachate, and air. A detailed description was provided for each piece of recovery equipment including: 1) the ground water recovery and treatment system, submersible well pumps, iron sequestering system, static mixers, basket strainers, air strippers and wet well transfer pump; 2) the soil vapor extraction and treatment system: vapor extraction blower, moisture separator, condensation transfer pump and catalytic oxidation treatment unit.

The Draft Design Report also included a Draft Health and Safety Plan incorporating the requirements of 29 CFR 1910 to protect the safety and health of persons in and around the vicinity of the Site during the construction and operation phase of the remediation.

The final design drawings included the addition of Site Plan drawings, Asphalt layout, Structural drawings, Piping drawings, Detail drawings, Equipment Arrangement and Electrical drawings along with finalized Process and Instrumentation Diagram drawings.

The final design also addressed the Citizens Participation Plan. The plan allowed for copies of the Pilot Report and subsequent correspondence and documents to be placed in the document repository in the Glen Cove Public

Library. It also provided for assistance to the NYSDEC in a Public Availability Session to address questions by members of the community. A discussion of the Remediation Project Design and the proposed construction activities was conducted during a subsequent public session.

The Draft Performance Analysis and Design Modification Plan was also prepared during final design in accordance with the NYSDEC, Order on Consent and described how to monitor and evaluate the effectiveness of the remediation and make changes, if needed, to improve the ability of the selected remedy to achieve the remedial goals. The final version was approved during the construction phase of remediation and is included as Appendix C of this Manual. The plan identifies the performance criteria and the methods which could be used to determine if the remediation is effective in meeting these criteria. Additionally, the plan identifies the options that would be employed to modify the operations of the system to improve its effectiveness toward achieving the performance criteria. The effectiveness monitoring methods involve specific procedures for assessing each operating component of the remedial system including the ground water recovery system, the soil vapor recovery system, the ground water treatment system and the vapor treatment system.

1.4 GROUND WATER QUALITY

A pilot test was conducted in April, May and June 1992 at the Site to evaluate the performance of a combined ground water and vapor extraction system to remediate the Site. The results of the pilot study indicated that soil vapor extraction in conjunction with Site dewatering would be the most effective in removing VOCs in the contaminated area. The study revealed the importance of lowering the water table for soil vapor extraction to be most effective. With the water table lowered, it was found that soil vapor had high concentrations of VOCs (mostly toluene), and therefore high recovery rates could be maintained.

In April 1992, twelve (12) existing monitoring wells and a new ground water extraction well were developed in order to prepare for the pilot test to be conducted at the Site. The results of the pilot test program are summarized in the report titled, Pilot Study and Additional Data Acquisition, dated August 1992 and the results are summarized herein.

The pilot study report concluded that contaminated ground water at the Site does not have the potential to move northward beyond the Site boundary. Laboratory results of the ground water samples taken are summarized in the pilot study report and were in accordance with NYSDEC protocols. Toluene was the most prevalent compound reported in the ground water. The design removal concentrations expected for the major contaminants are as follows:

Parameter	Concentration (ug/l)
Benzene	23
Tetrachloroethene	20
Toluene	20,000
Trichloroethene	38
1,1-Dichloroethane	19
Ethylbenzene	39
Xylene	222

The concentrations of VOCs in ground water, particularly toluene remained elevated during the pilot study, in the range of previous levels historically reported at the Site. Additionally, samples taken from screened areas below the semi-confining layer located throughout the remediation area indicated that the potential for the contamination to migrate downward was extremely low. It was found during the ground water evaluation that turbidity and dissolved metals, specifically iron, would need to be important design considerations. These factors could cause severe fouling problems in the treatment system.

1.5 SOIL VAPOR QUALITY

The remaining component of the remediation system is the quality of soil vapor capable of being extracted from the soil. As discussed in Section 1.4, combined ground water extraction and vapor extraction was determined to be the most effective system to remediate the Site.

The soil survey conducted and analytical data compiled during the pilot study did not indicate there was a substantive area of residual Site-related contamination in unsaturated soils in the northern or southern area of the Site.

A continuous 11-day soil vapor extraction test was conducted during the pilot study and a network of 12 vapor extraction wells and 18 passive air injection wells were designed and installed for the vapor recovery system. The vapor recovery system is designed to extract 240 cubic feet per minute (cfm) total or 20 cfm from each extraction well. The vapor treatment system is designed to treat the following major contaminants:

Parameter	Concentration (ppmv)
Benzene	3.1
Toluene	812.5
Ethylbenzene	36.1
Xylenes	0.1
Methane	0-90% Total Volume

1.6 PLANT OVERVIEW

This Section provides a brief overview of the Plant unit processes and operations. This discussion is aided by referring to the process flow schematic diagram included at the end of this Section as Figure 1-2, and the equipment design criteria summary located in Appendix A.

The Plant contains a ground water recovery system and treatment system, a vapor recovery and treatment system, and support systems. The ground water treatment system and support systems are housed in the Treatment Building (the "Building" or the "Plant"). The vapor recovery and treatment systems are located adjacent to the building. All components of these systems are described in detail in Sections 7.0, 8.0 and 9.0.

The ground water recovery system consists of a network of ground water recovery wells. The operator should refer to Record Drawings C-1 and P-1 for the layout of the recovery wells and recovery well piping.

Each recovery well contains a submersible pump which pumps ground water through individual piping laterals to a single recovery header line. The recovered water then passes through a static mixer used to blend an iron sequestering solution, a basket strainer system to remove fine particles and through an additional static mixer to blend liquid recovered from the moisture separator, before entering into an air stripper treatment system. The treated ground water is then pumped to a wet well located adjacent to the building and is subsequently pumped off-Site to a storm drain sewer. The off-gas from the air stripper system may be either discharged to atmosphere or treated through a vapor treatment module (VTM) located adjacent to the building prior to being discharged to atmosphere.

The vapor recovery system consists of a network of soil vapor extraction wells and passive air inlet wells. The vapor extraction wells are individually piped to a header located in the treatment facility which is connected to a moisture separator also located in the building. The moisture separator or knockout pot removes and collects the moisture from the air stream. A transfer pump is used to convey the separated liquid to the ground water recovery line for further treatment. The vapor recovery header continues through the building wall to the vapor extraction module (vacuum blower) located outside the building. The vacuum blower is used to extract the vapors from the remediation area and convey them to the vapor treatment module (VTM) where the organic contaminants in the vapor stream are destroyed by catalytic oxidation. The treated vapors are then discharged to the atmosphere.

2.0 PERMITS AND REGULATORY REQUIREMENTS

2.1 NYSDEC REQUIREMENTS

Konica Imaging, USA, Inc., formerly known as Powers Chemco, Inc. is under administrative order (the 12 May 1993 Consent Order) to develop and implement an inactive hazardous waste disposal site remedial program for the Site in accordance with Article 27, Title 13 and Article 71, Title 27 of the New York State Environmental Conservation Law ("ECL") entitled "Inactive Hazardous Waste Disposal Sites".

As stated in the Consent Order, the Site is an inactive hazardous waste disposal site, as that term is defined at ECL 27-1301.2. The Site has been listed in the Registry of Inactive Hazardous Waste Disposal Sites in New York State as Site Number 1-30-028. The NYSDEC has classified the Site as a Class 2 site pursuant to ECL Section 27-1305.4.b.

As provided in Section 35-1.7(c) of 6 NYCRR Part 375, Inactive Hazardous Waste Disposal Site Program:

> *When a responsible party for a site develops and implements a program in compliance with an order to which section 375-2.1 of this Part is applicable, and when the Department [NYSDEC] develops and implements a program under authority of ECL-27-1313.5, no permit, consent, approval, or other authorization under any local government zoning, land-use, or other regulatory program shall be required.*

Paragraphs (a) and (b) of Section 375-1.7 "Permitting remedial activities" of 6 NYCRR state:

(a) Except as provided in section 375-1.11 of this Part and unless a permit is applied for and issued, when a responsible party for a site develops and implements a program or an IRM [Interim Remedial Measure] in compliance with an order to which section 375-2.1 of this Part is

applicable, the Department may exempt a person from the requirement to obtain any permit issuable by the Department for an activity satisfying the criteria set out in subdivision 375-1.7(b) of this Part.

(b) The following criteria must be met:

(1) The activity is on-site. For purposes hereof, an activity is on-site:

(i) if it is conducted on the same premises as the site, or

(ii) if it is conducted on different premises that are under common control or are contiguous to or physically connected with the site and the activity manages exclusively waste for which the responsible party is liable; and

(2) The activity satisfies all substantive technical requirements applicable to like activity conducted pursuant to a permit as determined by the Department; and

(3) The activity is a component of a program selected by a process complying with the public participation requirements of section 375-1.5 of this Part, to the extent applicable.

Although the above excerpts indicate that formal permitting is not required, the substantive requirements of all applicable permits have been met for this Site and are described in Section 2.2.

2.2 *SUBSTANTIVE PERMIT REQUIREMENTS*

In order to comply with the substantive technical requirements established by state or federal law that would otherwise be embodied in a permit issued by NYSDEC, an air permit application was completed but was not filed with the NYSDEC. A completed air permit application was provided to Mr. Andrew English, P.E., formerly Senior Engineer in the Bureau of Eastern Remedial Action at his request. The permit application depicted that the proposed air emissions at the Site would meet all applicable substantive requirements.

As noted above, the formal issuance of a permit by NYSDEC is not required under the Consent Order. An air permit application was completed to document the basis of the performance standards established for the Remedial Program (Plant). The reporting requirements proposed to meet the substantive technical requirements discussed above and associated with the air permit application are summarized in Section 5.0. A copy of the air permit application is included in Appendix D.

2.2.1 *NYSDEC Air Permit Application*

An Air Permit Application (Application for Permit to Construct or Certificate to Operate) was completed for the Vapor Treatment Module (VTM). The VTM is designed to treat recovered soil vapors and discharge the treated vapors at a specific emission point. The operation of the VTM is explained in more detail in Section 9.5 of this manual.

The chemical constituents identified in the air permit application as being potentially present in the process air stream are:

- Benzene
- Toluene
- Ethylbenzene
- Xylenes
- n-Hexane
- Methylene Chloride
- 1,1-Dichloroethane
- Tetrachloroethene
- Trichloroethene
- Carbon Tetrachloride
- Chloroform
- 1,2-Dichloroethane
- Acetone
- 1,1,1-Trichloroethane
- Benzaldehyde
- Dichlorobenzene
- Acetophenone
- Methane
- Nitrogen Dioxide
- Carbon Monoxide

The VTM is capable of treating the influent process stream to achieve 99 percent VOC destruction, provided the inlet air stream temperature to the catalytic pod is greater or equal to 600°F.

Although there are no specific monitoring and reporting requirements established in the Consent Order, the VTM influent and effluent process air streams will be periodically sampled and analyzed to verify that the specified performance criteria are being met and to comply with the general requirements of the Consent Order. The samples will be analyzed for seven of the most prominent chemical constituents identified above, and the results reported to NYSDEC. The specific sampling, analytical and reporting protocols to be followed are presented in Section 4.0.

2.2.2 *NYSPDES Surface Water Discharge Criteria*

There are no specific monitoring and reporting requirements established in the Consent Order regarding the discharge of recovered ground water from the remediation area. The ground water treatment system influent and effluent process streams will be periodically sampled and analyzed to verify that the specified performance criteria are being met, to comply with the general requirements of the Consent Order and to comply with NYSPDES discharge criteria. The samples will be analyzed for the constituents described below, and the results reported to NYSDEC. The specific sampling, analytical and reporting protocols to be followed are presented in Section 4.

The chemical constituents to be analyzed to meet ground water discharge requirements are:

- Benzene
- Toluene
- Ethylbenzene
- Trichloroethene
- Tetrachloroethene
- Xylenes
- Dichloroethane
- Dichloroethene
- Chloroethane

The ground water treatment system consisting of two air strippers is capable of treating the recovered ground water to achieve a minimum VOC removal efficiency of 99.8%. A factor which would effect this efficiency would be the accumulation of iron deposition on the internal trays of the air stripper(s). An iron sequestering solution is injected into the system to help minimize this occurrence and is described in detail in Section 7.0.

Specific issues and requirements regarding reporting requirements are addressed in Section 5.0.

2.2.3 Local Permits

A copy of the local building permit obtained for construction along with the flammable gas installation inspection certificate and application are included in Appendix D of this manual.

3.0 PERSONNEL

3.1 GENERAL DISCUSSION

The successful operation of any facility, be it a factory, office, or treatment plant, is dependent on the quality, competence and personal satisfaction of the people employed to operate and manage the facility, and the manner in which they are organized to perform their necessary and required duties. Regardless of how well a plant is designed, the operation can only be as successful as the performance of the personnel and organization operating it.

It is anticipated that at least part of the services required to operate and maintain the Remedial Program for the Site will be provided by outside contract(s).

This Section will provide guidelines and requirements for the development of an organizational structure and personnel policy which will provide for successful and reliable operation and maintenance of the Remedial Program for the Site. Topics to be addressed include personnel certification, staffing and responsibilities.

3.2 ORGANIZATION OF REMEDIAL PROGRAM OPERATIONS

The major functions of the Remedial Program operation include:

- Operations
- Monitoring
- Analytical/Recordkeeping
- Maintenance
  - Mechanical/Technical
  - Housekeeping
  - Yard Work

Although it is essential in the operation of the Remedial Program that there be versatility with all operating personnel for the work of functions identified above, it is considered appropriate that these four functions be the primary responsibility of one individual. This individual will hereinafter be called the "operator".

Given the small size of the Plant and the fact that the required operation and maintenance of the Remedial Program is not labor intensive, the work of the operator is not anticipated to be a full time position.

There will be occasions when the services of qualified mechanical, electrical or instrumentation contractors are required. It is recommended that a list of qualified contractors be compiled and available at the Plant in the event there is work to be performed for which available staff are not qualified. The contractors listed in Appendix H of this manual were employed by the remedial contractor, Bensin Contracting, Inc. (Bensin), in the construction of the Remedial Design and should be considered for future work at the Plant.

3.3 *MANAGERIAL RESPONSIBILITIES (KONICA IMAGING, USA)*

As noted above, Konica may issue contracts for at least part of the services required to operate and maintain the Remedial Program for the Site.

Konica will be responsible for the oversight of all aspects of the administration and operation and maintenance of the entire Remedial Program for the Site including compliance with all requirements of the Consent Order issued for the Site. The specific managerial responsibilities which Konica will assume for the operation and maintenance of the Remedial Program are outlined in the following list:

- Maintain efficient Plant operation and maintenance.

- Maintain adequate Remedial Program operational and management records.

- Establish staff requirements and assign personnel as appropriate.

- Prepare an appropriate budget and ensure that costs associated with operation and maintenance of the Remedial Program stay within that budget.

- Make employees aware of the importance of proper Plant performance.

- Make periodic inspections of the Plant and associated facilities to discuss mutual problems with the operational personnel and to observe operational practices.

- Create an atmosphere that will make operational personnel feel that they can bring special problems to management's attention.

- Maintain good public relations.

- Submit required reports to NYSDEC in a timely manner.

- Plan for future Plant needs.

3.4 *OPERATOR RESPONSIBILITIES*

The services required to administer, operate and maintain the Remedial Program for the Site may be contracted by Konica. The specific responsibilities of the Plant Operator are outlined in the following list:

- Exercise direct authority over any subordinate personnel and subcontractors in accordance with approved policies and procedures. Provide training as required.

- Establish work priorities for Plant personnel, and when necessary, authorize work orders to obtain the services of outside contractors.

- Schedule and oversee all Site maintenance including preventative maintenance and lubrication.

- Direct and supervise the preparation of operating logs and reports, maintenance and repair schedules and reports, requests for contract work, purchase requisitions, equipment files and accident reports.

- Provide good working conditions, proper tools, and safety equipment for the operational personnel.
- Analyze and evaluate operation, maintenance and monitoring activities; initiate or recommend new or improved practices.
- Schedule and implement all ground water disposal and complete associated paperwork.
- Inspect all facilities regularly.
- Ensure a safe working environment. Formulate advance planning and take steps to prevent employee injuries and equipment damage; anticipate hazards in new procedures and materials and develop procedures for controlling such hazards. Provide leadership and motivation in a continuing safety program.
- Implement and enforce all Plant health and safety requirements.
- Provide regular safety training.
- Be responsible for all Plant security. Ensure that fences around Plant are intact and that no unauthorized person enters or remains within Plant premises.
- Perform monitoring, sampling, and analysis as required or scheduled. Review and perform QA/QC of all laboratory work. Sampling will include the vapor recovery system, ground water recovery system, treatment systems and ground water monitoring wells.
- Review and approve all process data collected and maintain process data records.
- Prepare, or review and approve, operation and progress reports.
- Prepare NYSDEC reports.
- Operate and maintain the Plant equipment.
- Observe variations in operating conditions and interpret monitoring equipment output and analytic results to determine processing requirements.
- Maintain all record and reporting forms included in this manual (including maintenance records).
- Assist in the start-up of new equipment.

- Perform custodial and grounds keeping chores and any maintenance work or repairs required.

- Perform general maintenance and repair tasks on the Building, equipment and grounds.

- Perform preventative maintenance and repairs on wells, handholes and other exterior Site facilities.

3.5 *CERTIFICATION AND TRAINING REQUIREMENTS*

Although the Plant operator should have previous experience in the operation of industrial facilities, and should be generally knowledgeable about process terminology and equipment, there are no regulatory requirements concerning certification of Plant personnel.

The Plant operator must have participated in a health and safety training program that complies with OSHA regulation 29 CFR 1910.120. Refer to the Health and Safety Plan included as Appendix F to this manual for additional information regarding health and safety training.

In addition to the health and safety training identified above, the Plant operator must also have participated in a hazardous waste training program which complies with the requirements of NYCRR, Title 6, Chapter IV, Subpart B, Subpart 373-3.2(g).

3.6 *STAFFING*

During initial Plant start-up and operation, it is recommended that the operator or his/her assistant be present on-Site eight hours per day, five days per week.

After the initial start-up period, while a full time presence at the Plant is not required, it is strongly recommended that the operator or his/her assistant visit and check all Plant operations once each day.

4.0 LABORATORY TESTING

4.1 GENERAL INTRODUCTION

This Section describes the laboratory analytical parameters associated with the operation and monitoring of the Remedial Program. The discussion focuses on the sampling and analysis procedures which should be followed in the determination of specific parameters. The preparation and frequency of reports generated using the laboratory data are described in Section 5.0. It is essential that Plant operating personnel are familiar with all sample collection methods and laboratory analyses performed, in order to:

- Collect samples correctly;
- Make operational decisions based on the results; and
- Accurately complete reports to regulatory agencies.

4.1.1 Purpose of Laboratory Testing

In this Section, laboratory testing of Site ground water, ground water iron concentration, and vapors is discussed. The purpose of this laboratory testing is to:

- quantify the recovered ground water for treatment and discharge purposes;
- quantify the recovered ground water iron concentration for sequestering purposes;
- access the efficiency of the ground water treatment system;
- verify that contaminated ground water is not migrating off of the Site;
- quantify the recovered remediation area vapor entering and exiting the VTM; and
- assess the treatment efficiency of the VTM; and
- assess the extent of contaminant reduction in the Site ground water.

The laboratory test results should be recorded in a manner which facilitates operational decision-making and the preparation of reports. Sampling, testing, and recording must be done accurately in order to preclude operational decisions and reports to regulatory agencies which are based on erroneous data. In addition, laboratory analytical data obtained from samples that are improperly handled may be invalidated by NYSDEC. The suggested sampling frequencies are presented in Section 5.0.

4.1.2 *Scope of Laboratory Analysis*

Laboratory analysis of collected samples can be classified as either physical or chemical. Physical analyses include temperature and solids determinations. Chemical analyses are generally more complicated than physical analyses performed on the same sample, and include VOCs, metals, and pH determinations.

4.1.3 *Laboratory Facilities*

The Plant does not contain any laboratory capabilities. All laboratory analytical services must therefore be contracted to off-Site laboratories. All ground water and sediment analyses should be performed by a New York State Department of Health (NYSDOH)-certified laboratory.

The operator may choose which labs to contract these services to, subject to Konica's approval. A laboratory schedule has been included in Appendix H.

The laboratory selected to perform vapor analyses must be proficient in air sampling and analytical techniques, with a thorough knowledge of EPA Test Method TO14, and analytical procedures for methane and other natural gas components. The selection of this laboratory should be coordinated with Konica, who may have used such laboratories in the past.

4.1.4 *Laboratory Analytical Protocols and Procedures*

Table 4-1 lists the approved procedures for sample collection, handling, and laboratory analyses for each required analytical parameter. These references are fully identified in Table 4-2, which also lists supplementary reference materials.

4.2 *GENERAL SAMPLING REQUIREMENTS*

The value of any laboratory analytical result depends upon the integrity of the sample and the competency of the sample collector. The objective of sampling is to collect a portion of material small enough in volume to be conveniently handled in the laboratory, but still representative of the material being analyzed. The sample must be collected in a manner which will assure that nothing is added or lost in the portion, and that no change occurs during the time between the collection and the laboratory analysis of the sample.

All ground water and vapor sampling on the Site will consist of grab samples. A grab sample is an individual sample collected over a period not exceeding 15 minutes.

Sediment concentration sampling, if necessary, will be collected as a composite sample, which is defined as a <u>combination</u> of individual (or continuously taken) samples (aliquots) collected at periodic intervals over a specified time period. In all cases, the samples delivered to the laboratory must be representative of the actual material being sampled.

Several general practices must be followed when collecting samples, and are listed below:

- All sampling must be performed in accordance with applicable NYSDEC protocols.

- Ensure that the sample collection container and any sampling equipment which may come in contact with the sample are clean.

- Ensure that the sample collection container has received any required preparatory treatment for the analysis, including the addition of chemical preservative if required. Refer to Table 4-1 for specific preparatory requirements.

- Tied-on or affixed labels with an identification number shall be used for labeling all samples.

- After the sample has been collected, the container label must be completely filled out, identifying the sample no., location, date, time, and name of the sampler. If the label has been removed, it shall be re-affixed or replaced, or the container must be discarded.

- All sample deliveries to the laboratory must include a completed chain-of-custody form.

- The chain-of-custody form shall list at a minimum the following information:

    - Sample number
    - Description of samples
    - Specific location of sample collection
    - Identity of person collecting the sample
    - Date and time of sample collection
    - Date and time of custody transfer to laboratory (if the sample was collected by a person other than laboratory personnel)
    - Name of the laboratory
    - Type and quantity of containers
    - Requested analyses

- Use only proper sampling equipment and containers.

- All samples should be stored and transported in a chilled condition. This may be accomplished by use of "blue ice" paks.

- Implement proper personnel safety and hygiene precautions when collecting and handling samples. Refer to the HASP located in Appendix F to this manual.

4.3 *RECOVERED GROUND WATER TREATMENT INFLUENT AND EFFLUENT WATER*

4.3.1 *Ground Water Treatment Sampling Procedures*

Samples of treated recovered ground water must be collected and analyzed periodically in order to ensure contaminant concentrations meet the requirements to discharge to the city sewer system. The sampling frequencies will be established by Konica. Analysis of these samples will also indicate the quality of recovered ground water for NYSDEC reporting purposes.

The locations for sampling and descriptions are specified below:

A. *Influent*

Sample Port	Description
314 - 5 1/2" SMP	Location for sampling raw influent for the following: - Volatile Organics (see Contaminant Summary below for list) - Inorganics (see Contaminant Summary below for list) - Total Hardness as $CaCO_3$
403-1 1/2" SMP	Location for sampling PO_4 addition. Sampling for the following: - Phosphorus (see Contaminant Summary below for list)

B. *Intermediate*

408-1 1/2" SMP	Location for sampling Air Stripper STR-401 performance sampling for the following: - Volatile Organics

C. *Effluent*

Proposed Sampling Port*	Location for sampling system effluent for inorganics and PO_4: - Inorganics - Phosphorus - Total Hardness as $CACO_3$ - Arsenic (As) and Lead (Pb)
408-6 1/2" SMP	Location for sampling system effluent. Sample for the following: - Volatile Organics

D. *Condensate from Vapor Separation Module*

Sample Port	Description
Located on pump discharge or Tank Drain or Injection Point to Plant influent piping.	Sample for the following: - Volatile Organics (see Contaminant Summary below for list)

* Reason: Pump on bottom of Air Stripper STR-402 will pick up solids and affect inorganics and phosphorus analysis.

NOTE: Phosphorus and inorganics samples may be analyzed free of charge once per quarter from Aqua Mag suppliers lab. However, additional samples should be taken and analyzed elsewhere as QA/QC step.

CONTAMINANT SUMMARY

Volatile Organics	Inorganics	Phosphorus
Benzene		Ortho-Phosphate as P
Toluene	Ca - calcium	Organic phosphorus
Ethylbenzene	Fe - iron	Hydrolyzable Phosphorus
1,1-Dichloroethane	Mn - Manganese	Total Phosphorus as P
Tetrachloroethene	Mg - Magnesium	
Trichloroethene		
Chloroethane		
1,1-Dichloroethene		
1,2-Dichloroethene		
1,2-Dichloroethane		

Sampling procedures are as follows:

- The bottles listed in Table 4-1 for recovered ground water sampling must be used to contain the ground water being sampled, and the sampling equipment listed in Table 4-3 must be used to conduct the sampling.
- It is recommended that a bucket be used to catch any water which is not captured by the sample containers. (Any water captured in the bucket must subsequently be pumped back to the ground water recovery header.
- Open the sample valve slowly while holding a sample container under the valve.
- Repeat this procedure until all sample bottles are filled. **The VOC sample containers must contain no air spaces or bubbles.**
- Properly label and pack the sample containers for delivery to the laboratory, making sure to include "ice" packs, and a completed chain-of-custody form.
- Ship the samples promptly to a NYSDOH-certified laboratory.

4.3.2 *Laboratory Analyses of Ground Water Treatment Water*

Analytical requirements for recovered ground water must be coordinated through Konica. The analytical requirements may change in the future.

Sample collection, handling, and analytical testing protocols and procedures for recovered ground water are summarized in Table 4-1. Results of all recovered ground water testing should be recorded on Figures 5-7, 5-7A and 5-8 located at the end of Section 5.0.

4.4 RECOVERED GROUND WATER SEDIMENTS

Low concentrations of suspended solids have been identified in the Site ground water. During normal Plant operations, however, these suspended solids will tend to settle to the bottoms of the air strippers and the wet well. If these sediments accumulate on the bottoms, arrangements will have to be made for their disposal. Sediment disposal, if required at all, is expected to be on a infrequent basis.

4.4.1 Sediment Sampling Procedures

Sediments in the air strippers or wet well may be sampled by entering the trays through the cleanout ports on the sides of each stripper and in the wet well through the manhole.

Sampling procedures are as follows:

- **The safety procedures regarding wet well entry, listed in Section 6.3.7, must be implemented during sediment sampling.** Proper sampling and safety equipment must be worn and used prior to, and during, tank entry.
- The number and type of sample containers required will be determined by Konica.
- VOC sample containers, when filled, must contain no air spaces.
- Properly label and pack the sample containers for delivery to the laboratory, making sure to include "ice" packs and a completed chain-of-custody form. (Refer to Section 4.2.)
- Ship the samples to a NYSDOH-certified laboratory.

4.4.2 *Laboratory Analyses of Ground Water Sediments*

Until sediment disposal is required, and disposal facilities subsequently contacted, the sediment analytical requirements cannot be finalized. All analytical requirements must be coordinated through Konica.

It is expected that the analytical requirements would be similar to the parameters listed in Section 4.3.2 for recovered ground water.

4.5 *RECOVERED REMEDIATION AREA SOIL VAPOR*

The purpose of soil vapor sampling is to quantify and optimize the volume of toluene being recovered from the remediation area, in order to determine the balancing requirements of the vapor recovery network, and to determine the removal and destruction efficiencies of the contaminants as described in the PADMP and as recommended in the pilot report.

During normal operations, decisions regarding the configuration and operation of the vapor recovery network should be made using a PID (photo-ionization detector) meter, and the % LEL readings monitored by the VTM combustion sensor. Refer to Section 9.4 for a more detailed description of VTM and vapor recovery operations.

The primary purpose of the laboratory samples is to confirm the readings obtained on the PID meter and VTM combustion sensor.

4.5.1 *Remediation Area Soil Vapor Sampling Procedures*

A sample of the recovered soil vapor should be collected from each of the wells and the results should be recorded in Figure 5-1. Monthly sampling of the vapor extraction blower exhaust will be used to correlate toluene removal from the individual wells. The individual wells and the blower exhaust will be monitored with a PID only. The blower exhaust will be analyzed via EPA TO-14 using a Summa Canister at sample location valve no. 504-1. The operator will ultimately have the final judgement as to when samples should be collected. The wells should be tested concurrently with the VTM testing, which is described in Section 4.6.

Summa sample containers will be used to obtain various vapor samples, and are shipped directly from the laboratory. A Summa container is a sealed, stainless steel container that is under a negative pressure, and is fitted with a pressure gauge, shutoff valve, and a sample fitting. When obtaining a sample, the negative pressure draws the vapor sample into the sealed container. The shutoff valve is then closed, and the container delivered back to the laboratory. Unlike carbon trap samples which can allow vapor contaminants to break through and not be captured, this method is very accurate because the entire volume of sampled vapor is captured in the container. The laboratory then calibrates the sample based on the initial and final container pressures, and can determine the precise amount of vapor that entered the container.

Although this method costs approximately $500 per sample, compared to $100 per sample for a carbon trap, the Summa samples can be collected in about five or ten minutes, compared to upwards of one hour for carbon trap samples, presenting a savings in labor costs.

In addition, it is common that two or three carbon trap samples be collected with different sample volumes for each sampling event, to guard against breakthrough.

The procedures for obtaining vapor samples from a sampling point for Summa Canister testing are listed below. Each sample should be obtained from the sample ports (e.g. valve no. 504-1) located on the respective line.

- Obtain a Summa sample container from the laboratory. When requesting the container, notify the laboratory that the sample will likely contain high concentrations of benzene, toluene, ethylbenzene and xylenes (BTEX) and methane, and ask if there are any specific sample collection requirements. The laboratory will probably request that a partial container volume sample be taken, and will give instructions to obtain a partial sample.

- Use Tygon tubing for sampling purposes. The length of tubing should be minimized, and should be just long enough to attach and properly handle the Summa container.

- If sampling from a flow sensing element, attach the Tygon tubing to the high pressure valve port on the flow sensor. Open the flow sensor valve in order to purge the tubing.

- After approximately one minute, attach the free end of the Tygon tubing to the Summa container. Make sure that all fittings are completely sealed, or ambient air will enter the container and interfere with the analytical results. Record the initial container pressure, and the % LEL in the VTM at the time the sample is obtained.

- Open the main shutoff valve to the Summa container.

- At the lab-specified container pressure, or when the container pressure reaches "0" gage vacuum, close the Summa container shutoff valve, then close the flow sensor valve and remove the tubing.

- Record the final container pressure.

- Properly package the container for delivery to the laboratory. Include a completed chain-of-custody form, filled out label, and indicate the initial and final container pressures on the chain-of-custody form.

- Ship the Summa container to the laboratory.

4.5.2 *Laboratory Analyses of Recovered Soil Vapor*

The laboratory should be instructed to analyze the soil vapor samples for VOCs in accordance with EPA Test Method TO14, and to run a natural gas screen (including methane) by FID-GC methods, using a portion of the Summa container contents.

Sample collection, handling, and analytical testing procedures and protocols for the recovered soil vapors are summarized in Table 4-1. The results of this sampling should be recorded on Figures 5-11 and 5-12, located at the end of Section 5.0.

4.6 VTM INFLUENT AND EFFLUENT VAPOR

It is recommended that sample collection and analysis of the VTM vapor stream be conducted on a quarterly basis with EPA Method TO-14 using Summa Canisters in order to assess the treatment efficiency being achieved by the VTM. All results should be reported to NYSDEC.

4.6.1 VTM Sampling Procedures

The VTM sampling will consist of one sample from each of the two sampling ports located on the VTM. One port is located after the oxidizer dilution air between the booster blower and the oxidation chamber (VTM influent sample). The other port is located above the catalyst bed on the exhaust stack (VTM effluent sample). Both ports have been fitted with shutoff valves and hose connections.

Both samples should be collected at the same time, or the effluent sample collected immediately following the influent sample.

The following steps should be implemented when sampling the VTM:

- Obtain two Summa sample containers from the laboratory. Notify the laboratory that one of the samples is expected to contain high concentrations of BTEX and methane, and that the other sample will be collected at a temperature between 600°F and 1,300°F. Request specific sampling requirements due to these conditions.
- Minimal lengths of Tygon tubing should be used for sampling purposes.

- Attach Tygon tubing to each VTM port and open the port sampling valves in order to purge the tubing.

- After one minute, attach a Summa container to the free end of each length of tubing. Caution must be exercised by the operator when conducting this sampling in the vicinity of moving parts and the hot exhaust stack.) Record the initial container pressures and the following VTM parameters at the time the samples are obtained:

  - the percent LEL reading
  - the exhaust stack temperature
  - the combustion chamber temperatures
  - the pre-combustion (blower exit) temperature
  - the VTM flow rate

  Make sure that all fittings are properly sealed, or ambient air may enter the container(s) interfering with analytical results.

- Open the sample port shutoff valves and the Summa container valves to collect the samples.

- At the lab-specified container pressure, or when the container pressure reaches "0" gage vacuum, close the Summa container valve and record the final pressure for each container. Close the sample port shutoff valves.

- Package the containers for delivery to the laboratory, and include a chain-of-custody form, filled out label, and indicate the initial and final container pressures and stack temperature on the chain-of-custody form.

- Ship the Summa containers to the laboratory.

4.6.2 *Laboratory Analyses of VTM Vapor*

The laboratory should be instructed to analyze the VTM vapor samples for VOCs in accordance with EPA Test Method TO14, and to run a natural gas scan (including methane by FID-GC methods), using a portion of the Summa container contents.

Sample collection, handling, and analytical testing procedures and protocols for the VTM vapors are summarized in Table 4-1. Results of all VTM testing should be recorded on Figures 5-12 and 5-13, located at the end of Section 5.0.

4.7 *SITE MONITORING WELLS*

The ground water quality outside the limits of the Remediation Area, should also be monitored and evaluated periodically through sampling and analysis. This will be accomplished by sampling seven monitoring wells on the Site. The wells selected for sampling are monitoring wells MW-1, MW-3R, MW-5, MW-6 MW-8,MW-11, and MW-12. Refer to Section 5.5.1.2. Results of all sampling must be reported to NYSDEC.

4.7.1 *Monitoring Well Sampling Procedures*

The static water in each of the wells must be evacuated prior to sampling. In order to properly evacuate each well, the water volume in each well must be determined using a water level indicator. The volume is calculated according to the formula Volume = $(\pi \bullet r^2 \bullet h \bullet 7.48 \text{ gal/ft}^3)$, where:

r = radius of the well in feet
h = height of static water in the well, in feet

The height of static water should be measured to the nearest one-hundredth of a foot. To obtain the static water height, measure the depth from the north side of the top of the well casing to the bottom of the well, and the depth from the north side of the top of the well casing to the ground water surface. The static water height is equal to the well depth minus the depth to water. The water level indicator must be cleaned before use in each well.

Three well volumes should be evacuated prior to sample collection. Removal of three volumes should ensure the collection of a representative sample not influenced by stagnant well water. If the well goes dry during evacuation, allow the well to recharge and then continue evacuating the well until at least one and one-half well volumes are purged. All evacuated well water must be disposed of appropriately. Since the ground water in these wells has been and is anticipated to remain contaminant-free, no off-Site disposal procedures or requirements are necessary.

Once the well has been properly evacuated, the sample should be collected as follows:

- Sample containers indicated in Table 4-1 should be supplied by the laboratory.
- The samples must be collected and packaged quickly, to avoid losses of volatile constituents. **The sample containers must not contain air spaces or bubbles.**
- Label all containers properly, and then package for delivery to the laboratory. Include a completed chain-of-custody form and "ice" packs.
- Ship the samples promptly to a NYSDOH-certified laboratory.

In each round of sampling, one trip blank and one duplicate sample must be analyzed in order to achieve QA/QC of all sampling events. The trip blank is filled with analytically pure water by the laboratory, is shipped to the Site, and then shipped back to the laboratory for analysis. The trip blank must not be opened except at the laboratory.

The duplicate sample should be collected from one of the wells, and submitted for analysis in order to determine sample representativeness. The duplicate sample should be labeled and presented to the laboratory in a manner so that the laboratory will not be aware that it is a duplicate sample. The duplicate sample must be collected following the procedures described above.

The collection and analysis of a field blank during all well sampling events is necessary, because each well does not contain a dedicated sampler. Cross-contamination of samples due to field decontamination procedures is possible, since the sampling equipment requires decontamination.

4.7.2 *Monitoring Well Analytical Requirements*

All monitoring well samples must be analyzed for VOCs in accordance with EPA Method 601/602. Sample collection, handling, and testing procedures and protocols for well sampling are summarized in Table 4-1. Results of this sampling, when conducted, should be recorded in Figure 5-8 located at the end of Section 5.0.

TABLE 4-1

SAMPLE COLLECTION, HANDLING AND TESTING PROTOCOLS AND PROCEDURES

Sample Category	Analytical Parameters	EPA Test Method	Container Type	Size	Preservative
Recovered Ground Water***	VOCs Ca, Fe, Mg, Mn, As, Pb, AIK, pH, $CaCO_3$	601/602 --- Various	glass ***	40 ml* ***	none** ***
Ground Water Treatment Influent and Effluent Samples	Analytical parameters similar to recovered ground water	All the same as recovered ground water.			
Recovered Soil Vapor	VOCs Methane	TO14 None-perform a natural gas scan by FID-GC	Summa Containers	---	none
VTM Influent and Effluent Samples	VOCs Methane	TO14 None-perform a natural gas scan by FID-GC	Summa Containers	---	none
Site Monitoring Wells	VOCs	601/602	glass	40 ml	none**

* 40 ml glass vials must have teflon caps and septums.

** No preservative is required for these VOC samples since they will be shipped and analyzed by the laboratory within seven days.

*** Coordinate these requirements with Konica.

TABLE 4-2

LABORATORY REFERENCES

1. Standard Methods for the Examination of Water and Wastewater - 17th Edition; American Public Health Association, 1015 Fifteenth Street, N.W., Washington, D.C. 20036, 1988.

2. "Microbiological Methods for Monitoring the Environment, Water, and Waste", U.S. Environmental Protection Agency, EPA-600/8-78-017, 1978.

3. "Methods for Chemical Analysis of Water and Wastes", U.S. Environmental Protection Agency, EPA-600/4-79-020, 1979.

4. "Methods for Analysis of Inorganic Substances in Water and Fluvial Sediments", U.S. Department of the Interior, U.S. Geological Survey, Open File Report 85-495, 1986.

TABLE 4-3

SAMPLING EQUIPMENT

Sampling Equipment*	Quantity
Rubber Gloves	1 box
Splash Goggles	2 pairs
Trowels	2
Packing Material	
Chain-of-Custody Forms	

* Refer to Section 6.0 for safety equipment to be worn when entering the wet well.

5.0 RECORDS AND REPORTS

5.1 GENERAL DISCUSSION

The purpose of this Section is to describe in detail the records and reports that serve to document the operation and performance of the Plant. A copy of the approved Performance Analysis and Design Modification Plan (PADMP) has been included as Appendix E. The PADMP was prepared in accordance with the Consent Order and approved by the NYSDEC. The PADMP proposes the means to achieve four objectives, specifically:

- evaluate the performance of the Remedial Program system components to gauge whether they are operating in accordance with their design intent;
- evaluate the effectiveness of the Remedial Program in achieving the remedial goals established by the NYSDEC Record of Decision;
- define the requirements, methods and decision making processes necessary to effect operational changes of the remedial systems in order to meet or improve the ability to meet the established remedial goals; and
- establish a mechanism to implement shutdown of the remedial system.

The data needed to meet the requirements of this Section are to be recorded based on periodic Plant inspections. The reporting forms contained in this Section have been generated for this Project based on the objectives discussed in the PADMP and should be filled out regularly. As the reporting forms are completed and compiled during the operation of the Plant, all or part of the records may be provided as supplementary data along with the reports submitted periodically to the NYSDEC.

5.1.1 *Importance of Plant Records*

The maintenance of complete and accurate records is essential to the proper and efficient operation of the Plant. These records provide a comprehensive and continuous account of Plant performance, from which operational procedures are evaluated and modified as necessary, and from which required reports are prepared. Plant records are also an important source of information for scheduling Plant maintenance and repairs, and for justifying Plant expansions or modifications if needed. To achieve these goals, it is important that entries are made in the Plant operating records routinely and accurately, and that changes in the key control parameters are recognized early through timely evaluation of the recorded data.

In addition, Plant data files created on a computer should be downloaded regularly to electronic storage media (e.g., floppy disks, tapes). Backup copies of all Plant data should be maintained.

5.1.2 *Use of Graphs and Trend Charts*

Plotting and graphing of the key operational parameters are of great value to the Plant operating personnel in providing an easily recognizable visual indication of changes in Plant efficiency. Such regular plotting of data may reveal unexpected trends which can trigger early corrective action and prevent operational disturbances. Trend charts developed from the plotted data will show short term and long term trends in Plant operation and may be used to justify and support changes or modifications to monitoring or operational procedures.

Process control data should be plotted on a daily, weekly, or monthly basis dependent upon the prescribed frequency for testing. Daily plots showing large variations indicate that operational errors and/or calculation errors are being committed. Weekly and monthly plots will show long term changes in process efficiency.

5.1.3 *Storage of Records and Reports*

Records and reports must be readily retrievable if they are to be of any value in the operation and control of the Plant. Thus, the establishment of an efficient storage and filing system is essential. The record storage and filing system may be located in the Building. It should be noted that the environment in the Building is not intended to be entirely moisture free and that records, if left in the Building, should be stored accordingly. Files should be maintained in file folders which are stored in filing cabinets. The files should be arranged in accordance with a logically designed filing system to enable rapid retrieval of records, reports, and technical data when needed. Manuals and reference books should be catalogued and stored in an orderly manner on book shelves. Record drawings and other plans should be stored on hanging plan file racks as noted hereafter.

5.2 *PHYSICAL RECORDS*

5.2.1 *Plant Engineering Data*

5.2.1.1 *Record Drawings*

A complete set of Record ("As-Built") Drawings of the Plant should be maintained at the Plant for ready reference by operating personnel. The drawings should be protected by stiff cover sheets, clamped on a hanging plan file, and stored on a plan rack for protection and easy access.

A set of Record Drawings will be maintained by Konica at their main facility.

5.2.1.2 *Construction Specifications*

A bound set of the technical sections of the construction specifications for the Plant, including all addenda, should be maintained at the Plant for ready reference by operating personnel.

5.2.1.3 *Permits*

As previously noted in Section 2.0, a copy of the air permit for the Plant is included in Appendix D to this manual. In addition, copies of the gas inspection certificate and building permit are also included in Appendix D. A copy of these documents should be maintained at the Plant for reference by operating personnel and for review by regulatory personnel during periodic site inspections.

5.2.2 *Plant Equipment Data*

5.2.2.1 *Shop Drawing Submittals*

A complete set of approved shop drawings, manufacturers' brochures, O&M manuals, and related submittal data from the Plant construction contractor, and replacement equipment suppliers, should be maintained at the Plant for reference by operating and maintenance personnel.

Manufacturer O&M manuals for all Plant equipment items are included as Appendix L to this O&M Manual. The manufacturer O&M manuals normally include the approved shop drawing for the appropriate equipment item.

5.2.2.2 *Equipment History Cards/Forms*

Records of the equipment used in the Plant should be maintained on Equipment History Cards or Forms, as described and illustrated in Section

12.0, or on a computer database. The equipment manufacturer's completed certification forms have been included in Appendix L, Inspection, Maintenance and Lubrication Schedule.

5.3 PLANT OPERATING RECORDS

Plant operating records are the recorded results of observations, tests, and measurements performed during the operation and maintenance of the Plant. Data to be recorded and maintained should be only the data necessary to control the processes, to record the operating conditions, or to provide data for the preparation of the required reports listed hereafter.

Reporting forms for the Plant have been developed using the Lotus 123 spreadsheet program, and are described in more detail in the following subsections. The data for the Reports utilizing these spreadsheets may be tracked on an off-site computer.

5.3.1 Plant Control Records

The Plant control records consist of the Process Reports developed specifically for the Plant. The Process Reports should be maintained by the Plant operator and will provide a record of the general Plant operating conditions. These reports will be used in conjunction with the plan outlined in the Performance Analysis and Design Modification Plan (PADMP) report. Recorded data include equipment operational and control status, flow measurements, instrumentation readings, etc. Unusual conditions and maintenance/repairs should be entered in the comments section of the appropriate operating report and further discussed in the operator's log if warranted.

The Process Reporting Forms listed below have been specifically developed for this Plant, and all applicable Reporting Forms should be filled out as appropriate during operator Plant visits. All of these Reporting Forms are located at the end of this Section.

5.3.2 *Laboratory Records*

All laboratory work will be performed by an outside laboratory. Data from laboratory tests of ground water samples and air samples should be maintained in a loose leaf binder or other appropriate filing system as selected by Konica. Any of the Laboratory Reports developed in accordance with Section 4.0 are also used as Plant control records, insofar as the laboratory test results contained therein are utilized in making adjustments to the process flows.

5.3.3 *Maintenance Records*

The establishment of a good maintenance management system is a necessary supplement to the establishment of proper Plant operating procedures. The details of such a system are set forth in Section 12.0 of this manual. The records and forms associated with the maintenance management system are discussed in detail in that Section. They are summarized herein for general familiarization:

1. Maintenance Planning Records - Schedule boards, maintenance work orders, standard maintenance procedures, and workload projections used for orderly and scheduled accomplishment of recurring maintenance work.
2. Equipment History Cards or Forms - (Discussed in Section 12.0).
3. Storage Area Records - Inventory cards, purchase order logs, and replenishment schedules required for proper management of spare part and consumable supply inventories.

5.4 *PLANT ADMINISTRATIVE RECORDS*

The official personnel and fiscal records related to the operation and maintenance of the Plant are maintained by Konica management. Supplementary local records pertaining to these administrative functions should be maintained by the operator for effective control of day-to-day operations, and to provide information to his supervisor(s). Suggested record formats, contents, and use are discussed below.

5.4.1 *Personnel Records*

The basic types of local personnel records maintained by the Plant supervisory personnel include:

- Operator Attendance Records
- Visitor Sign-in Sheet

Operator attendance records should be maintained to provide documentation of the amount of time spent at the Plant by the operator and/or his assistants. This information may be required for regulatory authorities. An operator sign-in sheet (Figure 5-17) has been developed for this purpose, and is included at the end of this Section.

It is also recommended that records be kept of all visitors to the Plant. All visitors should be required to sign in on the visitor sign-in sheet included as Figure 5-18.

5.4.2 *Operating Cost Records*

The operator should maintain cost records for proper control of expenditures on a daily basis, and to provide current information on Plant operating costs. These records serve to supplement Konica's official accounting and bookkeeping records, and provide a basis for budget preparation and support for capital expenditure requests.

The operator may wish to track the operating costs given in Figure 5-19. It is recommended that the operator develop a form for any additional operating costs he feels warrant tracking.

5.5 *REPORTS*

5.5.1 *Required Monitoring & Evaluation of Remedial Program*

The Consent Order requires that Konica prepare and submit periodic progress reports to the NYSDEC, in order to demonstrate that all components of the Remedial Program are operating effectively. These reporting requirements are identified in Section III of the Consent Order, and are summarized herein for reference purposes.

...written monthly progress reports beginning with the approval of the Remedial Design and continuing until one year after approval of the O&M Plan. One year after the approval of the O&M Plan, the progress reports shall be submitted on a quarterly basis. Respondent may request an early transition from monthly reporting to quarterly reporting subject to Department approval.

The reports shall: (i) describe the actions which have been taken toward achieving compliance with this Order during the previous reporting period; (ii) include all results of sampling and tests and all other data received or generated... in the previous reporting period, including quality assurance/quality control information, whether conducted pursuant to this Order or conducted independently...; (iii) identify all work plans, reports, and other deliverables required by this Order that were completed and submitted during the previous reporting period; (iv) describe all actions, including, but not limited to, data collection and implementation of work plans, that are scheduled for the next reporting period and provide other information relating to the progress at the Site; (v) include information regarding percentage of completion, unresolved delays encountered or anticipated that may affect the future schedule for implementation..., and efforts made to mitigate those delays or anticipated delays; (vi) include any modifications to any work plans...; and (vii) describe all activities undertaken in support of the Citizen Participation

Plan during the previous reporting period and those to be undertaken in the next reporting period.

It is anticipated that all reports submitted to NYSDEC will be in the form of letter reports, with all laboratory analyses and documentation attached. Several of the reporting forms included at the end of this Section can also be used for reporting purposes, as backup data. In addition, all reports submitted to NYSDEC should include a copy of Figure 5-20 - "Site Sampling Locations" which is a Site map showing all well sampling and monitoring locations. Specific sampling procedures and laboratory analyses required as part of the reports are presented in Section 4.0 of this Manual.

The distribution of reports should be as follows:

G. Anders Carlson, Ph.D (2 copies)
Director, Bureau of Environmental Exposure Investigation
New York State Department of Health
2 University Place
Albany, New York 12203

Raymond E. Cowen (1 copy)
Regional Director - Region 1
New York State Department of Environmental Conservation
SUNY Campus - Building 40
Stony Brook, New York 11794-2356

Louis P. Oliva (1 copy)
Senior Attorney - Eastern Field Unit
NYSDEC - DEE
200 White Plains Road - 5th Floor
Tarrytown, New York 10591-5805

Daniel Evans (1 copy)
Project Manger
Division of Hazardous Waste Remediation
Bureau of Construction Services
NYSDEC
50 Wolf Road
Albany, New York 12233-7010

David R. Case, Esq.
915 15th Street
5th Floor
Washington, DC 20005

NOTE: This distribution may be changed by the NYSDEC over time.

Copies of all reports and data submitted to NYSDEC should be retained on-Site by the operator. The reporting schedule is summarized on Table 5-1, which is located at the end of this Section.

It should be noted that the Consent Order does not list any specific sampling requirements, as such, the following Sections recommend sampling and analytical procedures and protocols that should be used to implement the general reporting requirements outlined. Several of the figures presented in this Section along with the supporting laboratory analytical may be provided to the NYSDEC to supplement the suggested reporting requirements.

5.5.1.1 *Piezometric Performance of the Remediation Area (Ground Water Recovery System)*

The piezometric performance of the remediation area will be monitored throughout the duration of the remediation. This performance is evaluated by obtaining ground water levels from the thirty (30) ground water recovery wells, WRW-301 through WRW-330, the eighteen (18) passive air inlet wells, AIW-701 through AIW-718, the soil vapor recovery wells, VRW-201 through VRW-212. The seven (7) existing monitoring wells are located at various points within and outside the remediation area. Refer to the Record Drawings and Figure 5-21 for the locations of these wells. The results of these well level readings may be documented on Figures 5-1 through 5-4.

During the startup phase of the ground water recovery system, sets of water level measurements should be collected on a twice per week basis for the first two weeks of operation, and on a weekly basis for the next six weeks. Water level measurements should then be collected monthly for four months, and quarterly thereafter for the duration of the Remedial Program. Figures 5-1 through 5-4 also calculate the rate the ground water system is dewatering the remediation area and also offer an effective means of optimizing individual recovery flow rates for each ground water recovery pump.

5.5.1.2 *Ground Water Quality Monitoring*

As described in Section 1.0, the recovered ground water will be treated through on-Site air stripping prior to being discharged to the local stormwater sewer. The quality of recovered ground water will be tested for two purposes:

1. to determine if the surface water discharge requirements are met; and
2. to determine, by mass balance calculations, the concentrations of contaminants in the discharge air from the air stripper(s).

The frequency of sampling events should be at a minimum monthly and upon startup of the vapor extraction module (VEM). The sampling frequency may be reduced to quarterly one year after approval of this O&M Manual by the NYSDEC. The minimum ground water recovery sampling to be conducted should be at air stripper influent and effluent points as shown on Figure 5-7. Other water quality data may be obtained intermediately as required to optimize treatment system performance as outlined in the Performance Analysis and Design Modification Plan (PADMP) and as shown on Figures 5-5 through 5-8. Figure 5-7A records the input chemical data required to optimize the iron sequestering system. This form also shows the calculated sequestering agent dosage and the optimum metering pump stroke setting based on the input concentrations.

5.5.1.3 *Soil Vapor Recovery Monitoring*

Soil vapor recovery monitoring data recording Figures 5-9 and 5-10 have been provided in order to track the performance of the twelve (12) vapor recovery wells and their effective radius of influence by monitoring vacuum response on the adjacent eighteen (18) passive air inlet wells.

5.5.1.4 *Soil Vapor Treatment System*

Figure 5-11 through 5-13 provide the documentation for recording individual contaminant concentrations. Figure 5-11 also automatically calculates the pounds per day of contaminants recovered within the soil vapor. Figure 5-12 provides a format for recording the operating status of the vapor treatment module (VTM). The quality of the vapors being recovered from the remediation must be tested to demonstrate that the vapor recovery and treatment system is operating efficiently and safely. All testing will be performed at the VTM unit trailer, and will consist of the following:

- Annual sampling of the VTM performance. One sample will be obtained at the entrance to the catalytic oxidation chamber on the VTM, and the other sample obtained from the exhaust stack of the VTM.
- Annual sampling of the undiluted recovery area soil vapor from each of the twelve (12) vapor recovery wells. The wells should be sampled after each has been operating long enough to obtain a representative sample of the recovered vapor.

5.5.1.5 *Miscellaneous Operations*

Figures 5-14 through 5-20 provide the recording formats for miscellaneous equipment operations and other information gathered by the operator during routine monitoring and miscellaneous maintenance tasks. Figures have been provided to record and summarize typical operating costs associated with the operation and maintenance of the treatment plant.

Specific sampling procedures and recommended laboratory analyses are described in Section 4.0 for the ground water recovery testing and soil vapor testing.

It is recommended that the VTM influent and effluent sampling be conducted in order to demonstrate that the VTM is effectively destroying contaminants in accordance with the treatment efficiency stated in the Air Permit application, and is discharging vapors that meet the Air Permit limits. Results of this sampling should be recorded on Form 5-13 for Plant record purposes. Copies of the analytical results, and a completed Figure 5-20, should be forwarded to NYSDEC.

The quality of vapor recovered from the remediation area shall be tested periodically to obtain data that will be used to help determine when each vapor recovery well should be turned on and off (refer also to Section 9.0 and Appendix C). Each recovery well should be tested at least once per year by obtaining a vapor sample from the two-inch lines located in the treatment facility. Each well should be tested only after it has been operational for at least one week, to ensure that the sample is representative of remediation area conditions.

These samples should be obtained at the same time the VTM samples are obtained, to demonstrate the interaction of the various dilution valves and the VTM. Data obtained from these sampling events should be recorded on Figure 5-11 for Plant record purposes. Copies of the analytical results, along with Figure 5-20 should be forwarded to NYSDEC.

The first annual sampling of the VTM and of the vapor recovery wells should be conducted as part of the VTM warranty performance testing.

5.5.2 *Monthly Operating Summary Report*

The Operator is responsible for preparing a monthly operating summary report at the beginning of each month. The Operating Summary Report should be a comprehensive statement of the effectiveness of Plant operations for the past month.

The Report should include a written narrative covering the following topics:

- Operating data summary;
- Management data summary;
- Compliance with permit requirements;
- Abnormal events;
- Major equipment failures; and
- Requirements for capital improvements or maintenance, including budget considerations.

The operating data entries are obtained form the operating reports described in Section 5.3. The management data are essentially cost-oriented. The operating cost records discussed in Section 5.5.1.5 are the primary source documents for this information.

The operating data should be summarized on the form included as Figure 5-19 in order to present a summary of the monthly operating costs.

TABLE 5-1

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

SUGGESTED SUMMARY OF MINIMUM SAMPLING REQUIREMENTS

Report Description	Monitoring Location	Monitoring Parameters	Sampling Frequency
Ground Water Recovery Well Level Measurements	Thirty Ground Water Recovery Wells. See Section 5.5.1.1 and Figure No. 5-1	Water Level Measurements	* Twice per week for first two weeks. * Weekly for next four months. * Quarterly sampling for duration of the remedial program.
Passive Air Inlet Well Level Measurements	Eighteen Air Inlet Wells. See Section 5.5.1.2 and Figure No. 5-2	Water Level Measurements	* Twice per week for first two weeks. * Weekly for next four months. * Quarterly sampling for duration of the remedial program.
Vapor Recovery Well Level Measurements	Twelve Vapor Recovery Wells See Section 5.5 1.3 and Figure No. 5-3	Water Level Measurements	* Twice per week for first two weeks. * Weekly for next four months. * Quarterly sampling for duration of the remedial program.
Monitoring Well Water Quality Sampling	Seven Monitoring Wells See Section 5. Figure No. 5-8	VOCs-EPA Method 601/602 Metals Ca, Fe, Mg, Mn.	* Monthly for first six months. * Quarterly for next twelve months. * Semi-annually for duration of the remedial program.
		Metals As and Pb.	* Monthly for first three months then review with NYSDEC.
Air Strippers Water Quality Sampling	Combined from 30 Ground Water Recovery Wells One influent and One Effluent Point One intermediate Air Stripper See Section 5.5.1.4 and Figure No. 5-7	VOCs-EPA Method 601/602 Metals Ca, Fe, Mg, Mn.	* Monthly for first six months. * Quarterly for next twelve months. * Semi-annually for duration of the remedial program.
		Metals As and Pb.	* Monthly for first three months then review with NYSDEC.
Recovered Soil Vapor Air Quality Sampling	Oxidizer Performance Sampling	EPA TO-14	* Quarterly
	Individual Vapor Recovery Wells	PID	* Monthly
	Combined Vapor Recovery Wells	PID, EPA TO-14	* Monthly

FIGURE 5–1

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GROUND WATER RECOVERY PUMP OPERATING DATA REPORT

DATE/TIME:	PUMP NO.	RUN TIME HRS.	DTW FT.	FREQ. (HZ)	DEPTH TO LSL FT.	DEPTH TO LSH FT.
TOTAL INF. GALS X 100			0			
INSTANTANEOUS FLOW (GPM)			0			
AVG. FLOW /PERIOD (GPM)			0			

Note: ND – No Data
DTW – Depth to Water
LSL – Low level switch
LSH – High Level Switch

DATE/TIME:	PUMP NO.	CHANGE REAL TIME HRS.	CHANGE RUN TIME HRS.	CHANGE DTW FT.	DRAW-DOWN RATE FT./MIN.	% TIME RUNNING

Note: ND – No Data
DTW – Depth to Water
LSL – Low Level Switch
LSH – High Level Switch

FIGURE 5-2

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GROUND WATER LEVEL DATA REPORT

AIR INLET VALVES

DATE/TIME:	WELL NO.	DEPTH TO BOTTOM (FEET)	DEPTH TO WATER (FEET)	WATER COLUMN (FEET)	TOTAL DRAW-DOWN (FEET)	DELTA DRAW-DOWN PER DAY (IN./DAY)

Note: ND – No Data

FIGURE 5-3

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GROUND WATER LEVEL DATA REPORT

VAPOUR RECOVERY WELLS

DATE/TIME:	WELL NO.	DEPTH TO BOTTOM (FEET)	DEPTH TO WATER (FEET)	WATER COLUMN (FEET)	TOTAL DRAW-DOWN (FEET)	DELTA DRAW-DOWN PER DAY (IN./DAY)

Note: ND – No Data

FIGURE 5–4

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GROUND WATER LEVEL DATA REPORT

MONITORING WELLS

DATE/TIME	WELL NO.	DEPTH TO BOTTOM (FEET)	DEPTH TO WATER (FEET)	WATER COLUMN (FEET)	TOTAL DRAW–DOWN (FEET)	DELTA DRAW–DOWN PER/DAY (IN./DAY)
	MW–1					
	MW–3R					
	MW–5					
	MW–6					
	MW–8					
	MW–11					
	MW–12					

Note: ND – No Data

FIGURE 5–5

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GROUND WATER TREATMENT SYSTEM

AIR STRIPPER OPERATING REPORT

STR – 401

DATE	TIME	STATUS	WATER INLET FLOW RATE (GPM)	PLANT EFFLUENT FLOW RATE (GPM)	BLOWER INLET DAMPER OPEN (%)	AIR DISCHARGE FLOW RATE (CFM)	AIR TO WATER RATIO	AIR DISCHARGE TO CAT./OX. (YES/NO)	COMMENTS
05–Dec–94	14:19	RUNNING	14			300	21.4		

Note: ND – No Data
Shaded area represents calculated value.

FIGURE 5–6

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GROUND WATER TREATMENT SYSTEM

AIR STRIPPER OPERATING REPORT

STR – 402

DATE	TIME	STATUS	WATER INLET FLOW RATE (GPM)	PLANT EFFLUENT FLOW RATE (GPM)	BLOWER INLET DAMPER OPEN (%)	AIR DISCHARGE FLOW RATE (CFM)	AIR TO WATER RATIO	AIR DISCHARGE TO CAT./OX. (YES/NO)	COMMENTS
05–Dec–94	14:22	RUNNING	14			300	21.4		

Note: ND – No Data
Shaded area represents calculated value.

FIGURE 5–7

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GROUND WATER TREATMENT SYSTEM

WATER QUALITY MONITORING REPORT

DATE												
Water Flow Rate, gpm												
RAW INLET CONCENTRATIONS (PRIOR TO STRIPPERS):												
Benzene, ppb												
Toluene, ppb												
Ethyl Benzene, ppb												
Xylene, ppb												
Tetrachloroethane, ppb												
Trichloroethene, ppb												
Dichloroethane, ppb												
Dichloroethene, ppb												
Chloroethane, ppb												
INTERMEDIATE CONCENTRATIONS (AFTER FIRST STRIPPER):												
Benzene, ppb												
Toluene, ppb												
Ethyl Benzene, ppb												
Xylene, ppb												
Tetrachloroethane, ppb												
Trichloroethene, ppb												
Dichloroethane, ppb												
Dichloroethene, ppb												
Chloroethane, ppb												
Chloroethane, ppb												
FINAL DISCHARGE CONCENTRATIONS (AFTER SECOND STRIPPER):												
Benzene, ppb												
Toluene, ppb												
Ethyl Benzene, ppb												
Xylene, ppb												
Tetrachloroethane, ppb												
Trichloroethene, ppb												
Dichloroethane, ppb												
Dichloroethene, ppb												
Chloroethane, ppb												
Chloroethane, ppb												

FIGURE 5–7A

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GROUND WATER TREATMENT SYSTEM

PERFORMANCE SAMPLING FOR SEQUESTERING AGENT DOSAGE EXAMPLE

Date :

PARAMETER	INFLUENT (mg/L) Filtered	INFLUENT (mg/L) Unfiltered	EFFLUENT (mg/L) Filtered	EFFLUENT (mg/L) Unfiltered
As				
Ca				
Mg				
Mn		4.40		
Fe		44.00		
Zn				
Total Dissolved Solids				
Total Solids				
Hardness as CaCO3		200.00		

DOSAGE CALCULATION

pH:		
RECOVERY FLOW RATE:	14.00 gpm	
PO4 REQUIRED:	24.67 ppm	: (ppmFe + ppmMn / 2) + (40% of CaCo3 /171)
AQUA–MAG DOSAGE:	0.00159 gpm	: (gpd / 24*60)
AQUA–MAG DOSAGE:	2.29 gpd	: (4.61*recovery gpm*60*24*PO4 ppm / 1000000)

REQUIRED METERING PUMP SETTING

FLOW METER MAXIMUM RANGE:	25.00 gpm	
MAXIMUM PUMP OUTPUT:	24.00 gpd	
SET METER PUMP SPEED AT:	EXTERNAL	
SET METER PUMP STROKE AT:	0.17 %	: (pump output / (max pump output*% speed))

Note: Shaded cell(s) represent calculated values(s).

FIGURE 5-8

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GROUND WATER QUALITY IN MONITORING WELLS

Date Sample Collected	Well MW-1 TVOCs (ppb)	Well MW-3R TVOCs (ppb)	Well MW-5 TVOCs (ppb)	Well MW-6 TVOCs (ppb)	Well MW-8 TVOCs (ppb)	Well MW-11 TVOCs (ppb)	Well MW-12 TVOCs (ppb)	Comments

FIGURE 6-9

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

SOIL VAPOR RECOVERY SYSTEM OPERATING REPORT

DATE													
SOIL VAPOR RECOVERY HEADER													
Total Soil Vapor	Flow, CFM												
Total Soil Vapor	Vacuum, in.HG												
Total Dilution Air	Flow, CFM												
Total Dilution Air	Vacuum, in.HG												
SOIL VAPOR RECOVERY WELLS:													
VRW–201	Flow, CFM												
	Vacuum, in.HG												
VRW–201	Flow, CFM												
	Vacuum, in.HG												
VRW–201	Flow, CFM												
	Vacuum, in.HG												
VRW–201	Flow, CFM												
	Vacuum, in.HG												
VRW–201	Flow, CFM												
	Vacuum, in.HG												
VRW–201	Flow, CFM												
	Vacuum, in.HG												
VRW–201	Flow, CFM												
	Vacuum, in.HG												
VRW–201	Flow, CFM												
	Vacuum, in.HG												
VRW–201	Flow, CFM												
	Vacuum, in.HG												
VRW–201	Flow, CFM												
	Vacuum, in.HG												
VRW–201	Flow, CFM												
	Vacuum, in.HG												
Vacuum Blower Discharge Temperature	Deg. F												
Vacuum Blower Inlet Vacuum,	in.HG												
Vacuum Blower Discharge Pressure,	Psi												
Vacuum Blower Local Dilution Air Inlet, (Valve No. 503–2)	Open/Close												

FIGURE 5-10

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

PNEUMATIC RESPONSE OPERATING REPORT – AIR INLET WELLS

DATE	APPROX. TIME	WELL NUMBER AIW-#																	
		701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718
		VACUUM, INCHES WATER COLUMN																	

FIGURE 5–11

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

RECOVERED SOIL VAPOR QUALITY

Date:

			LAB ANALYSIS, PPB							PID READING			
SAMPLE SOURCE	VALVE NO.	FLOW RATE	TOLUNE	XYLENES	ETHYL BENZENE	BENZENE	1,1 DICHLORO–ETHANE	TETRACHLORO–ETHENE	TRICHLORO–ETHENE	TOTAL VOC's PPM	TOLUENE PPM	OXYGEN (%)	CO2 (%)
VRW–201	201–02												
VRW–202	202–02												
VRW–203	203–02												
VRW–204	204–02												
VRW–205	205–02												
VRW–206	206–02												
VRW–207	207–02												
VRW–208	208–02												
VRW–209	209–02												
VRW–210	210–02												
VRW–211	211–02												
VRW–212	212–02												
TOTAL INDIVIDUAL WELLS:	CFM	0											
	PPMv		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0		
	LBS/DAY		0.00	0.00	0.00	0.00	0.00	0.00	0.00				
FROM HEADER (No. 405–02)	CFM	0											
COMBINING ALL	PPMv												
VRW WELLS:	LBS/DAY		0.00	0.00	0.00	0.00	0.00	0.00	0.00				
AIR STRIPPER(S):	GPM	0											
(See Note 1. Below)	PPMm												
	LBS\DAY		0.00	0.00	0.00	0.00	0.00	0.00	0.00				
TOTAL AIR STR. + VRW WELLS:													
	LBS/DAY		0.00	0.00	0.00	0.00	0.00	0.00	0.00				

Note: 1. From "Ground Water Treatment System – Water Quality Data" (Fig. 5–7)
2. Shaded cells represent calculated values.

FIGURE 5–12

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

VAPOR TREATMENT MODULE VTM

OPERATING REPORT

Date	Time	Soil Vapor Header Airflow	Dilution Air Airflow	Total Airstripper Airflow	VTM Airflow	Total Dilution Airflow	VTM Inlet Temp.	Exhaust Stack Temp	LEL	VTM Run Time	VTS Alarms
		CFM	CFM	CFM	CFM	CFM	Deg F	Deg F	%	Hours	

FIGURE 5–13

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

VTM INFLUENT AND EFFLUENT VAPOR QUALITY

Date Sample Collected	Time Sample Collected	VTM % LEL		Benzene ug/l	Toluene ug/l	Ethylbenzene ug/l	1,1 Dichloroethane ug/l	Tetrachloroethene ug/l	Trichloroethene ug/l	Comments
			Oxidizer Influent							
			Effluent Stack							
			% Removal							
			Oxidizer Influent							
			Effluent Stack							
			% Removal							
			Oxidizer Influent							
			Effluent Stack							
			% Removal							
			Oxidizer Influent							
			Effluent Stack							
			% Removal							
			Oxidizer Influent							
			Effluent Stack							
			% Removal							
			Oxidizer Influent							
			Effluent Stack							
			% Removal							
			Oxidizer Influent							
			Effluent Stack							
			% Removal							
			Oxidizer Influent							
			Effluent Stack							
			% Removal							

FIGURE 5–14

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

MISCELLANEOUS EQUIPMENT

OPERATING REPORT

		Transfer Pump Air Stripper STR–401		Transfer Pump Air Stripper STR–402		Wet Well Sump Pump P–602	Chemical Feed Pump P–601		Moisture Separator Transfer Pump P–501	
Date	Time	H–O–A Setting	Status (On/Off)	H–O–A Setting	Status (On/Off)	Status	Speed/Stroke	Comments	H–O–A Setting	Status

FIGURE 5–15

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

PLANT ALARM LOG

Date	Time	Plant Alarm	Cause	Operator Response

FIGURE 5–16

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

SITE MAINTENANCE SUMMARY

Date	Operator	System Status	Describe all Site maintenance performed in the field (e.g., cleaned basket strainer, repaired well handhole, etc.)	List all problems identified in the field

FIGURE 5-17

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

OPERATOR SIGN-IN SHEET

Name	Date	Time In	Time Out	Company

FIGURE 5–18

FORMER COLUMBIA AND RIBBON CARBON COMPANY DISPOSAL SITE

VISITOR SIGN–IN SHEET

Date	Name	Company	Purpose of Visit	Time In	Time Out	Hours

FIGURE 5-19

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

MONTHLY OPERATING COSTS

Month: Year:

Item	Quantity	Unit Cost	Sub-Total	Comments
1. Electricity				
2. Potable Water				
3. Telephone				
4. Security				
5. Liquid Propane				
6. Polyphosphate Solution				
7. Sediment Disposal				
8. Maintenance & Repair				
a. Contractor Services				
b. Supplies & Spare Parts				
9. Laboratory Services				
10. Emergency Services				
11. Operator				
12. Operator's Assistant				

Total: ______

6.0 *HEALTH AND SAFETY*

6.1 *GENERAL DISCUSSION*

The collection and treatment of contaminated ground water, and the collection and treatment of contaminated vapors are inherently dangerous activities. Both process streams contain volatile organic compounds (VOCs) that are carcinogenic (e.g., benzene) and VOCs that may be present in concentrations that would present short-term or long-term exposure hazards (e.g., benzene and toluene). In addition, the chemical constituents present in the contaminated treatment area have not been thoroughly identified, and the ongoing recovery of these process streams may yield chemical contaminants that are not currently known to be present in the treatment area.

Other potential hazards associated with operation of the Plant include but are not limited to:

- The working areas inside the Building may present a slipping hazard in the event of a spill.
- Oxygen-deficient and explosive conditions may exist in confined-space areas subject to occasional personnel entry (e.g., handholes and wet well).
- Electrical hazards may exist where moisture is present adjacent to electrical motors, instrumentation, and control equipment.

Because of these potential hazards, it is extremely important that all personnel engaged in the operation and maintenance of the Plant be well trained in health and safety practices, and in the use of safety equipment.

It is the intent of this Section to outline the more common hazards involved in the operation and maintenance of the Plant, and to describe the health and safety practices related thereto. The safety and health rules and procedures described herein should be considered as minimum requirements.

Supplemental procedures should be developed and promulgated by Plant management where experience demonstrates that more stringent requirements are needed.

A more detailed Health and Safety Plan (HASP) has been developed for the operation of the Plant and is included in this manual as Appendix F. The potential chemical hazards (mainly VOCs) associated with the contaminated ground water and vapor recovered from the treatment area, and personal protection requirements for handling of these process streams, are addressed in the HASP rather than in this Section. The HASP has been developed on the basis of data and information collected during the environmental site investigations, and standard health and safety practices.

A copy of the American Red Cross Standard First Aid Manual is included as Appendix G.

6.2 *HEALTH AND SAFETY PROGRAM*

6.2.1 *Health and Safety Management*

Responsibility for the safe operation of the Plant, and management of the health and safety program, rests with the operator who is responsible for assisting with the development and implementation of a working health and safety program consisting of the following major elements:

- Providing and maintaining a safe and healthful working environment by frequently inspecting Plant layout, surroundings, equipment, and tools.
- Properly selecting, hiring, and placing employees to ensure that they are physically and mentally fit to do the work required.
- Providing adequate training and education for employees in order to preclude personal injuries during operation and maintenance of the Plant.

- Providing supervision and leadership to make every employee safety-conscious through safety meetings, safety posters, and distribution of articles on safe practices.

- Immediate reporting of accidents and injuries to ensure full personal and legal protection for both the employee and employer. Figure 6-1 at the end of this Section shows a sample Accident Report Form, which must be submitted to Mr. Charles Nehrig of Konica Imaging USA in the event of an accident at the Plant.

- Thorough investigation of accidents and injuries in order to determine corrective actions, prevent a recurrence of similar events, and to increase the safety awareness of all employees.

- Checking, cleaning, repairing, or replacing all safety equipment at regular intervals.

6.2.2 *Emergency Telephone Numbers*

A comprehensive listing of all emergency telephone numbers is contained in the HASP, in Appendix F. This listing should be posted in conspicuous locations in the Building. The specific emergency contacts incorporated in the Plant safety program are provided in Table 6-1 for easy access.

6.2.3 *Safety and Emergency Equipment*

At a minimum, the safety and emergency equipment listed in Tables 6-2, 6-3, and 6-4 should be procured as necessary, and stored in the Building, unless otherwise noted. This inventory of safety equipment should be inspected frequently by the operator to verify its completeness and proper condition. The listed items are separate from the maintenance tools and equipment described in Section 12.0. They should be maintained as separate inventories and used exclusively in the execution of safety practices. All safety equipment should be OSHA approved.

Two fire extinguishers are located in the Building one at southeast corner of the Building and the other is by the eyewash and safety shower. The Building fire extinguishers are 10# "ABC" Firemaster Model 541014 extinguishers. All fire extinguishers should be inspected and tested annually to ensure proper operation, and should be re-charged as required to maintain a full charge.

A combination drench shower/eye wash unit is located in the Building for use in the event of a personal injury or exposure that requires rinsing of the body or eyes. The unit is mounted between the hose station and the doors on the south wall of the Building. Refer to the vendor O&M Manuals in Appendix L for further information regarding the safety equipment discussed above.

6.2.4 *Safety Valves*

The Plant contains pressurized and negatively pressurized (vacuum) piping, as well as vessels that are under either a pressure or vacuum. In order to prevent damage to personnel and equipment, safety valves are utilized to relieve excess pressure or vacuum in piping and vessels before it becomes a health and safety hazard. The safety valves located throughout the Plant are listed in Table 10-1, which gives the description, location, manufacturer, and relief pressure setpoint for each valve. All safety valves should be tested and certified annually with respect to their relief pressure settings. The safety valves installed in the Plant are summarized below for easy reference.

Tag No.	Description	Location
PSV-4001	Air Relief Valve	Along pipeline 401, between the two static mixers.
PSV-5001	Vacuum Relief Valve	VEM-501
PSC-5000	Flame Arrestor	VTM-501

6.3 *HEALTH AND SAFETY PRACTICES*

Specific potential hazards and related health and safety practices associated with the operation and maintenance of the Plant can be divided into the following broad categories:

- General Health Hazards
- Ground Water Recovery System Hazards
- Vapor Recovery System Hazards
- Mechanical Hazards
- Electrical Hazards
- Chemical Hazards
- Confined Space Hazards
- Explosive/Fire Hazards
- Burn Hazards

Each of these potential hazards and appropriate safety and health procedures are discussed in the following subsections.

6.3.1 *General Health Hazards*

The following are some of the general protective measures and precautions that should be taken during Plant operations:

- As discussed in Section 7.0, there is a potable water supply to the Plant. However, since this water supply will be used for maintenance purposes associated with contaminated ground water and vapors at the Site, it should not be used as a source of potable water. Refer to Section 7.6 in this manual. All other water sources should be considered contaminated and should be avoided.

- No cut or scratch should be considered too minor to receive attention. A fully stocked first-aid kit must be maintained to treat minor cuts and scratches. Major cuts should receive the attention of a physician.

- Apparel such as rubberized cotton gloves, rubber boots, or rubber suits must be worn when employees cannot avoid contact with ground water in such places as sumps or handholes. Refer to the HASP for more detailed information.

- Smoking should be avoided while on the Site.

- An excellent rule to observe while performing duties which will require intimate contact with ground water or sediments is to "keep the hands below one's collar".

- Personnel who have performed any Plant tasks should wash their hands with hot water and soap, especially before eating or smoking.

- Employees should at all times exercise good judgement in maintaining proper hygiene.

6.3.2 *Ground Water Recovery System Hazards*

Chemical hazards associated with handling of contaminated ground water are addressed in the HASP, which is located in Appendix F.

Potential hazards inherent to the inspection, cleaning, maintenance and repair of the ground water recovery system piping and handholes primarily involve oxygen-deficient, explosive or VOC contaminated atmospheres, and lifting of heavy objects. Specific safety practices relating to these hazards are as follows:

- Extinguish all smoking materials before opening a handhole or the wet well cover (personnel should not be smoking on-Site).

- Never enter an enclosed area until the atmosphere has been tested. Refer to the HASP for additional information.

- If testing indicates that a hazardous atmosphere is present in the area, allow the area to air out, and induce fresh air into the area if required. Retest the area's atmosphere before attempting to reenter the area.

- There should always be sufficient manpower available to do the job without hazard to life or limb.

- Every handhole has been provided with a cover. While any handhole cover is off, the handhole shall be constantly attended. This procedure should be also maintained for the wet well.

- Inspect the wet well and handholes before entering them. The handholes have very little foot room, and can present a tripping hazard, which can lead to foot and ankle injuries.

- All penetrations have been sealed vapor-tight, to prevent migration of volatile, explosive vapors into the handhole. Once a seal has been removed, the operator should be aware that potentially explosive vapors may be migrating into the handhole from the top of the recovery well.

- Prevent sparking of any kind in the handhole.

- Prior to performing any maintenance on the submersible pumps, the following shutdown procedures **must** be implemented in the order presented:

  - Turn the H/O/A switch on the main control panel to "Off".
  - Open the respective circuit breaker in the control panel.
  - Lockout/Tag the circuit breaker. Refer to the lockout and tagging procedures in Section 8.5.4 and in the HASP.
  - Proceed to the handhole and turn the local disconnect switch to "Off".

If these procedures are not implemented correctly, damage to the speed controller(s) is very probable, and injury may occur due to contact with live circuits. The local disconnect switch contains an auxiliary contact ahead of the switch mechanism, which will remain live if the circuit breaker is not opened.

- It is necessary that all workers be made aware of all hazards and know all safety precautions in reference to their work.

- Wear safety shoes when working in handholes or wet well.

6.3.3 Vapor Recovery System Hazards

Chemical hazards associated with the handling of the contaminated vapor streams are addressed in the HASP, which is located in Appendix F.

Potential hazards inherent to the inspection, cleaning, maintenance, and repair of the vapor recovery system piping, handholes and wet well primarily involve oxygen-deficient, explosive, or VOC-contaminated atmospheres. Specific safety practices relating to these hazards are as follows:

- Extinguish all smoking materials before opening a cover or hatch(personnel should not be smoking on-site).
- Never enter an area until the atmosphere has been tested. Refer to the HASP for additional information.
- If testing indicates that a hazardous atmosphere is present in the area, allow the area to air out, and induce fresh air into the area if required. Retest the area's atmosphere before attempting to reenter the area.
- Prevent sparking of any kind.
- It is necessary that all workers be made aware of all hazards and know all safety precautions in reference to their work.

6.3.4 *Mechanical Hazards*

The exposed moving parts of some equipment items pose a safety hazard to personnel working around the equipment. Injuries caused by moving parts can be prevented by installing stationary guards where necessary. These guards, which shield the moving part without interfering with their operation, should be considered for belts, wheels, shafts, and any couplings between a piece of equipment and its drive motor. Manufacturer's protective guards have been furnished on the VEM-501 and VTM-501.

Guards should be kept in good condition and replaced if necessary. Bent or improperly fitting guards could rub and interfere with the movement of a belt, shaft, wheel, etc. Before a guard is replaced, the related equipment item should be shut off and the power disconnected.

In addition, certain items of equipment (e.g., blower VEM-501) may pose noise problems. High noise levels can result in permanent hearing damage to personnel in close contact with the equipment. Some form of ear protection such as headsets, ear muffs or ear plugs should be worn by personnel working near these units. Personnel should verify that unusual noise levels are not the result of equipment malfunction before any corrective actions are taken.

At no time should unauthorized personnel be allowed to approach equipment which poses a safety threat, regardless of the presence of safety guards.

6.3.5 *Electrical Hazards*

Electrical maintenance and repairs should be performed only by qualified personnel. Specific safe practices for working with electrical equipment are as follows:

- Do not ground yourself in water or on pipes or drains.
- Positively "lock-out" and tag appropriate circuit breakers and disconnect switches, and test the circuit, before working on electrical equipment. Refer to Section 8.5.4.
- Test power leads at the equipment with a voltmeter before contacting any normally energized component.
- Keep all electrical controls accessible and well marked.
- Keep wires from becoming a tripping hazard.
- Work in pairs around electrical equipment.
- Switches which another person can turn on should be locked out and tagged with "Man on Line" signs when working on electrical equipment.
- Never use metal ladders around electrical equipment.
- Handle breaker wires as though they are "live" wires.
- When there is a question about any electrical hazard, ask an electrician before you expose yourself to it.
- Do not use any part of your body to test a circuit.

- Ground all electric tools and equipment.
- Allow only authorized personnel to work on electrical equipment.

If a person is exposed to severe electric shock and requires assistance, the following first aid procedures should be performed:

- The rescuer should disconnect the source of power from the equipment by opening the circuit breaker or disconnect switch, if possible.
- The rescuer should separate the victim from the contact by using a long, very dry pole, a dry rope or length of dry cloth. Be sure hands are dry and that rescuer is standing on a dry surface.
- If victim is unconscious, call for emergency medical assistance and begin artificial respiration, and treat for shock.

6.3.6 *Chemical Hazards*

Hazards associated with the handling of contaminated environmental media are addressed in the HASP, which is located in Appendix F.

Currently, a sodium ortho/polyphosphate blended solution is used in the ground water recovery treatment process. The Material Safety Data Sheet (MSDS) for this solution is included in Appendix F. The chemical is a FDA and USDA listed and is reported to have no significant health effects. the chemical (sequestering agent) is used during the recovered ground water treatment process to help alleviate iron deposition into the air strippers reducing iron fouling within the treatment system equipment. The sequestering agent is stored in a 500-gallon tank mounted within a second tank acting as secondary containment in order to prevent a spill if the primary tank leaks or ruptures. The chemical is introduced into the process stream through a chemical metering pump controlled through a signal received from a meter located on the process stream piping. An eyewash and emergency shower station is located adjacent to the storage tank and metering pump in case of direct contact with the sequestering agent.

6.3.7 *Confined Space Hazards*

The ground water recovery handholes and wet well present potential confined space hazards. The potential hazards include oxygen deficient or explosive atmospheres. In addition, open handholes present a hazard for tripping and falling in. Specific safety practices related to confined space hazards are as follows:

- Extinguish all smoking materials before opening a handhole cover or any entryway into a tank (personnel should not be smoking on-Site).
- Test the atmosphere of the confined space for oxygen deficiency and contaminant % LEL levels, before entering the confined space. The atmosphere should be checked frequently once inside the confined space.
- The wet well should be ventilated with a portable blower before entering. Tests on the wet well atmosphere should be repeated and deemed normal before workers enter. ADEQUATE VENTILATION MUST BE MAINTAINED DURING WORK, AND TESTS REPEATED FREQUENTLY.
- Inspect entry areas before entering the confined space. The handholes have limited foot room and contain many tripping hazards. The wet well may contain sediments and water, and may therefore be very slippery.
- Ground water must be drained from the wet well to the greatest extent possible before entry is attempted by personnel.
- Workers entering the wet well must be under the constant observation of a standby worker <u>outside</u> the wet well. All work should be planned out, including the means of evacuation and the standby worker's responsibilities.
- All workers entering the wet well must wear a rescue harness and lifeline, to enable rescue in the event of an emergency.

to report an emergency if no one else is available. Under no circumstances shall the standby worker enter the wet well.

- Use only safety, explosion-proof flashlights and power lighting.
- All electrical equipment to be used in the wet well must be in perfect condition and properly grounded.
- Only the manhole at the top of the wet well should be used for entry.

Use the following first aid procedure if a person has been exposed to oxygen deficient conditions or atmospheric contaminants:

- Initiate emergency response by notifying ambulance or other emergency service.
- Do not attempt to rescue the victim without proper respiratory equipment, unless it is possible to ventilate the area thoroughly.
- Remove the victim to an open area.
- If the victim is not breathing, administer artificial respiration by the mouth-to-mouth or CPR procedure.
- After breathing is restored, treat the victim for shock by maintaining victim in a prone position and taking steps to prevent loss of body heat.
- Obtain medical assistance and transport to hospital for observation and further treatment as required.

6.3.8 *Explosive/Fire Hazards*

VOCs will be present in the recovered ground water and vapor streams.

Consequently, vapors present in the handholes, ground water treatment system, and in the VTM may be flammable. When these vapors are mixed with oxygen in the air in correct proportions, explosive conditions exist. Refer to Sections 6.3.2 and 6.3.3 for safety practices relating to these conditions.

If an explosive or combustible atmosphere is ever detected in the Building, the following steps should be implemented:

- Notify supervisor, relating all available details.
- Request notification of police and fire department.
- Open all Building doors.
- Turn off any running engines and motors in the vicinity.
- Attempt to locate the source of the problem, and correct the situation if possible.

The following procedures should be implemented at the Plant to prevent explosive accidents:

- Use non-sparking tools and explosion-proof flashlights when working in handholes or wet well.
- Wear non-sparking footwear.
- Post "No Smoking" signs in the Building and at the VTM pad.
- Instruct employees in preventive action and control procedures in case of a fire.

Konica Imaging, USA should arrange with the Glen Cove Fire Department, if possible, to conduct training sessions for Plant personnel in first aid and fire-fighting techniques, including proper use of hand fire extinguishers, early control steps, and personnel evacuation procedures.

All Plant personnel should be instructed in the first aid treatment for burns, which are discussed in the following Section 6.3.9.

6.3.9 *Burn Hazards*

In addition to burns which may result from any fire or explosion at the Plant, there are several items of equipment that may run hot enough during normal operation to result in burns if a worker inadvertently touches a surface.

These items include:

- MCP internal equipment.
- Blower VEM-501.
- Unit heaters EUH-1 and EUH-2.
- Vapor Treatment Module VTM-501.

The VTM contains several items of internal equipment that may operate at elevated temperatures, including the blower, catalytic oxidizer, exhaust stack, and associated process piping.

Although the catalytic oxidizer is well insulated, this unit will operate with internal temperatures as high as 1350°F. The temperature of the air flowing through the exhaust stack will be above 600°F.

All Plant personnel must exercise caution when working in the vicinity of any of this equipment and should be instructed in first aid treatment for burns. Burns to personnel are classified as follows:

- First degree burns - minor burns resulting from momentary contact with hot objects, hot water, or steam. Usual signs are:
    - Slight redness and discoloration.
    - Mild swelling and pain.
    - No skin breakage or open wounds.
- Second degree burns - moderate burns resulting from more extensive contact with hot objects, hot water, steam, or flash burns from gasoline

and other flammable liquids or gases. Second degree burns are characterized by damage to nerve endings at the skin surface. Usual signs are:

- Red or mottled appearance of skin.
- Blister development.
- Considerable swelling which persists for several days.
- Moist appearance of burned area.

- Third degree burns - major burns resulting from direct contact with flame, ignited clothing, immersion in hot liquids, prolonged contact with hot objects, or electrical current. Usual signs are:

  - Deep tissue destruction.
  - White or charred appearance of burned area.
  - Complete skin loss in burned area.

First aid treatment for each burn classification is as follows:

- First degree burns - Apply cold water applications or, if possible, immerse burned area in cool water; apply dry dressing to reduce air contact if necessary.

- Second degree burns - Immerse burned area in cool water (do not use ice water) until pain subsides; apply moist sterile gauze dressing; do not break blisters or remove damaged tissues; do not use antiseptic ointments or oils; elevate arms or legs, if affected.

- Third degree burns - Do not remove adhering particles of charred clothing; cover burned area with thick sterile gauze dressing; if hands or arms are involved, elevate above the victim's heart; if feet or legs are involved, keep elevated; if facial burns are involved, maintain victim in a sitting position and observe closely until transported; if respiration problems develop, maintain an open air-way; do not apply ointments; transport to a medical facility as soon as possible.

6.4 *SAFETY REFERENCES*

The references listed in Table 6-5 are available sources for information on hazards incidental to treatment plants and on the safe practices related thereto. Selected publications from this list should be maintained at the Plant to supplement the material in this Section.

TABLE 6-1

EMERGENCY CONTACTS

Glen Cove Fire Department	516-676-0366
Glen Cove Police Department	516-676-1000
Emergency Medical Services	516-676-1000
Community Hospital, Glen Cove	516-676-5000
National Poison Control Center	800-962-1253
ERM Project Manager: James Perazzo	212-447-1900
NYSDEC Emergency Action Hotline	800-457-7362

Directions to Glen Cove Community Hospital:
(A hospital route map is included in the HASP in Appendix F)

- Take Glen Cove Avenue past school and stores on right.
- Go through four sets of lights and make right on Forrest Avenue. Then make right on St. Andrews.

FIGURE 6-1
ACCIDENT FORM
FORMER COLUMBIA RIBBON AND CARBON CO. DISPOSAL SITE

Date ____________________ Time ____________________

Description of incident, including injuries, property damage and emergency action taken and personnel involved. Note specifically the names of any personnel who sustained an injury.

____
____
____
____
____

Witness of incident:

____
____
____
____

Possible or known causes:

____
____
____
____

What actions are needed to prevent a similar incident?

____
____
____
____

____
Name of Person
Completing Form

____
Operator

TABLE 6-2
EMERGENCY EQUIPMENT

ITEM	INTENDED USE
* Fire Extinguishers	Extinguishing fires
Oxygen deficiency/ combustible and toxic gas indicator devices	Used to detect low oxygen or toxic/combustible gases in confined areas of Plant
** Gas masks/air purifying filter respirators with appropriate spare canisters	Used to prevent exposure to contaminated atmospheres which are dangerous to the respiratory system
** Portable blower	Used to ventilate enclosed areas such as wet well with low oxygen concentrations and/or high concentrations of toxic or combustible gases
** Portable pump	Used to remove liquids from areas where entry is required
Explosion proof flashlights, lighting	Used to provide illumination in potentially explosive unlit areas
* Warning Signs	Used to identify potentially dangerous areas or activities (e.g., "No Smoking")
* Eye Wash/ Safety Shower	Used to wash foreign objects or liquids from the eyes and body
First aid kit	Contains medical supplies used to treat injuries at the Site
** Self Contained Breathing Apparatus (SCBA)	Used to provide complete respiratory protection in all toxic and oxygen deficient atmospheres
Safety Harness with life line	Designed to maintain a worker in a vertical position. Used when an employee is working in an area where entry for purposes of rescue would be difficult
Fire Blanket	Used to smother fires
Chemical resistant rubber gloves and boots	Used to protect employees from spills and splashes
** Non-metal ladder, rope	Many miscellaneous safety uses
Industrial Protective Goggles	Used to protect eyes from injury from flying objects and liquids

* These items have been provided under the construction contract.

** These items should be available either at the Plant or at Konica's manufacturing facility. Some of these items are expected to be required only when working inside the wet well, and may therefore be rented on an as-needed basis (e.g. SCBA equipment.)

TABLE 6-3
INDUSTRIAL FIRST AID KIT

At a minimum, the Plant first aid kit should include the following:

Triangle bandages
Elastic bandage
Ammonia inhalants
Sterile swabs
Butterfly closure
5" x 9" surgical pads
3" x 3" adaptic non-adhering dressing
First aid guide book
Bandaids
Tube of first aid cream/antiseptic ointment
Rescue blanket
First aid cleansing wipes
Sterile Pads
Bottle of eye aid drops
Gauze bandage
Tweezers
Scissors
Wire Splint
Adhesive Tape
Burn ointment

NOTE: All first aid kit items should be replenished as they are used.

TABLE 6-4
EMPLOYEE SAFETY EQUIPMENT

Hard hat

All purpose gloves

Safety glasses with side shields or goggles

Safety shoes

Ear protection

Rain gear

- Jacket with hood
- Pants
- Rubber boots

Protective clothing

TABLE 6-5
SAFETY REFERENCES

1. Water Pollution Control Federation - Manual of Practice (MOP) No. 1 - Safety in Wastewater Works.

2. U.S. Environmental Protection Agency, Technical Bulletin - Safety in the Operation and Maintenance of Wastewater Treatment Works.

3. U.S. Department of Labor - OSHA 2206 - General Industry Safety and Health Standards.

4. New York State Department of Health - Manual of Instruction for Sewage Treatment Plant Operators.

5. Water Pollution Control Federation - Manual of Practice (MOP) No. 18 - Simplified Laboratory Procedures for Wastewater Examination.

7.0 UTILITY AND SUPPORT SYSTEMS

7.1 INTRODUCTION

The utilities and support systems serving the Plant are critical to the continuity of Plant operations. Frequent or prolonged interruptions to utilities or support systems will have significant adverse effects on the Plant. Accordingly, Plant personnel should be aware of the utilities serving the Plant, and should know how to operate and maintain the Plant support systems.

The Plant utility and support systems addressed in this Section include the following:

- Heating, Ventilating and Air Conditioning System (HVAC)
- Electric Power
- Telephone Service
- Plant Water Supply
- Fire protection system
- Security system
- Sewer Discharge

The objective of this Section is to familiarize Plant personnel with the utilities and support systems which serve that plant, and to describe in detail the operation of the Plant support systems.

7.2 HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) SYSTEM

7.2.1 General Description

The heating and ventilation requirements of the Building are provided by two electric unit heaters, an exhaust fan, and a motorized louver. The air conditioning system is comprised of a single air conditioning unit for the Main Control Panel (MCP). The components of the systems, as well as their operation are described in the following Sections.

7.2.2 *Building Heating System (EUH-1 and EUH-2)*

Design Criteria

The heating system is designed to maintain the temperature inside the Building at 50°F when the outside temperature is at a minimum of 10°F. A minimum outside temperature of 10°F corresponds to the American Society of Heating, Refrigeration, and Air Conditioning Engineers' (ASHRAE) 97.5% confidence level recommendation. An inside minimum temperature of 50°F was selected for design purposes since the Building should be unoccupied most of the time.

Equipment Description

The Building heating system consists of two electric unit heaters, EUH-1 and EUH-2, which are supported from the building roof steel by 1/2" dia. threaded rods. Both unit heaters are mounted horizontally, at a height of 10'-0" (bottom unit above finished floor). Unit heaters EUH-1 and EUH-2 are located in south-west and north-east sections of the building, respectively.

Both unit heaters are Model MUH05-81 and are manufactured by Q-Mark. Each heater is equipped with a louver diffuser to more evenly distribute heated air, a wall-mounted thermostat, and a heat recovery thermostat mounted above the heater. The heaters are each rated at 5 KW, 17,000 BTU/Hour, with a 350 cfm fan.

The wall-mounted thermostat for heater EUH-1 is mounted on the middle column of the south building wall. The wall-mounted thermostat for heater EUH-2 is mounted on the north building wall, in between the filter and the flow indicator.

The operation of both heaters is identical, therefore, the majority of this Section will discuss the operation of EUH-1 only. Detailed information regarding the unit heaters can be found in the manufacturer's O&M Manual included in Appendix L to this Manual.

Instrumentation and Control

EUH-1 is supplied with a wall-mounted thermostat, which controls On-Off operation of EUH-1. When the building temperature falls below the thermostat setpoint, EUH-1 is turned on. The wall-mounted thermostat should normally be set to 50°F. Further control of the heater is determined by the capillary heat-recovery thermostat.

EUH-1 is supplied with a capillary heat-recovery thermostat which is mounted above EUH-1. Once the wall-mounted thermostat determines that EUH-1 must be energized to provide heat, the capillary heat-recovery thermostat controls the activation of the fan and heating elements as described in the following paragraph.

If the capillary heat-recovery thermostat, which is factory set, senses a ceiling temperature greater than its setpoint (i.e., reusable heat is trapped in the ceiling space) the EUH-1 fan only will be activated, to recirculate this trapped heat to floor level. If the heat-recovery thermostat does not sense reusable heat in the ceiling, the EUH-1 heating elements and fan are energized.

EUH-1 and EUH-2 receive 120 VAC, single phase power from circuit breaker Nos. 16 and 18 respectively, located in the Main Distribution Panel.

Start-up and Operation

To start unit heater EUH-1, set the wall-mounted thermostat to 50°F. During normal operations, EUH-1 will start when the temperature at the wall-mounted thermostat falls below 50°F. If a higher Building temperature is desired, the thermostat setting should be raised.

Because of the thermostatic control of EUH-1, its circuit breaker can remain closed (energized) year-round. This will protect the Building from unexpected cold weather.

During initial Plant start-up, it was observed that due to the location of the EUH-1 thermostat near the Building door, EUH-1 alone was energizing, since the temperature at its thermostat was colder than the temperature at the EUH-2 thermostat. To compensate for this condition, which would cause EUH-1 to bear most of the heating load, the EUH-2 thermostat should be set 1 or 2 degrees higher than the EUH-1 thermostat. The operator should pay close attention to this matter during initial operations, and make any adjustments necessary to ensure a balanced heating load on each heater.

The "Fan Only" switch will allow the unit fans on the unit heaters to run continuously. The heat recovery thermostats with capillaries mounted on the units, will allow unit fans to run when the ceiling temperature is above the setpoint.

Shutdown

During normal operations, EUH-1 will shutdown automatically based on the wall-mounted thermostat setting. If repair work or maintenance is being performed on EUH-1, circuit breaker No. 16 must be opened in the Distribution Panel.

7.2.3 *Building Ventilation System (EF-1 and L-1)*

Equipment Description

The Building ventilation system consists of exhaust fan EF-1, which is mounted high on the north wall of the Building, and motorized louver L-1, which is mounted near the bottom center of the west wall.

During warm weather, EF-1 is designed to cool the Building by drawing outside air through L-1. Detailed information regarding this equipment can be found in the manufacturer's O&M Manuals included in Appendix L to this Manual.

Exhaust fan EF-1 is a DOMEX belt-drive, Model WLB24, manufactured by Penn Ventilator Co., and is rated at approximately 5,240 cfm. EF-1 includes a gravity damper, an interior wall grille, and an exterior bird screen.

Louver L-1 is a Model E-280 motorized louver manufactured by Arrow United Industries, and includes a bird screen.

Instrumentation and Control

EF-1 is supplied with a cooling thermostat, which is wall-mounted on the central column of the south wall, next to the thermostat for unit heater EUH-1. This thermostat controls the temperature at which EF-1 turns on and off.

EF-1, L-1 and the cooling thermostat receive 120 VAC, single-phase power from a circuit breaker located in the Panel (PP-1).

EF-1 is wired to L-1 so that any time EF-1 is started, the motor operator on L-1 opens the louver blades, and holds the blades open while EF-1 is energized. When EF-1 shuts off, the L-1 louver blades close by spring action.

Exhaust fan EF-1 is equipped with an H-O-A selector switch, which is mounted on the front of the MCP. In "Hand" mode, EF-1 runs continuously. In "Auto" mode, operation of EF-1 and L-1 is controlled by the cooling thermostat. In "Off" position, EF-1 will not operate and L-1 remains closed.

Start-up

Exhaust Fan EF-1 should be started as follows:

1. Set cooling thermostat at 90°F.
2. Turn the EF-1 H-O-A selector switch to "Auto".

During normal operations, EF-1 will start when the Building temperature exceeds 90°F.

Operation

The cooling thermostat should be set at 90°F during initial Plant operations. If a lower Building temperature is desired while the Building is attended, the H-O-A selector switch should be set to "Hand" position. The Building, however, should never be left unattended with the H-O-A switch in "Hand" position.

If after a period of warm weather operation, a setpoint of 90°F is determined to be too high, the cooling thermostat can be lowered. The operator should be aware that lowering of the cooling thermostat setting will increase the running time of EF-1 and also increase power consumption costs.

The cooling thermostat should be set and left alone to the greatest extent possible. EF-1 should never be manually energized by lowering the thermostat setting, except if required to test the operation of the system.

Shutdown

During normal operations, EF-1 will shut down automatically based on the cooling thermostat setting. Because of the thermostatic control of the ventilation system, the EF-1 H-O-A selector switch can be left in "Auto" position year-round. If manual shutdown is required, turn the H-O-A selector switch to "Off" position. If maintenance or repair is required, open the circuit breaker in the Main Distribution Panel.

7.2.4 *Enclosure Air Conditioner*

Equipment Description

The air conditioning system in the building consists of a single enclosure air conditioning unit AC-1, which is mounted on top of the MCP, along the south wall of the building.

During warm weather, AC-1 is designed to cool the MCP to a pre-set temperature. Within the air conditioner, the recirculated clean enclosure air is kept separate from the ambient air flow system. This protects the electronic controls and prevents shutdowns caused by heat, humidity, dust or other contaminants.

Air conditioner AC-1 is a Model HB30-0616 enclosed air conditioner manufactured by McLean Midwest and is rated at 6,000 BTU/Hr. Detailed information regarding this equipment can be found in the manufacturer's O&M located in Appendix L.

Instrumentation and Control

AC-1 is supplied with a cooling thermostat, which is located on the side of the unit. This thermostat controls the temperature at which AC-1 turns on and off.

AC-1 and the cooling thermostat receive 115 VAC, single phase power from circuit breaker No. 1 located in the Distribution Panel.

During normal operations, AC-1 will start when the enclosure temperature exceeds the pre-set temperature.

Operation

The cooling thermostat should be set a 75°F during initial plant operations. If after a period of warm weather operation, the setpoint is determined to be too high, the cooling thermostat can be lowered. The operator should be aware that lowering the cooling thermostat setting will increase the running time of AC-1 and also increase power consumption costs. The cooling thermostat should be set and left alone to the greatest extent possible.

It has been recommended by the manufacturer that, initially, the filter and coil in the air conditioner be checked every two weeks to determine whether they need to be cleaned. This interval can be revised depending on how often the operator deems the cleaning of the filter and coil necessary.

Shutdown

During normal operations, AC-1 will shutdown automatically based on the cooling thermostat setting. If manual shutdown is required, the power switch can be selected to the "Off" position. If maintenance or repair is required, open circuit breaker No. 1 in the Panel (PP-1).

7.3 ELECTRIC POWER

Electric power, provided by Long Island Lighting Company (LILCO), is brought to the Plant by an overhead distribution system along The Place. Electricity is carried by the overhead distribution system to LILCO transformers mounted on a utility pole, which is located approximately 25 feet east of the Building. The power is transformed to 208-volt, 3-phase, 60-Hertz power, and is carried from the pole by conductors, through underground direct burial lines to the Building.

The electric power, then, is routed through a metering cabinet mounted on the south outside wall of the Building. From there, the power enters a 600-amp main disconnect switch in the Main Distribution Panel (MDP) which is mounted on the interior south wall of the Building. From this switch, the power is split to the different circuits, each with it's own circuit breaker, in the following manner:

- 100 amps is fed to a separate control panel (PP-1) from which items such as lighting and the A/C unit are fed power.
- 50 amps to each of the air strippers.
- 30 amps to each of the unit heaters.
- 40 amps to the Vapor Extraction Module (VEM).
- 30 amps to the Vapor Treatment Module (VTM).
- 15 amps to the effluent pump.
- 15 amps to the exhaust fan.
- 8 amps to each of the 30 Speed Indicator Controllers (SIC) for the ground water recovery wells.

Refer to Record Drawings E-1 and E-6 for detailed drawings of the electrical system.

A complete description of the Plant's electric power system is presented in Section 8.0 of this Manual.

7.4 TELEPHONE SERVICE

Telephone service is provided to the Plant by NYNEX. Three separate standard lines are mounted on the same utility pole that carries the electrical service to the Building. From the final utility pole east of the Building, the telephone service is carried aboveground to a NYNEX service box, which is mounted outside on the southeast corner of the building.

Currently, three telephone lines are in use at the Plant, for the following dedicated purposes:

- Plant Telephone [(518) 674-8930].
- Autodialer calling [(516) 674-8937].
- Security system callouts [telephone number is not identified in this O&M Manual for security reasons].

7.5 PLANT WATER SUPPLY

Plant water is provided from a well which is located remotely at the Konica facility. Water for Plant maintenance purposes is obtained through a 1½-inch diameter underground line which runs from the treatment building across the Site to the warehouse building, and is connected to an existing overhead water line inside the warehouse building. The routing of this line is shown on Record Drawing C-1. As shown on Record Drawing C-1, the water supply line enters the Plant at the south building wall. The water line contains a double check valve backflow preventer, at the point where the line enters the warehouse building. This is to protect the water source from any potential contamination.

The Plant water can be used for general Plant maintenance, and for the portable safety shower/eyewash station. **Even though well water is supplied to the Plant, it should not be used for drinking purposes.**

7.6 *FIRE PROTECTION SYSTEM*

The fire protection system consists of hand-held extinguishers located in the Building and outdoors at the VTM pad.

INFO TO BE ADDED...

7.7 *SECURITY SYSTEM*

As fencing surrounds the entire Konica Facility, the Plant and Remediation Area are protected from unauthorized entry.

A fire and theft security system has been installed in the Building and is monitored by ADT for fires and unauthorized entry into the Plant. The security system consists of various sensors. In the event that the system detects unauthorized entry or a fire, the system calls out to security over a dedicated telephone line.

For security reasons, no other details regarding the security system will be presented in this O&M Manual.

7.8 *WET WELL/STORM SEWER DISCHARGE*

7.8.1 *General Description*

The Plant was designed and constructed for the disposal of the treated ground water to a storm water sewer via a wet well tank. The storm water sewer catch basin is on "The Place" which is the road to the north of the Site. The local regulatory authorities approved the disposal of the treated effluent in this manner and it is unlikely that this will change in the future.

7.8.2 *Wet Well Tank*

Equipment Description

The tank is a 72-inch diameter, precast, reinforced 4,000 PSI concrete wet well with a tapered man access chimney. It is equipped with aluminum ladder rungs and butyl rubber joint seals. The tank is 72 inches deep and is designed to have a usable capacity of 1,000 gallons. The water enters the tank through 3" EFF-408-PVC6 and 3" EFF-609-PVC6 which are 3" diameter pipes connected to the air strippers and the floor drains and cleanouts, respectively.

The water is pumped from the tank by the pump P-602, which is a 2-inch 1 horsepower, 208 volt, 3-phase submersible pump. It is designed to operate at an inflow rate of 25 gpm. The effluent water is pumped from the tank to the storm sewer catch basin through pipe 3" EFF-610-PVC7. Details of the wet well are shown in Drawing P-2. Further details of the pump may be obtained from the manufacturer's O&M Manuals in Appendix L.

Instrumentation and Control

The instrumentation associated with the operation of submersible pump P-602 is discussed below. Refer to the P&I Record Drawings for a schematic representation of all tank piping and instrumentation.

Level switches LSL-6002 and LSH-6002 are mounted in the wet well. These level switches are adjustable for different height levels. These switches are connected to level controller LC-6002 which in turn is connected to pump P-602. When LSL-6002 is triggered the pump P-602 is switched off until the water reaches the level of LSH-6002 which then turns pump P-602 back on.

Level switch LSHH-6022 is also mounted in the wet well. This level switch is also height adjustable. If the water level reaches this height, LSHH-6022 sends a signal to level alarm LSHH-6002, which sends an alarm signal to the Autodialer and shuts down the air strippers, which in turn shuts down the ground water recovery system. The air stripper blowers will remain operating for a period of time based on the air stripper adjustable time delay in order to treat the process water remaining in the trays.

7.8.3 Storm Sewer Discharge

The submersible pump P-602 pumps the treated effluent via a 3-inch diameter EFF-610-PVC-7 line which runs from the wet well tank to the existing catch basin on "The Place". This 3-inch PVC pipe travels east from the wet well and then north to the catch basin, around the perimeter of the Remediation Area. Details of the thrust blocks along the effluent line and the inlet pipe to the catchment basin are shown, with other details of the effluent line, on Record Drawings C-1 and P-2. The storm sewer catch basin should be inspected periodically to determine if sediments from the wet well are accumulating which should be removed and disposed of accordingly.

8.0 PLANT ELECTRICAL SYSTEM

8.1 INTRODUCTION

Virtually the entire Plant utilizes equipment whose operation depends on electricity. Therefore, an understanding of the Plant electrical system is essential to Plant operation and maintenance. In this chapter, the Plant electrical system is described in detail. General electrical safety practices are also described in this chapter.

8.2 ELECTRICAL SYSTEM DESCRIPTION

8.2.1 Power Source

The Plant electrical requirements are provided by the Long Island Lighting Company (LILCO) primary overhead service feeder from The Place. Primary power is transformed to 208 VAC, 3 phase, 60 hertz secondary power by pole-mounted transformers located approximately 10 feet west of the Plant. Power from the transformers is carried by two sets of 4-350 MCM conductors to the metering cabinet mounted on the exterior south wall of the Plant. The main service conductors to the meter are underground direct burial cables.

8.2.2 Power Distribution

From the meter, electric power is distributed to the Main Distribution Panel (MDP). A 600 amp circuit breaker is located in the MDP.

Power is distributed to the MDP from the meter pan via two sets of 4-350 MCM conductors in a three-inch PVC conduit.

Within the MDP, 208/120 volt, 3 phase, 4 wire power is routed through the 600 amp main circuit breaker to a subdistribution panel, PP-1, used for the lights, automatic louvers and other miscellaneous circuits. The MDP also distributes power for the variable speed drive controllers (one breaker per five drives for a total of five breakers and thirty drives) the exhaust fan, the air strippers, the vapor extraction module, the vapor treatment module, the wet well effluent pump, unit heaters and the surge suppressor, all protected by individual 100 amp, circuit breakers. Refer to the MDP wiring diagram Record Drawings which show detailed power distribution and Plant wiring.

The Main Distribution Panel, MDP, and distribution panel, PP-1, are manufactured by Square D. The distribution of power is listed in Table 8-1. The available circuits may be expanded in the future if required, by feeding an additional secondary panel off of the remaining unused poles in the MDP. All existing circuits and power distribution are also illustrated on the Record Drawings.

8.2.3 Additional Circuits

Duplex receptacles are located throughout the Plant and exterior of the Plant to provide power during operation and maintenance tasks. Within the Plant, multiple receptacles are located on all walls and adjacent to doors. Outside the plant, a receptacle has been added to the Vapor Treatment Module control panel and in the yard near the eastern stockade fence wall adjacent the pond.

8.2.4 Lightning Protection

A lightning protection system has been installed on the Plant building structure in order to reduce the risk of damage to the facility due to a strike by lightning. The lightning protection system consists of six roof mounted lightning rods and two grounding rods located on the southwest and northeast corners of the building.

8.2.5 *Transient Protections*

Transient protection has been added to the control system in order to protect the variable speed drive controllers in the event of a lightning strike. A lightning strike may cause excessive line surges caused by electricity conducted through the ground back to the control equipment. Individual secondary arresters have been installed between the ground water recovery pump and the MCP mounted H-O-A switches for each variable speed drive controller. Secondary Arresters are 650 Volt, Tranquell Model 9L15EC and are described more fully in the Eagle Control, Inc. O&M Manual located in Appendix L.

8.3 *SYSTEM OPERATION AND CONTROL*

8.3.1 *General Discussion*

The Plant is controlled through various local control panels for individual equipment and also through the Main Control Panel, MCP. The MCP was provided by Eagle Control Corp. and the various local control panels; i.e., air stripper panel, were provided by their respective equipment manufacturers. The MCP contains the elapsed time meters, KQIR-3011 through KQIR-3301, the variable speed drive controllers, SIC-3011 through SIC-3301. It also contains the ground water recovery pump H-O-A switches, HS-3011 through HS-3301, the H-O-A switches for injection pump P-601, exhaust fan EF-1, wet well sump pump P-602 and the vapor separation module transfer pump P-501. Along side the above H-O-A switches is a high level silence button for the iron sequestering tank, TK-601A. The MCP also contains all alarm indication lights, test and silence buttons, the autodialer mounted on the cabinet's side, individual circuit breaker for each of the variable speed controllers and air conditioning unit mounted on top of the MCP.

strippers are provided locally at the individual pieces of equipment. The Vapor Separation Module (VSM) is provided with a local reset switch. Information regarding the above-referenced equipment including the MCP, VTM, VEM and VSM control panels has been included in the manufacturer's provided O&M manuals located in Appendix L.

8.3.2 *Operation*

The control switches for operation of the Plant are described in detail in Sections 7, 9 and 10 of this Manual.

It should be noted that the submersible ground water recovery pumps, P-301 through P-330, are provided with a safety disconnect switch located in each corresponding electrical handhole. This will allow the operator to ensure that the pump cannot be energized from the Main Control Panel, MCP, while maintenance is being performed on the pump or the well. This is an important safety feature, since the submersible pumps could otherwise start automatically or be started at the MCP while a pump is being repaired, which could result in serious injury. The submersible pumps are grouped onto circuit breakers within the MDP but have individual circuit breaker protection within the MCP. There are thirty (30) individual circuit breakers located on the rack above the variable speed drive controllers within the MCP.

NOTE: The submersible pump(s) <u>must</u> be shut off via the Hand/Off/Auto switches located on the MCP, and preferably by tripping the corresponding circuit breaker within the MCP, prior to opening the local safety disconnect switch. The respective Furnace speed controller may be <u>damaged</u> if the local disconnect switch is opened while the pump is running.

Before the repair or maintenance of any equipment items is performed, the associated circuit breaker must be opened in the distribution panel or within the MCP. Care should be taken to make certain that the power is properly disconnected, the appropriate circuit breaker is tagged "Out of Service - Do Not Use", and the unit is locked out of service before any maintenance or repair is attempted on any of the powered equipment. Refer to Section 8.5.4 for lockout and tagging procedures.

8.3.3 *Controls*

Specific controls for the Plant equipment are discussed in detail in each respective unit's subsection in Sections 7.0, 9.0 and 10.0. The basic controls and their respective functions are described as follows:

1. <u>Hand-Off-Automatic (H-O-A) Selector Switches:</u>

   Hand-Off-Automatic (H-O-A) selector switches provide manual operation in the "Hand" position and automatic operation in the "Auto" position. The unit is placed out of operation in the "Off" position. Normally, any equipment equipped with an H-O-A selector switch will be in the "Auto" position to allow the unit to be controlled automatically by the Plant instrumentation. The "Hand" and "Off" positions will normally not be used except during testing and service conditions. Placing the switch in the "Hand" position causes a piece of equipment to run continuously until the selector switch position is changed or until the equipment shuts down due to damage. Placing the switch in the "Off" position provides for manual stopping of the equipment.

   When an equipment item must be shut down for maintenance and/or repair, its H-O-A switch (if provided) should be placed in the "Off" position, the appropriate circuit breaker should be opened, and the local disconnect switch (if provided) should be placed in the "Off" position, to disconnect electrical power to the unit. The circuit breaker and disconnect switch should then be locked and tagged. Refer to Section 8.5.4 for lockout and tagging procedures. After the necessary maintenance and/or repairs are completed, the lock and tag should be removed from the circuit breaker and disconnect switch, and these switches should both be placed in the "On" position. The H-O-A switch should be returned to the "Auto" position, unless indicated otherwise in this Manual. Each submersible pump is provided with a local H-O-R switch in the corresponding electric handhole. The H-O-R switch is key operated and functions the same as the H-O-A described above but will operate automatically when in the "Remote" position.

2. <u>On-Off Selector Switches:</u>

An On-Off selector switch is provided for operation of vapor extraction blower, VEM-501. Normally, this switch will be in the "On" position. If a manual shutdown of the unit is necessary, the selector switch should be set to "Off" position, the circuit breaker opened and then locked and tagged. After necessary work is completed, the lock and tag should be removed from the circuit breaker, and the selector switch should be returned to "On" position. In the event of a shutdown due to an alarm condition, the "Reset" button will need to be pushed on this unit before the blower can be energized.

3. <u>Circuit Breakers and Fuses:</u>

Circuit breakers or fuse disconnects are provided in the MDP and MCP to protect the equipment against overloads by interrupting the flow of electricity. Disconnect switches are also located on the individual equipment control panels.

4. Indicator Lights:

Indicator lights are provided on the front of the MCP to indicate that individual piece of equipment is operating.

8.3.4 *Operational (Mechanical Equipment) Problems*

Problems associated with the MCP, distribution panels and local control panels will usually be evidenced by improper and/or lack of operation of the various pieces of equipment. The causes of the most common problems associated with these panels are listed below:

- Blown fuse. (Replace with fuse of correct size and type.)
- Disconnected (open) circuit breaker. (Reset breaker.)
- Corroded or shorted switch contacts. (Clean contacts.)
- Loose or broken terminal connections. (Tighten or repair.)
- Switches not set properly for operation. (Check control settings and adjust for proper operation.)
- Contacts for the controls dirty and arcing. (Clean contacts.)
- Wiring short-circuited. (Have qualified personnel inspect and repair.)

In all cases, if any major problem is experienced with one of the devices in the MCP or any other control panel, an experienced electrician should be called in to make the appropriate repairs. The power should be turned off prior to the disassembly of any electrical equipment, and the circuit locked and tagged.

8.4 *SYSTEM MAINTENANCE*

The procedures for establishing preventive maintenance check lists, scheduling, and performing preventive maintenance and repairs on all Plant equipment are set forth in Section 11.0 of this Manual. The specific maintenance considerations for the electrical control equipment are discussed in this section.

8.4.1 *Control Panel Inspections*

The control panels should be visually inspected monthly by the operator, for evidence of the operational problems listed in Section 8.3.3. Each piece of electrical equipment should be checked to be sure that it is operating as intended, and as explained in the applicable sections of Sections 7.0, 9.0 and 10.0.

8.4.2 *Control Panel Semi-Annual Inspections*

Every six months, the preventive maintenance inspection outlined in Table 8-2 should be conducted for the control panels.

8.4.3 *Preventive Maintenance of Electrical Equipment*

The following general check points and considerations should be addressed when establishing preventive maintenance task lists, schedules, and standard maintenance procedures for electrical systems and equipment:

Control Cabinets

Keep control enclosures free of dust and grease on the face of the panel as well as inside. Replace the air filter in the MCP air conditioning unit regularly. Dirt can cause faulty relay operation and can be a source of corrosion of metal parts. Connecting wires coming from conduits and cables should be neatly arranged at terminating points and laced into a fanned cable form opposite the terminals they serve. This saves time when looking for a wire during troubleshooting or replacement of circuits.

Cleaning

Keep motor controls clean. Dust, dirt, and grease must be removed periodically from the controllers. Dust or grease can become lodged in auxiliary relay contacts or interlocks and may prevent a circuit from functioning. In addition, dust may contain conducting materials, which could form unwanted circuit paths resulting in current leakage, possible grounds, or short-circuits. Blow out dust with dry compressed air and check the surrounding area for sources of dust, or corrosive vapors.

Mechanical Parts

Moving mechanical parts should operate easily without binding or excessive friction. Check operation of each contractor and relay by hand and, at the same time, look for loose pins, bolts, or bearings. Do not lubricate bearings. Bearings on electrical controls are designed to operate without lubrication. Oil or grease on the bearings will cause dirt to accumulate, resulting in sluggish action and possible failure.

Check terminal screws for tightness, since loose connections may develop at any time. Check main line connections and control connections on a regularly scheduled basis.

Contactors

Contactors need the most attention. Be sure contact springs maintain the proper contact pressure. If contacts are allowed to wear too thin, spring pressure decreases and overheating of the contact results. Check spring pressures. If pressure at one pole is considerably lower than that at other poles, the spring is weakened and should be replaced.

Do not file silver contacts. Replace them when they become severely roughened. Silver oxide, which sometimes forms on the contact surfaces, does not have to be removed because it is a good conductor.

Coils

Operating coils for AC contactors function satisfactorily over a range of 85% to 110% of their rated voltage. Higher voltages will cause coils to operate at a higher temperature, which results in a shorter coil life. In addition, the contractor or relay will operate with unnecessary force causing more mechanical wear and bounce when closing.

An excessively low voltage supply to a coil causes contactors and relays to operate sluggishly. Because of the weakened magnetic force, contacts may not "Make" firmly, which could result in overheating and welding together of contacts. Also, if the voltage is too low to allow complete closure of a contactor (or if the contactor or relay is blocked open), the coil will draw an excessively high current resulting in coil burn-out.

Overload Relays

To ensure reliable operation, relays should be tested and calibrated every one to three years. Special equipment is required for relay testing and an outside service company should be called in to perform the relay tests.

Fuses

Important steps in fuse maintenance include a periodic check of fuse clips to make sure that ferrules are in good contact with clips. Also look for corrosion or overheating at fuse clip. Hot fuses or clips usually indicate either poor contact or an overloaded fuse that may be close to blowing. A supply of fuses of proper ratings and types should be kept on hand for fast replacement of blown fuses.

Circuit Breakers

Molded case circuit breakers require little maintenance. They should be kept free of dust and grime to ensure proper mechanical operation. Inspect circuit breakers regularly, including dynamic tests. Check the tightness of all connections. Every three to four years, check operating trip settings with special load testing instruments. These tests may be performed by Konica maintenance personnel in accordance with manufacturer's recommended test procedures. When these tests are performed, it is advisable to load-test overload relays.

8.5 SAFETY PRACTICES

8.5.1 General Discussion

Ordinary 120 volt electricity may be fatal. Extensive studies have shown that currents as low as 10 to 15 mA can cause loss of muscle control and that 12 volts may, on good contact, cause injury. **Therefore, all voltages should be considered dangerous.** Most electrical systems at the Plant operate at voltages from 120 to approximately 208. All electricity should be treated cautiously and without guessing as to the nature of the electrical circuit.

Electricity kills by paralyzing the nervous system and stopping muscular action. Frequently, electricity may hit the breathing center at the base of the brain and interrupt the transmission of the nervous impulses to the muscles responsible for breathing. In other cases, the electrical current directly affects the heart, causing it to cease pumping blood. Death follows from lack of oxygen in the body. If contact with a live conductor occurs, the victim must be freed from the live conductor promptly by use of a dry stick or other nonconductor, or by turning off the electricity to the point of contact. Never use bare hands to remove a live wire from a victim or a victim from an electrical source. Next, cardiopulmonary resuscitation or artificial respiration should be applied immediately and continuously until breathing is restored or until a doctor or emergency medical technician arrives.

8.5.2 *General Rules*

Always assume a circuit is live unless it is positively known to be dead. The following are some general rules for electrical maintenance safety:

- Allow only qualified and authorized people to work on electrical equipment or perform electrical maintenance;
- Do not ground yourself inadvertently to water piping or other metallic equipment when working on or in contact with electrical equipment or wiring, and do not pass tools to or from, or otherwise touch a person who is grounded;
- Keep all electrical controls in safe working order, accessible, and well-marked;
- Keep wires from becoming a tripping hazard;
- Never use metal ladders, metal tape measures, or other metal tools around electrical equipment;
- Unless a wire is positively known to be dead, and it is impossible for it to become accidentally live again, handle it as though it were a live wire;

- When working around electrical equipment, keep your mind on the hazard at all times;
- Always work from a firm base as loss of balance may cause a fall on energized busses or parts, which should be covered with a good electrical insulator such as a rubber blanket; and
- No safety device should be made inoperative by removing guards, using oversized fuses, or blocking or bypassing protective devices, unless it is absolutely essential to the repair or maintenance activity, and then only after alerting the operating personnel and maintenance supervisor.

8.5.3 Working in Pairs on Energized Equipment

All electrical work on energized equipment should be performed by two or more workers. When two employees work together, one can double check the other, and there is always one employee available to de-energize circuits, apply first aid, or summon assistance in the event of an accident. Usually, there is sufficient work so that both employees may work simultaneously.

8.5.4 Lockout and Tagging Procedure for Electrical Circuits

The most important safety requirement in electrical maintenance is to have, and adhere to, a good system for locking out and tagging electrical circuits when equipment is being repaired. Unexpected operation of electrical equipment that can be started by automatic or manual remote control may cause injuries to persons in the immediate area of the energized equipment.

A lockout and tagging procedure involves opening circuits to isolate circuits from the energy source, and then placing a lock and tag on these circuits, lines, or equipment so that they are not activated while work is in progress on or inside them. This procedure must be followed by all personnel (employees and contractors) whose duties require them to work on or near electrical circuits; on or inside lines or vessels that contain, or have contained, hazardous material; or on or inside rotating or reciprocating equipment. In some situations, a work permit may be required in addition to locking out and tagging a piece of equipment.

General Procedure

The person who is to perform the work attaches a lock and tag at each control point of any circuit, machine, or unit that could affect the job. Therefore, each person who may do this work must always carry safety padlocks, multiple lockout clamps, and tags.

After a switch has been opened each person on the job must install a lock on the safety control point(s) and affix a tag with all the pertinent information filled in (e.g., circuit description, mechanic's name, time locked out, etc). As individual work is completed, mechanics must remove only their own locks and tags. If an employee is absent, only the missing employee's supervisor may remove the lock and tag. If one worker replaces another (by reason of transfer, shift change, etc.) before a work assignment is complete, the person going off the job removes their personal lock and tag only after the replacement person has attached a lock and tag at each control point.

Only one key should be issued for each lock. This will ensure that locks cannot be removed except by the person who places them. The operator should have a master list of key numbers and should keep an extra key to each lock. **In no case should the operator lend his master key.** Locks may be painted various colors to indicate types of craft or to differentiate assignments. Each lock should be stamped with the employee's name or clock number, or a metal tag should be attached.

The following lockout procedure must be followed by maintenance personnel:

- Alert the operator that work will be performed and that lockout/tagging will be implemented.

- Before starting work on an engine, motor line shaft, power transmission equipment, or power-driven machinery, make sure it cannot be set in motion without your permission;

- Place your own padlock and tag on the control switch or lever, even if someone has locked the control before you. You will not be protected unless you put your own padlock on it;

- Stored electrical energy which might endanger personnel must be released. Capacities must be discharged and high capacitance elements must be short-circuited and grounded.

- Stored non-electrical energy in devices that could re-energize electric circuit parts must be blocked or relieved to the extent that the circuit parts could not be accidentally energized by the device.

- No work may occur on or near de-energized circuits or equipment until the equipment or circuit is verified to be de-energized by a qualified person.

  - Verification of equipment de-energizing consists of a qualified person operating equipment controls or otherwise ensuring that the equipment cannot be restarted.

  - Verification of circuit de-energizing consists of a qualified person using test equipment. The test equipment must be employed to ensure that all circuit elements and electrical parts of equipment are de-energized prior to employee exposure. The test must also determine if any recognized condition exists as a result of inadvertently induced voltage or unrelated voltage back-feed even through specific parts of the circuit have been de-energized and presumed to be safe.

- All affected personnel must be notified of the status of de-energized equipment during shift changes to ensure continuity of lockout and tagging protection for off-going and on-coming employees.

- When through working at the end of your shift, remove your padlock and tag, never permit someone else to remove them for you, and be sure you are not exposing another person to danger by removing them; and

- If you lose the key to your padlock, report the loss immediately to your supervisor and obtain a new padlock.

8.5.5 Backfeed

Precautions should be taken to make certain that there is no possibility of backfeed on a de-energized circuit. Backfeed can occur from the following sources: a tie with another electrical source; a control circuit that is interlocked with a control circuit fed from another source; the high voltage side of a potential or control transformer that is not disconnected from the bus or the low voltage side of the transformer that becomes energized from an extraneous source acting as a step-up transformer and energizing the bus at a high voltage.

8.5.6 Transformers

Transformers may retain lethal energy after the primary disconnect is de-energized. Therefore, transformers shall be tested to assure that they have "unloaded" before attempting to alter or adjust terminal lugs.

TABLE 8-1
CIRCUIT BREAKER DISTRIBUTION PANELS

Main Distribution Panel, MDP					
Circuit Breaker	**Description**	**AMPS**	**Circuit Breaker**	**Description**	**AMPS**
1	PP-1	100	2	Panel Protection	
3	D1 Drives	50	4	Spare	
5	D2 Drives	50	6	VTM-501	60
7	D3 Drives	50	8	D5 Drives	50
9	D4 Drives	50	10	D6 Drives	50
11	Exhaust Fan	15	12	VEM-501	40
13	STR-401 & 402	50	14	Eff. Pump, P-602	15
15	Spare		16	West Heater	30
17	Spare		18	North Heater	30
Distribution Panel, PP-1					
1	MCP Air Cond.	20	22	MCP 22	20
2	GFI, Pond Recp.	20	23	Spare	20
3	Spare	20	24	Spare	20
4	Emerg. Lights & Exit Lights	20	25	Spare	20
5	MCP 5	20	26	Spare	20
6	Outlets West Wall	20	27	Spare	20
7	MCP 7	20	28	Spare	20
8	Outlets East Wall	20	29	Spare	20
9	MCP 9	20	30	Spare	20
10	MCP 10, Mtr. Pump, P-501	20			
11	MCP 11	20			
12	Inside Overhead Lights	20			
13	MCP 13	20			
14	Outside HPS., Photocell	20			
15	Outlets North Wall	20			
16	Outside HPS, Dock Photocell	20			
17	MCP 17	20			
18	Spare	20			
19	Fire Alarm	20			
20	MCP 20, Annunciator	20			
21	Spare	20			

TABLE 8-2

SEMI-ANNUAL PREVENTIVE MAINTENANCE INSPECTION FOR MAIN CONTROL PANEL

WHAT TO INSPECT	WHAT TO INSPECT FOR
Exterior and Surroundings	Dust, grease, oil; high temperature; corrosion; mechanical damage; condition of gaskets, if any.
Interior of Panel	Same as above, plus inspect for loosened and missing enclosure nuts, bolts, and other mechanical connections.
Contactors, relays, solenoids	Check control circuit voltage, inspect for excess heating of parts evidenced by discoloration of metal, charred insulation or odor; check freedom of moving parts; remove dust, grease, and corrosion; tighten loose connections.
Contact tips	Check for excessive pitting and roughness. Do not file silver contacts.
Springs	Check contact pressure. Pressure must be the same on all tips.
Flexible leads	Look for frayed or broken strands; be sure lead is flexible - not brittle.
Arc chutes	Check for breaks or burning.
Bearings	Check for freedom of movement; do not oil.
Coils	Look for signs of overheating, charred insulation, or mechanical injury.
Magnets	Clean faces; check shading coil, inspect for misalignment bonding.
Fuses and fuse clips	Check for proper rating; check fuse clip pressure.
Overload relays	Check for proper heater size; tighten coil connections; inspect for dirt and corrosion.
Pushbutton and selector switches, and pilot devices	Check contacts; inspect for dirt, grease, and corrosion.
Dashpot-timers	Check for freedom of movement.
Resistors	Check for signs of overheating; tighten loose connections; tighten sliders.
Connections	Tighten main line and control conductor connections; look for discoloration of current carrying parts.
Control operation	Check sequence of operation of control relays; check contactors for flash when closing, and adjust to eliminate contact bounce if necessary; check pressure switches, temperature switches, etc.

9.0 UNIT PROCESS OPERATION

9.1 Introduction

A general overview of the Plant is presented in Section 1.0. In this Section, the unit processes are described in detail, including the design basis, equipment descriptions, instrumentation and control, start-up and operation. The information provided in this Section should be used for general guidance concerning the operation of the equipment comprising each of the unit processes. This information is intended to supplement, not substitute for, the information contained in the individual operation and maintenance manuals provided by the major equipment manufacturers. The manufacturer's manuals are included in Appendix L, which is the last appendix to this Manual, and should be consulted for specific equipment operation and maintenance instructions. The Plant personnel must familiarize themselves with each manufacturer's operation and maintenance manual prior to operating any item of equipment.

Section 10.0 provides a general overview of the Plant control panel and summarizes the Plant instrumentation, alarms, and autodialer alarms.

Numerous references are made throughout this Section to valves, which have been referenced according to the Plant Process and Instrumentation Record Drawings (Drawings PID-1 through PID-7) on which the valves are shown. For example, Valve no. 401-8 refers to the valve on ground water recovery line no. 401, which can be found on Drawing PID-4. All Plant valves are shown on the Process and Instrumentation Drawings included in Appendix B. A complete Valve Schedule is also included in Appendix E.

The main Sections of this Section are organized by major unit process and are presented in the approximate order of the process flow. These Sections are as follows:

9.2 Ground Water Recovery System
9.3 Ground Water Treatment System
9.4 Vapor Recovery and Treatment System

Each Section of this Section includes sub-sections which discuss the equipment, instrumentation and control, procedures for start-up, operation, and shutdown, and any special considerations, such as bypass procedures.

Each Section also discusses the operating parameters which affect each of the processes. The operator should be aware that the operating parameters may change as influent ground water and vapor characteristics change. The operator must also learn to anticipate problems and determine appropriate actions in order to correct operating problems as they occur.

9.2 GROUND WATER RECOVERY SYSTEM

9.2.1 Design Basis

The design basis for the ground water recovery system is described in this Section. Due to the heterogeneity of the aquifer formation, between 0.4 and 0.75 gpm was extracted from recovery wells during the pilot test conducted at this Site. The drawdown data generated by the test was analyzed using the straight-line method of Cooper and Jacob (1946). A second confirming analytical method was applied to the pilot data using the program WELFLOW (Walton, 1987). The results for the analysis yielded aquifer parameters of K (hydraulic conductivity) = 0.5 feet per day and S (Storativity) = 7x10-3 (dimensionless). This data, coupled with a specific capacity of 0.1 feet per foot of drawdown, suggested that significant dewatering of the source area (up to ten feet) could be accomplished with a relatively low ground water withdrawal rate. A dewatering grid system for the Site was selected utilizing 30 withdrawal points pumping at a combined rate of 14 gallons per minute (gpm).

The expected recovery rate from each of the recovery wells would be from 0.5 to 1.0 gpm. Submersible pumps were selected which could pump at low flow rates to match the remediation area yield. Variable speed pumps were chosen so that the pumping could occur on an almost continuous basis, which will ensure a more efficient recovery effort. The pumps are controlled by water level probes in each recovery well to turn the pumps on and off. The use of the variable speed pumps enables the speed of the pump to be increased or decreased based on the water level in the well and the overall run time of the pump. The object of the ground water recovery is to dewater the remediation area and maintain a depressed water table in order to achieve optimal remediation through the vapor recovery and treatment systems.

Recovered ground water from each well is pumped through a lateral piping system to a single header which enters the north side of the treatment building. See Record Drawings P-1 and PID-3 for locations and sizes. Each pump discharge riser is equipped with a check valve to prevent backflow to the well if it is de-energized.

Upon entering the treatment facility, the recovered ground water first passes through a static mixer intended to mix injected iron sequestering agent then by a pressure switch intended to protect the line from over pressurization. The flow then passes through a duplex filter and a flow element and finally through a second static mixer to blend condensate from the vapor extraction system moisture separator prior to entering the air stripping equipment for treatment.

9.2.2 Equipment Description

9.2.2.1 Ground Water Recovery Pumps

Thirty (30) submersible pumps are used to pump ground water from the ground water recovery wells designated WRW-301 through WRW-330. Each pump is assigned a tag number from P-301 to P-330 corresponding to the water recovery well in which it is situated.

Each recovery well contains one pump. All pumps are Model 5E5 Redi-Flo4 pumps manufactured by Grundfos Pumps Corp. of Clovis, CA. Each pump is powered by an individual variable speed drive which is described below.

9.2.2.2 Static Mixer SM-401 and Iron Sequestering System

The ground water recovery system is provided with provisions to alleviate and reduce the efforts caused by high concentrations of iron (Fe), magnesium (Mn) and hardness as $CaCO_3$. In addition to the mechanical cleanouts located throughout the ground water recovery system pipelines, an iron sequestering system including a 500-gallon storage tank, metering chemical injection feed pump and in-line static mixer are utilized to help keep facility maintenance to a minimum.

Static mixer, SM-401, is a 3-inch, Schedule 80 PVC mixer with full length integral mixing elements. The static mixer is Model 3 KME-PVC 6 manufactured by Chemineer and includes a 1/2-inch flanged injection port for the introduction of metered iron sequestering agent. A second and identical static mixer SM-402 located further down the line is utilized to mix and dilute condensate collected in the moisture separator in the vapor recovery system. The condensate from the moisture separator will be pumped at a low rate into the ground water recovery header prior to the air stripping phase of ground water treatment and will consist of very dilute concentrations of contaminants. It is not expected that the condensate will contribute any significant loading on the air stripper treatment phase. If it is found that the condensate does contain high concentrations of contaminants during initial sampling, the injection flow rate may be reduced to a minimum or the condensate may be containerized and properly disposed of or treated accordingly.

The iron sequestering agent storage tank TK-601A is a 500-gallon cross linked polyethylene storage tank with a 500-gallon cross linked polyethylene secondary containment tank. The iron sequestering agent is a sodium polyphosphate solution known as Aqua-Mag and is not a regulated solution (see Appendix L for material safety data sheets). However, a secondary tank has been installed for spill containment. The quantity of solution is monitored by an ultrasonic continuous level transmitter, LE-6001, and is indicated in inches at the control panel by a digital level indicator, LIS-6001. The total gallons remaining in the tank may be calculated by multiplying the inches of solution left in the tank indicated by instrument LIS-6001 by the constant 7.1. Thus:

Gallons of solution remaining = inches in tank x 7.1

A tank capacity conversion chart is also available from the tank manufacturer.

A high level alarm circuit is also provided for the iron sequestering solution tank to help prevent overfill during product deliveries. High level alarm LSHH-6001 provides for an audio and visual alarm outside the Plant at the truck fill area. A silencer is provided to stop the audio signal but the alarm light will remain energized until the tank fluid level drops below the high level alarm setpoint.

9.2.2.3 High Pressure Switch PSH-4000 and Pressure Safety Switch PSV-4001

A high pressure switch, PSH-4003, and pressure safety valve PSV-4001 are installed on the ground water recovery header to help protect the system. The pressure safety valve PSV-4001 releases air trapped in the system during shutdowns, repairs and during normal operation of this system. The high pressure switch, PSH-4003 has an adjustable high pressure setting and independent low pressure setting.

Upon system pressure reaching the high pressure setpoint of the pressure switch, a high pressure alarm is initiated at the control alarm panel and the ground water recovery pumps are de-energized. Subsequently, when the pressure in the header reduces to the setpoint level, the pumps will be re-energized and come back on-line. The high pressure setpoint should never exceed 60 psi or 140 ft. w.c. (water column). This corresponds to the dead head of the submersible pumps when operated at 80 hz. For higher frequencies of operation, the pump manufacturer should be consulted.

The low pressure setpoint of pressure safety switch PSH-4003 is currently set at 0 psi. The reason the setting is at its lowest is to ensure that the ground water recovery system does not re-energize until all the pressure in the line is dissipated. Presently, there are no provisions to lock out the ground water recovery system if a high pressure shutdown occurs. Setting the low setpoint to 0 psi helps prevent restart if there is a system problem. If this protection is found not to be adequate during future operation of the Plant, a pump lock-out (manual restart required) may be wired into the circuit.

Pressure Safety Valve, PSV-4001, has been located downstream of the basket strainers (duplex filter) and at an elevation above the system flow meter. This valve will remove any air trapped in the system during Plant startup and subsequent Plant operation activities. By removing air from the ground water recovery system, various systems, will operate more effectively, i.e., flow meter, and the possibility of pressuring a compressible gas and causing potential injury is reduced. There are no adjustable setpoints associated with this valve.

9.2.2.4 Duplex Filter F-401

A duplex filter (basket strainer) assembly has also been included on the ground water recovery header in the Plant and is designated as Duplex Filter, F-401. The basket strainer has been sized to remove particles down to 1/16 inch in order to reduce solids deposits onto the air stripper treatment trays. It is expected that smaller particles will be present in the process stream but quantities will reduce over time. In order to keep pressure head on the ground water recovery pumps to a minimum, the above strainer size was selected. It should be noted that if found during operation, the strainer mesh size is too large or small, the baskets can be replaced with more appropriately sized mesh baskets.

The duplex filter, F-401, provides for uninterrupted process flow by adjusting the integral lever toward either basket for individual flow to allow removal and service of the opposing basket. It is not recommended to operate the system with the lever set in the center between each basket. The lever should remain toward one basket or the other. Note that the basket located under the lever is the basket in operation.

9.2.3 Instrumentation and Control

9.2.3.1 General

Each well is isolated in the field with a buried ball valve located within a valve box for access. A local electrical handhole is also located at each well containing individual local key operated, hand/off/remote switches and water level controllers. A hand/off/auto switch is located on the main control panel MCP for each well pump. In hand operation, the pump will operate regardless of water level status in the specific well. Special care should be taken not to run the pumps dry.

In "auto" operation, the ground water recovery system is fully operational as long as no alarm conditions are encountered.

The ground water recovery system is interlocked with the ground water treatment system, primarily the air strippers. If for any reason the air strippers are shut down, the ground water recovery system will, in turn, shut down. The ground water recovery system will automatically restart if the treatment system conditions are reset to an "in operation" mode.

9.2.3.2 *Control*

The operation of the pumps are controlled and monitored by the variable speed drives, individual hand/off/auto switches and elapse time (run time) meters. The hand/off/auto switches are located on the main control panel face. A green light indicates the pump is energized. The control of all 30 pumps is identical, except for a few setpoint values. Therefore, the control of only Pump P-301 will be discussed below. See PID-3 for a general graphical description of the pump and well configurations.

LSH-3011 and LSL-3011: Level Switches

The ON/OFF operation of ground water recovery well Pump P-301 is controlled through high and low level switches located in the well. There is excess cable leading to the switches to allow height adjustment of both sensors within the well which allows the operator to control the deadband between the probes. This, in turn, allows control of Site dewatering. These probes are wired to controller LC-3011 located in the electrical handhole adjacent to the well.

HS-3011 - Hand Switch

A key operated hand/off/remote switch is located in the local electrical handhole adjacent to the well allowing electrical isolation of the well. When the local hand switch is in the remote position, the hands/off/auto switch located in the main control panel has priority. If the hand switches are positioned to enable hand operation, the pump will not de-energize upon low water level by LSL-3011 and will continue to operate. **If the "local hand**

switch" is set to "off" while the corresponding speed controller is operating, the controller may be damaged.

SIC-3011 - Speed Indicator Controller

Speed indicator controller or variable speed drive unit (drive) SIC-3011 is a Furnas-VeeArc Drive, Model Micro 5000 with Option Card 77NG1 to run the auxiliary elapsed time meter designated KQIR-3011 on the PID drawings. The variable speed drive is an adjustable speed AC drive controller which includes a programmable keypad used to adjust all the drive's setpoints. Transient surge protection has been installed in line with the drive for additional protection. The drive, surge protection and elapsed time meter are located at the main control panel. The elapsed run time meters are resettable from the face of the control panel but may be locked so that they are not reset accidently. Individual circuit breakers also located in the control panel on the rack above the drives to allow individual on/off and protection of each drive in addition to the main circuit breakers.

The elapsed time meters or run time meters are used to optimize the operation of the ground water recovery pumps and thus the dewatering of the remediation area. The run time in conjunction with the speed setting of the drive in hertz are recorded on Figure 5-1 (see Section 5.0). This figure automatically calculates the Percent Time Running and The Drawdown Rate when the appropriate data is input into the program. By reviewing the trend in these parameters, a determination may be made to adjust the set speed of the variable speed drive unit in order to maximize the dewatering of the remediation area. Consult the manufacturer's supplied documentation in Appendix L for additional operating parameters and setpoints that may be adjusted within the drive unit.

9.2.4 *Start-up*

9.2.4.1 *Procedures*

The procedure for startup of the Ground Water Recovery system is as follows:

Start-up Prerequisites

1. Verify that the sump pump (P-602) is ready for automatic operation.
2. Verify that the air strippers (STR-401 & STR-402) are ready for automatic operation.
3. Verify that the Vapor Treatment Module (VTM-501) is ready for automatic operation.
4. Confirm that the Main Control Panel is powered and the air conditioner unit is operational.
5. Confirm that all the H-O-A switches located on the panel for the ground water pumps are in the OFF position.
6. Confirm that all circuit breakers for the variable speed drive units are in the ON position.
7. Confirm that all the local H-O-R switches at each ground water well are in the remote position.
8. Confirm that all the local disconnect switches at each ground water well are in the ON position.
9. Verify that the individual ground water well high and low level switches are operable.
10. Verify that the Furnas variable speed drives are programmed and prepared for operation.

Start-Up

1. Open the buried local ground water well isolation valves with the valve operator key.
2. Open the process water line valves 314-3 & 401-8.

3. Prepare the iron sequestering system for operation if required.

4. Start the vapor treatment module if required.

5. Start the air stripper system.

6. Sequentially place the individual panel mounted ground water pump H-O-A switches into the AUTO position allowing 5-10 seconds minimum ramp up time between energizing pump starts.

7. Note the process line header pressure.

8. Note the process flow.

9.2.4.2 *The Procedure for Start-up of Miscellaneous Equipment Items*

(See Section 7.0 for additional information regarding these items.)

A. Exhaust Fan (EF-1)

1. Test rotation.

2. Test thermostat by setting temperature to 90°F.

3. Place H-O-A switch at Control Pan in AUTO position.

4. Close exhaust fan safety disconnect switch.

5. Gradually lower setting of thermostat. Verify fan and louver opens automatically.

6. Gradually increase thermostat setting. Verify fan stops automatically and louver closes.

7. Leave thermostat set at 90°F.

B. Electric Unit Heaters, (EUH-1 and EUH-2)

1. Review unit heater manufacturer's O&M Manual instructions.

2. Set individual unit heater thermostat to 50°F.

3. Switch appropriate circuit breakers ON.

4. Raise thermostat setting until heaters activate.

5. Lower thermostat setting until heaters de-activate.

6. Finalize setting for unit heater thermostat at approximately 50°F to 60°F

C. Safety Shower and Eyewash

1. Open valves 601-1, 2, 3 and 4 and 602-1 on the potable water feed line to the shower.

2. Pull the safety shower handle and observe if water flows out of the head.

3. Pull the eyewash lever and observe if water flows out the eyewash spigots.

9.3 GROUND WATER TREATMENT SYSTEM

9.3.1 Design Basis

The design basis for the ground water treatment system is described in this Section. It was determined through ground water sampling data that recovered ground water would require treatment to remove VOCs prior to its discharge in order to meet surface water discharge requirements. Several methods of treatment including utilizing activated carbon adsorption, were reviewed and air stripping was determined to be the most appropriate and cost effective system.

During previously conducted pilot work at this Site, it was observed that iron would be present in the recovery process water. As a result, a pair of low profile air strippers, designated on Record Drawing PID-4 as STR-401 and STR-402, were sized and selected. The selection of the air stripper manufacturer was based on the effective contaminant removal efficiency and the ability of the equipment to be controlled, monitored and maintained. Two low profile air strippers were installed with the capability of being operated in either series or individual operation. Low profile air strippers inherently exhibit reduced fouling as caused by iron due to the large air passages located in the contaminant media transfer trays. The "Shallow Tray" air strippers have the capability of being dismantled tray by tray in the Plant. A chain hoist has been installed over the equipment to assist tray removal and replacement efforts. The air strippers are also equipped with multiple cleanout ports to aid in cleaning. These ports may be accessed without removing the individual trays. See Appendix L for specific operation and maintenance information provided by the manufacturer.

Two air strippers were selected in order to provide the flexibility that would be needed during cleaning of the strippers due to iron depositing and building up inside the air strippers. As contaminant concentrations in the ground water decrease, it may only be required to operate one stripper at time. This will allow the maintenance of one stripper to be conducted while permitting the other to operate providing for continuous dewatering of the remediation area.

9.3.2 Equipment Description

9.3.2.1 Low Profile Air Strippers, STR-401 and STR-402

Two air strippers are used to treatment ground water recovered from the remediation area. The air strippers are "Shallow Tray" Model 2341 and were manufactured by N.E. Environmental Products, Inc., West Lebanon, New Hampshire. The Shallow Tray Air Strippers have been installed to remove dissolved VOCs from the recovered ground water. Each air stripper is equipped with a 5 horsepower air blower which provides a minimum of 300 cfm of fresh air from inlets located outside the treatment building through each air stripper. The recovered ground water is pumped counter-currently through each air stripper to provide the optimum mass transfer of the contaminants from the liquid to the air phase.

While in series operation, the flow of recovered ground water is pumped through the first air stripper by the ground water recovery pumps and is then pumped to the second air stripper via a 1.5 horsepower transfer pump mounted on the air stripper skid. After passing through the second air stripper, the treated ground water is pumped via another 1.5 horsepower transfer pump to a wet well. The wet well is located below grade in the oxidizer yard on the east side of the Plant.

The off-gas from the air strippers is then combined and discharged to either the atmosphere or to the vapor treatment system. This determination is dependent on the current contaminant concentrations of the air stripper off-gas. The Vapor Treatment Module (VTM) air treatment system is discussed in Section 9.4. The wet well is discussed in Section 7.8. The discharge route of the air stripper off-gas is determined by opening or closing Valve no. 404-3 for discharge to the atmosphere or Valve no. 405-1 for discharge to the VTM.

To minimize iron fouling of the ground water treatment equipment, an iron sequestering agent (a liquid polyphosphate blend) is pumped into the process flow. The iron sequestering system is discussed in Section 9.2.2.2.

Even with the addition of the iron sequestering agent to the process stream, periodic cleaning of the air strippers will be required. The frequency of cleaning is dependent on the concentrations of iron, iron-consuming bacteria, manganese and calcium carbonate in the ground water. The frequency of cleaning should be determined in the field by observing the amount of scaling occurring throughout the ground water recovery and treatment systems. All rotating parts and accessories should be inspected. Frequency of inspection should be weekly at first in order to establish the schedule. Refer to Shallow Tray Manufacturer's O&M and video tape for instructions on cleaning the unit.

9.3.3 *Instrumentation and Control*

9.3.3.1 *General*

Each air stripper is piped in the field to permit either series or independent operation. By opening or closing the appropriate valves, (see Record Drawing PID-4) the desired flow routing may be achieved. During series operation, both air strippers are tied electronically to each other. The operation of one air stripper is dependent on the other. If one encounters an alarm condition, both will shut down. During independent operation, this is not the case. Both air strippers are operated through one local control panel mounted on air stripper STR-401. Individual or Series operation of the air strippers is obtained by jumping specific circuits within the local air stripper control panel. The ground water treatment system may be interlocked to the vapor treatment system through a switch located in the local air stripper control panel. The switch is marked "bypass" and "oxidizer". If the off-gas from the air stripper(s) is being discharged to atmosphere, the interlock switch should be set to "bypass". This allows the air stripper(s) to operate independently of the vapor treatment equipment. The air stripper(s) will not shut down on an alarm from the vapor treatment equipment. If the interlock switch is set to "oxidizer", the air stripper equipment and subsequently the ground water recovery system will shut down and lock out on an alarm from the vapor treatment equipment.

9.3.3.2 *Control*

The operation of the air strippers is primarily controlled through the local control panel. The local control panel provides visual indications of High Sump Level and Low Air Pressure for each air stripper. It also provides an On/Off switch for each air stripper blower and a Hand/Off/Auto switch for each air stripper outlet transfer pump along with a main disconnect switch for the whole system.

9.4.2 *Equipment Description*

9.4.2.1 *Vapor Recovery Well System*

The vapor recovery well system consists of the twelve (12) vapor extraction wells and eighteen (18) passive air injection wells. Typical construction details for the vapor recovery wells and the passive air injection wells are shown on Record Drawings PID-2 and PID-7, respectively. The vapor recovery wells are constructed with 8-inch diameter handholes to gain access to the well head. Each well is capped with a removable cover to allow depth to water measurements.

Also part of the vapor recovery well system are 18 passive air injection wells positioned within the remediation area to allow fresh air to vent into the subsurface (atmospheric vents). These wells help prevent dead spaces within the remediation area and provide enhanced air flow to improve volatization of VOCs. A supplementary benefit is that by introducing atmospheric air to the contaminated soil, bioremediation will be enhanced to further accelerate remediation. There are two configurations of passive air injection wells. Each configuration provides for measuring vacuum response and taking depth to water measurements. On one configuration, the gooseneck above the surface of the remediation area has been offset horizontally by teeing into the well casing below the ground surface and running a lateral pipe to a remote and protected area. This was done so that the gooseneck would not interfere or be damaged by cars in the parking lot above the remediation area. All passive air injection wells have been protected by corrugated parking barriers.

Each of the twelve (12) vapor recovery lateral recovery lines extend into the Plant and are fitted with individual manually operated flow control valves. They are also constructed with individual sampling ports and flow indicating gauges to monitor individual and combined air flow recovered from the wells. An atmospheric dilution air line is tied to the vapor recovery header to allow

The High Sump Water Level and the Low Blower Air Pressure indicating lights are activated in the event either of those situations occurs. High and low water level float switches are located in each air stripper sump in order to control the operation of the transfer pumps as discussed in Section 9.3.2.1. A low air pressure switch PSL-4001 and PSL-4002, respectively is located in each air stripper in order to shut down the air strippers if low blower pressure is encountered. The pressure switch is set between 0.3 and 1.6 inches, water column. High water level switches LSH-4001 and LSH-4002, respectively are located in each air stripper in order to shut down the ground water recovery and treatment system if high sump level is encountered.

If a high water level, LSHH-6002, as described in Section 7.8, is encountered in the wet well, both air strippers will be automatically shut down along with the ground water recovery system which is required to be reset manually.

9.3.4 *Start-up*

9.3.4.1 *Air Stripper Start-up Procedures*

The procedure for the start-up of the ground water treatment system, air strippers STR-401 and STR-402 is as follows:

<u>*Prerequisites*</u>

1. Verify that the fresh air intake is clear of obstructions and the intake damper is open.

2. Verify that the wet well sump pump is operational. Refer to Sump Pump Start-up Section 9.3.4.2.

<u>*Start-up*</u>

1. Verify that the air stripper sump level float switches are operating.

2. Prime the water discharge pumps with clean water in the pump's discharge nozzle until it has filled the entire pump chamber.

Air stripper control panel is currently configured to operate in series such that start-up of the two air strippers should be conducted simultaneously assuming configuration has not been revised.

1. Process flow direction will be from Air Stripper STR-401 to STR-402.
2. Open isolation valve no. 314-3. Close valve 314-4, open valves 401-4, 401-8, 403-2, 408-7, 409-1, 408-8 & 408-4. Close all sample taps and valve nos. 605-1, 401-1, 401-3, 401-5, 401-6, 502-1, 408-5 & 403-3.
3. Close the air stripper sump tank drain valve and discharge sample valve.
4. Open the sump tank sight tube valve.
5. Verify that the circuit breaker at the panelboard is in the ON position.
6. Check the air pressure in the sump tank. Adjust the blower damper so that the air pressure is at least 15 inches W.C.
7. Follow the manufacturer's start-up instructions located in Appendix L.

9.3.4.2 *Procedures*

The procedures for the start-up of the wet well Sump Pump P-602 is as follows:

Startup Prerequisites - Sump Pump P-602 will pump treated air stripper sump water and/or water from floor drains to the local street storm sewer catch basin.

1. Verify that the pump is properly lubricated and prepared for operation in accordance with the Ebara O&M Manual.
2. Wet well must have sufficient water depth to operate pump.
3. Verify that level switches LSHH-6002, LSL-6002 & LSH-6002 are operational.

4. Verify that pump HOA switch located at the main control panel is in the OFF position.

<u>Start up</u>

1. Water must be provided from either the treatment facility floor drains or from the air stripper sumps. This water may be either pumped or provided via gravity flow.

2. Position the air stripper(s) sump discharge piping to provide water to the wet well. The appropriate valve status should be used depending on the air stripper sequence. See Air Stripper Start-up Section 9.3.4.1 for valve status schedule.

3. Fill the wet well with plant water to a point just below the high water level switch through a floor drain using the utility station hose by opening valves 601-1, 601-2, 601-3 and 602-1.

4. Place the pump safety/disconnect switch located on the side of the stripper panel in the ON position and the HOA switch in the AUTO position.

5. Continue to fill the wet well until the high water level LSH-6002 switch turns the pump on. When the pump starts, observe the discharge in the catch basin. Pump until only water is pumped (no air is sputtering).

6. Stop adding fresh water to the wet well by closing valve 602-1.

7. Check automatic pump stop with LSL-6002.

8. Check high wet well alarm level LSHH-6002 when autodialer contact LAHH-6002 is operational.

9.4 VAPOR RECOVERY AND TREATMENT SYSTEM

9.4.1 Design Basis

The design basis for the vapor recovery and treatment system is described in this Section. The vapor recovery and treatment system consists of vapor recovery wells, passive air injection wells, a moisture separator, a vapor extraction vacuum blower and the vapor treatment module (VTM) catalytic oxidizer.

Based on the results obtained during the pilot test at this Site, it was determined that approximately 20 cubic feet per minute (cfm) could be recovered from each recovery well at an applied vacuum of 40 to 60 inches of water column. Under these conditions, an effective radius of influence (EROI) in the remediation area of approximately 70 feet could be achieved. To be conservative in ensuring complete coverage of the contaminated area, an EROI of 50 feet was used for design of the system and selection of the proper equipment. Based on these parameters, a network of twelve (12) vapor recovery wells and eighteen (18) passive air injection (passive air inlet) wells were installed throughout the remediation area. Locations of these wells can be found on Record Drawings C-1 and P-1.

The twelve (12) vapor recovery wells designated VRW-201 through VRW-212 are individually piped to the Plant through twelve (12) lateral copper lines. Copper was chosen because it is relatively easy to work with and offers high chemical integrity in the event the recovered contaminants are concentrated in any condensate that may accumulate in the recovery lines. The well casings and screen are constructed of PVC where only dilute concentrations of contaminants are expected to be mixed with the ground water. The lateral lines from the recovery wells leading back to the recovery and treatment system have been sized in order to minimize the lead loss in the recovery line to maintain a minimum of 40-60 inches of water column vacuum at the recovery well head.

fresh air to be bled into the recovery system. On starting the vapor recovery system, the recovery well control valves should be closed and the dilution air control valve should be fully open. When the treatment system is up to speed and ready to receive contaminated vapors, the recovery well control valves should be opened slowly to the desired flow rates and suction vacuums and the fresh air dilution valve no. 505-1 should be closed correspondingly.

9.4.2.2 *Vacuum Extraction Module*

This system essentially consists of two components: the Vapor Extraction Module and the Vapor/Liquid Separator Module.

The Vapor Extraction Module, VEM-501, is a vacuum blower system used to draw the vapors from the recovery wells and discharge the vapors to the vapor treatment system.

The vacuum blower is a regenerative type blower with a 10 horsepower motor mounted on a skid inside a sound attenuation enclosure. The skid mounted unit includes a discharge air temperature indicator, process inlet and outlet vacuum/pressure gauges, particulate filter, outlet silencer, and vacuum relief valve no. 503-3. The VEM is capable of recovering 240 cfm (20 cfm from each of 12 wells) at 80 inches of water column. The recovery flow and vacuum can be adjusted for this unit. For further details, see Appendix L, the manufacturer's operations information provided for this unit, and Appendix C, the Performance Analysis and Design Modification Plan provided for this system. The VEM provided for this Plant is VEM Model 0030 by Global Technologies, Inc., Milwaukee, Wisconsin. A dilution air inlet valve no. 503-2 and particulate filter are provided on the inlet to the VEM. This valve should be wide open during start-up of the VEM and should not be closed until the vapor treatment module is prepared to accept process air.

The Vapor/Liquid Separator Module, VSM-501 consists of a 75-gallon capacity skid mounted epoxy coated tank. The Vapor/Liquid Separator Module (VSM) is provided with a sight glass for visual inspection of liquid level, a demister to remove up to 95% of liquid particles from the process stream and a condensate transfer pump, P-501, to pump condensate from the VSM into the ground water recovery treatment system for treatment prior to discharge to the storm sewer.

The transfer pump system is set up to recycle condensate back to the VSM tank. A metered line branches off the recirculation line and is connected to the ground water recovery header prior to Static Mixer, SM-402, to enhance mixing of the condensate prior to entering the air stripper(s). The injection rate to the ground water recovery header from the VSM tank is controlled by manual throttling valve no. 501-4.

9.4.2.3 Vapor Treatment Module

The Vapor Treatment Module, VTM-501, is a complex, fully automatic, vapor treatment system and its operation is only generally described in this Section. A complete manufacturer's O&M Manual including all the components of the catalytic oxidizer is included in Appendix L. The Vapor Treatment Module (VTM) consists of a trailer-mounted catalytic oxidizer.

The VTM is designed to receive process air from either or both the ground water treatment system air strippers and the soil vapor recovery system. This can be accomplished by adjusting valves no. 404-3 and 405-1 to permit or direct process air streams from the air strippers to atmosphere or to the VTM.

The VTM is equipped with 7.5 horsepower process air booster blower to provide up to 1000 cfm of process air through the VTM. The catalyst bed provides up to 99% contaminant destruction. An integral heat exchanger is used to recover 50% of the process heat. An LEL monitor has also been provided with the VTM. Percent LEL versus catalyst bed inlet and outlet temperature will be recorded on the chart recorder provided with the VTM. The VTM also contains a fuel train that automatically supplies the appropriate liquid petroleum gas (LPG) fuel from the LPG fuel storage bottles located adjacent to the southeast corner of the Plant. A locally mounted control panel has been supplied with the VTM in order to control and monitor the operation of the VTM. See the manufacturer's O&M Manual in Appendix L for complete information on the VTM control panel.

The VTM receives the vapor from the recovery wells and/or the off-gas from the air strippers, treats the contaminants in the preheated catalyst chamber and discharges the treated process flow to atmosphere. See Section 2.0 of this Manual for specific requirements of the air discharge criteria.

The vapor recovery treatment system also includes four LPG bottles which are manifolded together and provide fuel to the VTM via a buried 1-inch diameter steel line. The LPG bottles provide a minimum of 5 psi to the VTM fuel train. The estimated fuel consumption of the VTM at 6 percent of the LEL is expected to be 3.2 gallons per hour. At this rate, the LPG bottles would need to be refilled about every five days. The LPG supplier is capable of making a fuel delivery twice a week. The fuel supplier can refill the LPG bottles on an automatic schedule once the frequency of delivery is established during operation of the system. The higher the concentration of contaminants in the process stream to the VTM, the less LPG fuel the unit will require to operate. The LPG manifold configuration is outlined on Record Drawing PID-6.

9.4.3 Instrumentation and Control

9.4.3.1 General

The Vapor Extraction Module (VEM) and the Vapor Treatment Module (VTM) are interlocked with each other. The VEM cannot be operated unless the VTM is operating and is not under an alarm status. If the VTM shuts down or encounters an alarm, (see Appendix L for VTM manufacturer's alarm conditions) the VEM will automatically shut down. The air strippers may also be interlocked to the VTM if the off-gas manifold from the air strippers is valved appropriately by setting the "BYPASS/OXIDIZER" switch in the local air stripper control panel (see Section 9.3.3.1).

The Vapor Separation Module (VSM) is interlocked with the VEM and also with the air stripper liquid transfer pumps. If the air strippers shut down for any reason, the VSM Condensate Transfer Pump, P-501, will de-energize. The VEM blower will remain operating until the liquid level in the VSM condensate tank reaches the high level alarm switch, LSHH-5001, at which time it will shut down due to high condensate liquid level. It should be noted that the VTM (catalytic oxidizer) will run whether the vapor extraction system or the ground water treatment systems are operating.

9.4.3.2 *Control*

The operation of the vapor recovery system is controlled through manually operated butterfly valves located on the recovery lines, recovery header and the dilution air line located prior to the VSM condensate tank. Vacuum and flow indication are also provided at these points.

The liquid level is maintained in the condensate tank, VSM-501, by a series of level probe switches, LIC-5001, to sense high and low condensate level and LSHH-501 activating the high level alarm. The high and low level switches control a 3/4 horsepower, centrifugal type, Condensate Transfer Pump, P-501. P-501 recycles condensate back to the condensate tank. A waste stream is bled off to the ground water recovery header for treatment through the air stripper(s). The bleed line is controlled by manually throttling valve no. 501-2. The flow is indicated by an in-line mechanical flow meter.

The Vapor Extraction Module (VEM) is controlled through a local panel located within the unit's sound attenuation enclosure. The local control panel is equipped with an "ON/OFF" switch which must be reset manually after a shut down caused by a VTM alarm shut down or an alarm caused by a high condensate level alarm LSHH-5001. During each startup, the air dilution valve no. 503-2, also located in the unit's sound attenuation enclosure, should be fully open and then closed only when the appropriate conditions permit, i.e., VTM alarm has been cleared and is fully operational.

The Vapor Treatment Module (VTM) is controlled via a locally mounted control panel. When the VTM is fully operational, the system is fully automatic. The VTM is equipped with an automatic air dilution valve that will throttle the process air and dilution air based on exhaust stack exit temperature. The VTM will also automatically modify the fuel usage rate based on catalyst bed inlet temperature. The VTM will shut down on catalyst bed high temperature which should correspond to approximately 25% LEL.

9.4.4. Start-up

9.4.4.1 VEM Start-up Procedures

The procedure for the start-up of the Vapor Extraction Module is as follows:

Start-up Prerequisites

1. Verify that the fresh air intake is clear of obstructions.
2. Verify that the level switches in the Vapor/Liquid Separator, VSM-501, are operational.
3. Verify that the Condensate Transfer Pump, P-501, is operational.
4. Verify that the Vapor/Liquid Separator Module, VSM-501, HOA switch is in the OFF position.

5. Verify that the Vapor Extraction Module, VEM-501, ON/OFF switch is in the OFF position.

6. During normal operation, the Vapor Treatment Module, VTM-501, (catalytic oxidizer) blower should be used to evacuate the piping and Vapor Separator Module before starting the Vapor Extraction Module, VEM-501. After evacuation, the Vapor Extraction Module may be started.

Start-up

1. Close the process air valve no. 213-2 and the outside air line valve no. 505-1.

2. Open the fresh air inlet valve no. 503-2 and the Vapor Extraction Module air discharge valve no. 504-1.

3. Start up the Vapor Treatment Module as required in start-up prerequisite Item 6.

4. Place the Vapor.Extraction Module ON/OFF switch to the ON position.

5. Throttle back the fresh air inlet valve no. 503-2 as required. Do not exceed an inlet vacuum of 6 in. hg. or 80 in. W.C..

6. Open the outside air line valve no. 505-1 and close the fresh air inlet valve 503-2.

7. Note flow at flow indicator FI-5001.

8. Note Vapor Extraction Module blower inlet and outlet pressures.

9. Throttle open the vapor recovery well valves to the desired flow.

10. Close the dilution air valve 505-1 accordingly.

9.4.4.2 *VTM Start-up Procedures*

The procedure for the start-up of the Vapor Treatment Module is as follows:

Start-up Prerequisites

1. Verify that the LP gas bottles are filled and properly connected to the oxidizer. 5 psi minimum inlet press. is required.

2. Verify the fresh air intake and air exhaust duct are clear of obstructions.

3. Verify that the motor operated valve is operational.

Start-up

1. Close the vapor extraction air discharge line valve no. 504-2.

2. Close the air stripper air discharge line valve no. 405-3.

3. Follow the manufacturer's start-up instructions in the manufacturer-provided equipment O&M Manual located in Appendix L.

10.0 PLANT INSTRUMENTATION

10.1 GENERAL DISCUSSION

The successful operation of the Plant requires the coordination of equipment, instrumentation, and operating personnel. The instrumentation systems serve to monitor plant treatment process conditions.

The MCP and the majority of the instrumentation were provided by Eagle Control Corp. (a subcontractor to Bensin Contracting Inc.). Eagle Control's address and telephone number is: 12 Old Dock road, Yaphank, New York, 11980, (516) 924-1315. The Eagle Control Corp. contact for this Project is Jeff Zahradka.

A discussion of the Plant instrumentation and associated alarms is presented in this Section. The following tables are presented in this Section for reference purposes, and are located at the end of the Section in numerical order.

- Table 10-1: Instrumentation and Control Equipment List
- Table 10-2: Plant Alarms
- Table 10-3: Autodialer Alarms

10.2 MAIN CONTROL PANEL

The Main Control Panel (MCP) contains several instrumentation and control equipment items, and is the center of Plant operations. The MCP has been fabricated to NEMA 12 specifications. This Section identifies the equipment located at the MCP. A majority of this equipment is described in more detail below, and in Sections 8.0 and 9.0 of this Manual. Refer to the Eagle Control Corp. O&M Manual in Appendix L, the shop drawings, and the MCP Wiring Diagram Record Drawings for further MCP equipment information.

10.2.1 *Internal Panel Equipment*

Instrumentation and control equipment located inside the MCP includes the thirty (30) Furnas Vee Arc speed indicator controllers (SIC-3001 through SIC-3030), thirty (30) Furnas long-lead-length filters, thirty (30) signal isolators for the Furnas analog input signals, Allen-Bradley motor starters, and Square D electronic control relays. The Furnas equipment is discussed in Section 9.0.

10.2.2 *Outer Panel Equipment*

The equipment described below is mounted on the front of the MCP.

Elapsed Run Time Meter displays for the thirty (30) submersible pumps are mounted on the door nearest the MDP. Thirty (30) H-O-A switches, one for each submersible pumps are mounted on the next door over. Five (5) auxiliary switches are located on the third door over from the MDP. These switches are for the three transfer pumps P-601, P-501 and P-602, the exhaust for EF-1 and the level switch for tank TK-601A. On the fourth and final door, a circular chart recorder, an instantaneous flow indicator and a level indicator for tank, TK-601A are located. Also on the door are a 13 point annunciator with integral test and push buttons and an alarm horn.

Also located on the outer panel is the autodialer which is located on the west side of the MCP. It is mounted at a height of 4'-0" above the ground.

10.2.3 *Panel-Specific Equipment*

Some equipment has been provided solely for the efficient operation of the MCP. This equipment has no interaction with any other Plant equipment and is described below.

The MCP is equipped with two internal power receptacles for maintenance purposes, and two 4' fluorescent light fixtures. Each light is equipped with a protective wire guard, and both lights are manually controlled by a pair of two-way switches mounted inside the MCP. The lights and receptacles receive 120 VAC power through Circuit Breaker No. 17 located in the Main Distribution Panel.

The MCP is also equipped with a 6000 BTU/hr dedicated air conditioner, model HB30-0616, manufactured by McLean Midwest. The air conditioner is mounted on top of the MCP, and is used primarily to keep the speed controllers within Furnas' recommended operating temperature of 105°F. The air conditioner is controlled by an internal thermostat which should be set at approximately 90°F, and provides closed-loop cooling so that the air within the MCP is cooled and recirculated. No outside air enters the MCP through the air conditioner. Single-phase, 115 VAC power is supplied to the air conditioner through Circuit Breaker no. 1 located in the Distribution Panel.

10.3 MAIN DISTRIBUTION PANEL AND PANEL PP-1

All electrical distribution equipment for the Plant stems from the 600 amp breaker which is located in the Main Distribution Panel (MDP) which is mounted alongside the MCP on the south wall of the Building. The MDP includes electrical breakers for the unit heaters, surge suppressor, effluent pump, VTM, VEM, both air strippers, panel PP-1, the exhaust fan and the thirty (30) submersible pumps.

Panel PP-1 contains the circuit breakers for items such as the lighting, fire alarm and the annunciator. Panel PP-1 runs off the MDP by a 15 amp breaker. It is located in the southeast corner of the Building. Refer to Section 8.0 of this Manual for further electrical distribution information.

10.4 *INSTRUMENTATION*

The instrumentation systems serve to monitor Plant process conditions, and provide the process data required to control the operation of Plant equipment. For ease of reference, all of the Plant instruments, are listed in Table 10-1. This table provides the following information:

- Instrument identification number
- Description
- Location
- PID Drawing no.
- Manufacturer/model number

Refer to the Inspection, Maintenance, and Lubrication Schedule, included as Appendix J, and the Eagle Control Corp. O&M Manual, included in Appendix L, for specific information regarding instrumentation maintenance and operation.

10.5 *ALARMS*

The Plant instrumentation is responsible for activating alarms. An alarm is an indication that a condition exists, which if not addressed, could threaten operating efficiency, operator safety or the environment. Automatic alarm capability is essential because it is impossible for operating personnel to monitor every aspect of Plant operation simultaneously or to be present at all times. For ease of reference, all of the Plant alarms are listed in Table 10-2. This table provides the following information:

- Alarm identification number
- Alarm condition
- Plant response

10.6 AUTODIALER

A sixteen (16) channel alarm autodialer provides automatic callout to designated off-Site personnel, for several alarm conditions in the Plant. The autodialer is a Verbatim VSS-16C, manufactured by RACO Manufacturing Company, and is located on the west side of the MCP. The autodialer is contained in a locked, heavy duty metal enclosure to protect the autodialer. The unit is protected from electrical surges by heavy duty solid state and gas lube surge protection for all lines.

In the event of an alarm condition in the Plant, the autodialer will automatically call those telephone numbers which have been pre-programmed into the autodialer's memory, in the order the numbers are programmed. Calling will continue until the alarm has been acknowledged. Refer to the autodialer Owner's Manual, located in Appendix L for specific instructions regarding the acknowledgement of alarms.

The autodialer, using digital voice recording, will play back a prerecorded voice message corresponding to the alarm condition, for example, "Tank 601 is at low level". The operator can input any voice message for any of the alarms by simply speaking into the autodialer microphone while in the correct program mode. The channels to which Plant alarm conditions have been assigned are summarized in Table 10-3.

As of the writing of this Manual, the autodialer has been programmed to dial the following telephone numbers, listed in the same order as the dialout hierarchy:

- Charles Nehrig's beeper: 824-9411
- Mark Gouch: 648-8253

NOTE: This callout hierarchy may change over time.

The autodialer is powered by 15 amp fuse. In the event of a power failure, the autodialer has a battery backup to remain on-line for a few hours. The unit can sense internally if power has been interrupted from the unit, and will automatically call out a power failure alarm on battery power.

During some Plant alarm conditions, (e.g., if the VTM is shut down for repair), it may be desirable to disable a specific autodialer channel from calling out alarms for an extended period of time. Any specific channel may be set to "status only" rather than "alarm callout". This would allow the operator to obtain the alarm status by calling the autodialer, but the alarm would not be called out from the autodialer. In order to set a channel to "status only" refer to Sections 3.3 and 6.2 of the autodialer Owner's Manual. To call the autodialer and obtain a status report of all channels, refer to Section 5.1 of the autodialer Owner's Manual.

TABLE 10-1
INSTRUMENTATION AND CONTROL EQUIPMENT LIST
FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Instrument Tag Number	P&ID Number	Manufacturer/Vendor and Model Number	Description
FCV-5001	PID-4	Supplied with P-501	Flow Control Valve - Injection Valve
FCV-6001	PID-4	Supplied with P-601	Flow Control Valve - Injection Valve
FE-2001	PID-2	Dwyer Instrument Inc. DS-200 Series	Flow Element - averaging pitot type - 3/8" dia. 316 sta stl sensor tube for insertion into 4" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.
FE-2011	PID-2	Dwyer Instrument Inc. DS-200 Series	Flow Element - averaging pitot type - 3/8" dia. 316 sta stl sensor tube for insertion into 2" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.
FE-2021	PID-2	Dwyer Instrument Inc. DS-200 Series	Flow Element - averaging pitot type - 3/8" dia. 316 sta stl sensor tube for insertion into 2" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.
FE-2031	PID-2	Dwyer Instrument Inc. DS-200 Series	Flow Element - averaging pitot type - 3/8" dia. 316 sta stl sensor tube for insertion into 2" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.
FE-2041	PID-2	Dwyer Instrument Inc. DS-200 Series	Flow Element - averaging pitot type - 3/8" dia. 316 sta stl sensor tube for insertion into 2" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.
FE-2051	PID-2	Dwyer Instrument Inc. DS-200 Series	Flow Element - averaging pitot type - 3/8" dia. 316 sta stl sensor tube for insertion into 2" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.
FE-2061	PID-2	Dwyer Instrument Inc. DS-200 Series	Flow Element - averaging pitot type - 3/8" dia. 316 sta stl sensor tube for insertion into 2" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.

TABLE 10-1
INSTRUMENTATION AND CONTROL EQUIPMENT LIST
FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Instrument Tag Number	P&ID Number	Manufacturer/Vendor and Model Number	Description
FE-2071	PID-2	Dwyer Instrument Inc. DS-200 Series	Flow Element - averaging pitot type - 3/8" dia. 316 sta stl sensor tube for insertion into 2" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.
FE-2081	PID-2	Dwyer Instrument Inc. DS-200 Series	Flow Element - averaging pitot type - 3/8" dia. 316 sta stl sensor tube for insertion into 2" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.
FE-2091	PID-2	Dwyer Instrument Inc. DS-200 Series	Flow Element - averaging pitot type - 3/8" dia. 316 sta stl sensor tube for insertion into 2" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.
FE-2101	PID-2	Dwyer Instrument Inc. DS-200 Series	Flow Element - averaging pitot type - 3/8" dia. 316 sta stl sensor tube for insertion into 2" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.
FE-2111	PID-2	Dwyer Instrument Inc. DS-200 Series	Flow Element - averaging pitot type - 3/8" dia. 316 sta stl sensor tube for insertion into 2" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.
FE-2121	PID-2	Dwyer Instrument Inc. DS-200 Series	Flow Element - averaging pitot type - 3/8" dia. 316 sta stl sensor tube for insertion into 2" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.
FE-4001	PID- 4	Dwyer Instrument Inc. DS-200 Series	Flow Element - averaging pitot type 3/8" dia. 316 st stl sensor tube for insertion into an 8" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.

TABLE 10-1

INSTRUMENTATION AND CONTROL EQUIPMENT LIST

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Instrument Tag Number	P&ID Number	Manufacturer/Vendor and Model Number	Description
FE-4002	PID- 4	Dwyer Instrument Inc. DS-200 Series	Flow Element - averaging pitot type 3/8" dia. 316 st stl sensor tube for insertion into an 8" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.
FE/FIT 4003	PID-4	See "EAGLE" O&M manual Appendix L.	
FE/FIT-4004	PID-4	See "EAGLE" O&M manual Appendix L.	
FE-5001	PID-5	Dwyer Instrument Inc. DS-200 Series	Flow element - averaging pitot type - 3/8" dia. 316 st stl sensor tube for insertion into a 4" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.
FE-5002	PID-5	Dwyer Instrument Inc. DS-200 Series	Flow element - averaging pitot type - 3/8" dia. 316 st stl sensor tube for insertion into an 8" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.
FE-5003	PID-5	Dwyer Instrument Inc. Model 4080	Flow element - averaging pitot type - 3/8" dia. 316 st stl sensor tube for insertion into an 8" dia. pipe - (2) gage conn shutoff valves - with 3/8" tube x 1/2" MNPT Parker CPI compression fitting for packing gland.
FI-2001	PID-2	Dwyer Instrument Inc. Model 4080	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or flush mounted. 0-400 SCFM.
FI-2011	PID-2	Dwyer Instrument Inc. Model 4080	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or flush mounted. 0-40 SCFM.

TABLE 10-1
INSTRUMENTATION AND CONTROL EQUIPMENT LIST
FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Instrument Tag Number	P&ID Number	Manufacturer/Vendor and Model Number	Description
FI-2021	PID-2	Dwyer Instrument Inc. Model 4080	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or flush mounted. 0-40 SCFM.
FI-2031	PID-2	Dwyer Instrument Inc. Model 4080	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or flush mounted. 0-40 SCFM.
FI-2041	PID-2	Dwyer Instrument Inc. Model 4080	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or flush mounted. 0-40 SCFM.
FI-2051	PID-2	Dwyer Instrument Inc. Model 4080	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or flush mounted. 0-40 SCFM.
FI-2061	PID-2	Dwyer Instrument Inc. Model 4080	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or flush mounted. 0-40 SCFM.
FI-2071	PID-2	Dwyer Instrument Inc. Model 4080	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or flush mounted. 0-40 SCFM.
FI-2081	PID-2	Dwyer Instrument Inc. Model 4080	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or flush mounted. 0-40 SCFM.
FI-2091	PID-2	Dwyer Instrument Inc. Model 4080	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or flush mounted. 0-40 SCFM.
FI-2101	PID-2	Dwyer Instrument Inc. Model 4080	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or flush mounted. 0-40 SCFDM.

TABLE 10-1
INSTRUMENTATION AND CONTROL EQUIPMENT LIST
FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Instrument Tag Number	P&ID Number	Manufacturer/Vendor and Model Number	Description
FI-2111	PID-2	Dwyer Instrument Inc. Model 4080	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or flush mounted. 0-40 SCFM.
FI-2121	PID-2	Dwyer Instrument Inc. Model 42XX	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or flush mounted. 0-40 SCFM.
FI-4001	PID-4	Dwyer Instrument Inc. Model 42XX	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or surface mounted. 0-500 SCFM.
FI-4002	PID-4	Dwyer Instrument Inc. Model 4100	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or surface mounted. 0-500 SCFM.
FI-5001	PID-5	Dwyer Instrument Inc. Model 42XX	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or surface mounted. 0-450 SCFM.
FI-5002	PID-5	Dwyer Instrument Inc. Model 42XX	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or surface mounted. 0-300 SCFM.
FI-5003	PID-5	Dwyer Instrument Inc. Model 42XX	Flow indicator - diaphragm actuated capsuhelic differential press gage - 5" dia. die cast alum. - 1/4" NPT connections - panel or surface mounted. 0-600 SCFM.
FIR-4004	PID-4	See "EAGLE" O&M manual Appendix L.	
HS-3011	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3021	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3031	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3041	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3051	PID-3	See Electrical Drawings	Hand Switch (Stop Start).

TABLE 10-1
INSTRUMENTATION AND CONTROL EQUIPMENT LIST
FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Instrument Tag Number	P&ID Number	Manufacturer/Vendor and Model Number	Description
HS-3061	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3071	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3081	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3091	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3101	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3111	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3121	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3131	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3141	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3151	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3161	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3171	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3181	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3191	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3201	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3211	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3221	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3231	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3241	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3251	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3261	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3271	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3281	PID-3	See Electrical Drawings	Hand Switch (Stop Start).

TABLE 10-1
INSTRUMENTATION AND CONTROL EQUIPMENT LIST
FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Instrument Tag Number	P&ID Number	Manufacturer/Vendor and Model Number	Description
HS-3291	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
HS-3301	PID-3	See Electrical Drawings	Hand Switch (Stop Start).
KQIR-3011	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3021	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3031	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3041	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3051	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3061	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3071	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3081	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3091	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3101	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3111	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3121	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3131	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3141	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3151	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3161	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3171	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3181	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3191	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3201	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3211	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3221	PID-3	See Electrical Drawings	Running time totalizer meter.

TABLE 10-1
INSTRUMENTATION AND CONTROL EQUIPMENT LIST
FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Instrument Tag Number	P&ID Number	Manufacturer/Vendor and Model Number	Description
KQIR-3231	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3241	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3251	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3261	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3271	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3281	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3291	PID-3	See Electrical Drawings	Running time totalizer meter.
KQIR-3301	PID-3	See Electrical Drawings	Running time totalizer meter.
LAH-5001	PID-5	See Electrical Drawings	Level alarm high - autodialer
LAH-6001A	PID-6	See Electrical Drawings	Level alarm high high
LAHH-6001B	PID-6	See Electrical Drawings	Level alarm high high
LAHH-6002	PID-6	See Electrical Drawings	Level alarm high - autodialer
LAL-6001	PID-6	See Electrical Drawings	Level alarm low - autodialer
LC-3011	PID-3	Warrick Controls Inc. Series-27A1E04 Series-27B1E04 Series 3G483	Level controller - Well (1) Low level safe pack (1) High level safe pack Mounted in common NEMA 4 enclosure with attached 2" male NPT condut box.
LC-3021	PID-3	Warrick Controls Inc.	Well level controller
LC-3031	PID-3	Warrick Controls Inc.	Well level controller
LC-3041	PID-3	Warrick Controls Inc.	Well level controller
LC-3051	PID-3	Warrick Controls Inc.	Well level controller
LC-3061	PID-3	Warrick Controls Inc.	Well level controller
LC-3071	PID-3	Warrick Controls Inc.	Well level controller

TABLE 10-1
INSTRUMENTATION AND CONTROL EQUIPMENT LIST
FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Instrument Tag Number	P&ID Number	Manufacturer/Vendor and Model Number	Description
LC-3081	PID-3	Warrick Controls Inc.	Well level controller
LC-3091	PID-3	Warrick Controls Inc.	Well level controller
LC-3101	PID-3	Warrick Controls Inc.	Well level controller
LC-3111	PID-3	Warrick Controls Inc.	Well level controller
LC-3121	PID-3	Warrick Controls Inc.	Well level controller
LC-3131	PID-3	Warrick Controls Inc.	Well level controller
LC-3141	PID-3	Warrick Controls Inc.	Well level controller
LC-3151	PID-3	Warrick Controls Inc.	Well level controller
LC-3161	PID-3	Warrick Controls Inc.	Well level controller
LC-3171	PID-3	Warrick Controls Inc.	Well level controller
LC-3181	PID-3	Warrick Controls Inc.	Well level controller
LC-3191	PID-3	Warrick Controls Inc.	Well level controller
LC-3201	PID-3	Warrick Controls Inc.	Well level controller
LC-3211	PID-3	Warrick Controls Inc.	Well level controller
LC-3221	PID-3	Warrick Controls Inc.	Well level controller
LC-3231	PID-3	Warrick Controls Inc.	Well level controller
LC-3241	PID-3	Warrick Controls Inc.	Well level controller
LC-3251	PID-3	Warrick Controls Inc.	Well level controller
LC-3261	PID-3	Warrick Controls Inc.	Well level controller
LC-3271	PID-3	Warrick Controls Inc.	Well level controller
LC-3281	PID-3	Warrick Controls Inc.	Well level controller
LC-3291	PID-3	Warrick Controls Inc.	Well level controller
LC-3301	PID-3	Warrick Controls Inc.	Well level controller
LC-6002	PID-6	See Electrical Drawings	Level controller - manhole - holding relay

TABLE 10-1
INSTRUMENTATION AND CONTROL EQUIPMENT LIST
FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Instrument Tag Number	P&ID Number	Manufacturer/Vendor and Model Number	Description
LE-6001	PID-6	Control Electronics Model 55S	Level element - ultrasonic level & temp sensor - 3/4" NPT mounting - 5'-0" long cable.
LIS-6001	PID-6	See "EAGLE" O&M manual Appendix L.	
LIC-5001	PID-5	Supplied by Equipment Vendor with VSM-501	Level indicating controller
LSH-3011	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3021	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3031	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3041	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3051	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3061	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3071	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3081	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3091	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3101	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3111	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3121	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.

TABLE 10-1
INSTRUMENTATION AND CONTROL EQUIPMENT LIST
FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Instrument Tag Number	P&ID Number	Manufacturer/Vendor and Model Number	Description
LSH-3131	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3141	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3151	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3161	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3171	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3181	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3191	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3201	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3211	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3221	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3231	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3241	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3251	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3261	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3271	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3281	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.

TABLE 10-1
INSTRUMENTATION AND CONTROL EQUIPMENT LIST
FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Instrument Tag Number	P&ID Number	Manufacturer/Vendor and Model Number	Description
LSH-3291	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-3301	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch high - conductance type - PVC covered suspension wires.
LSH-4001	PID-4	Supplied by Equipment Vendor with STR-401	Level switch high
LSH-4002	PID-4	Supplied by Equipment Vendor with STR-402	Level Switch high
LSH-6002	PID-6	Conery MFG. Co. Model 2900-15	Level switch high - (manhole) - float type - 120 VAC N. O. contacts - 15'-0" 16/2 wet well rated cord.
LSHH-5001	PID-5	Supplied by Equipment Vendor with VSM-501	Level switch high high
LSHH-6002		Set Point In LI -6001	Level switch high high
LSHH-6002	PID-6	Conery MFG. Co. Model 2900-15	Level switch high high - (manhole) - float type - 120 VAC N. O. contacts - 15'-0" 16/2 wet well rated
LSL-3011	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3021	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3031	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3041	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3051	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3061	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3071	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3081	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.

TABLE 10-1
INSTRUMENTATION AND CONTROL EQUIPMENT LIST
FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Instrument Tag Number	P&ID Number	Manufacturer/Vendor and Model Number	Description
LSL-3091	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3101	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3111	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3121	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3131	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3141	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3151	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3161	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3171	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3181	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3191	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3201	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3211	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3221	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3231	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.

TABLE 10-1

INSTRUMENTATION AND CONTROL EQUIPMENT LIST

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Instrument Tag Number	P&ID Number	Manufacturer/Vendor and Model Number	Description
LSL-3241	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3251	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3261	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3271	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3281	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3291	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-3301	PID-3	Warrick Controls Inc. Model 3Y1C	Level switch low - conductance type - PVC covered suspension wires.
LSL-6001		Set Point In LI-6001	Level switch low.
LSL-6002	PID-6	Conery Mfg. Co. Model 2900-15	Level switch low - (manhole) - float type - 120 VAC N. O. contacts - 15'-0" 16/2 wet well rated cord.
OA-5001	PID-5	See Electrical Drawings	System alarm (autodialer).
PAH-4003	PID-4	See Electrical Drawings	Pressure alarm high (autodialer).
PAL-4001A	PID-4	Supplied by Equipment Vendor	Pressure alarm low.
PAL-4001B	PID-4	See Electrical Drawings	Pressure alarm low (autodialer).
PAL-4002A	PID-4	Supplied by Equipment Vendor with STR-402	Pressure alarm low.
PAL-4002B	PID-4	See Electrical Drawings	Pressure alarm low (autodialer).
PI-2011	PID-2	Ashcroft	Pressure/vacuum indicator - black phenolic turret
PI-2021	PID-2	Ashcroft 4-1/2" 1279 AS - lower 1/2"	Pressure/vacuum indicator - black phenolic turret type - 1/2" NPT bottom connected - 4-1/2" dia. -

TABLE 10-1
INSTRUMENTATION AND CONTROL EQUIPMENT LIST
FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Instrument Tag Number	P&ID Number	Manufacturer/Vendor and Model Number	Description
PI-2031	PID-2	Ashcroft	Pressure/vacuum indicator - black phenolic turret
PI-2041	PID-2	Ashcroft 4-1/2" 1279 AS - lower 1/2"	Pressure/vacuum indicator - black phenolic turret type - 1/2" NPT bottom connected - 4-1/2" dia. - phosphor bronze bourdon tube. 30" Hg/15 PSIG
PI-2051	PID-2	Ashcroft 4-1/2" 1279 AS - lower 1/2"	Pressure/vacuum indicator - black phenolic turret type - 1/2" NPT bottom connected - 4-1/2" dia. - phosphor bronze bourdon tube. 30" Hg/15 PSIG
PI-2061	PID-2	Ashcroft 4-1/2" 1279 AS - lower 1/2"	Pressure/vacuum indicator - black phenolic turret type - 1/2" NPT bottom connected - 4-1/2" dia. - phosphor bronze bourdon tube. 30" Hg/15 PSIG
PI-2071	PID-2	Ashcroft 4-1/2" 1279 AS - lower 1/2"	Pressure/vacuum indicator - black phenolic turret type - 1/2" NPT bottom connected - 4-1/2" dia. - phosphor bronze bourdon tube. 30" Hg/15 PSIG
PI-2081	PID-2	Ashcroft 4-1/2" 1279 AS - lower 1/2"	Pressure/vacuum indicator - black phenolic turret type - 1/2" NPT bottom connected - 4-1/2" dia. - phosphor bronze bourdon tube. 30" Hg/15 PSIG
PI-2091	PID-2	Ashcroft 4-1/2" 1279 AS - lower 1/2"	Pressure/vacuum indicator - black phenolic turret type - 1/2" NPT bottom connected - 4-1/2" dia. - phosphor bronze bourdon tube. 30" Hg/15 PSIG
PI-2101	PID-2	Ashcroft 4-1/2" 1279 AS - lower 1/2"	Pressure/vacuum indicator - black phenolic turret type - 1/2" NPT bottom connected - 4-1/2" dia. - phosphor bronze bourdon tube. 30" Hg/15 PSIG
PI-2111	PID-2	Ashcroft 4-1/2" 1279 AS - lower 1/2"	Pressure/vacuum indicator - black phenolic turret type - 1/2" NPT bottom connected - 4-1/2" dia. - phosphor bronze bourdon tube. 30" Hg/15 PSIG
PI-2121	PID-2	Ashcroft 4-1/2" 1279 AS - lower 1/2"	Pressure/vacuum indicator - black phenolic turret type - 1/2" NPT bottom connected - 4-1/2" dia. - phosphor bronze bourdon tube. 30" Hg/15 PSIG
PI-4001	PID-4	Ashcroft 4-1/2" 1279 AS - lower 1/2"	Pressure indicator - black phenolic turret type - 1/2" NPT bottom conn - 4-1/2" dia. phosphor bronze bourdon tube. 0/100 PSIG range.
PI-4002	PID-4	Ashcroft 4-1/2" 1279 AS - lower 1/2"	Pressure indicator - black phenolic turret type - 1/2" NPT bottom conn - 4-1/2" dia. phosphor bronze bourdon tube. 0/100 PSIG range.

TABLE 10-1
INSTRUMENTATION AND CONTROL EQUIPMENT LIST
FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

Instrument Tag Number	P&ID Number	Manufacturer/Vendor and Model Number	Description
PI-4003	PID-4	Ashcroft 4-1/2" 1279 AS - lower 1/2"	Pressure indicator - black phenolic turret type - 1/2" NPT bottom conn - 4-1/2" dia. phosphor bronze bourdon tube. 0/160 PSIG range.
PI-4004	PID-4	Ashcroft 4-1/2" 1279 AS - lower 1/2"	Pressurc indicator - black phenolic turret type - 1/2" NPT bottom conn - 4-1/2" dia. phosphor bronze bourdon tube. 0/300 PSIG.
PSH-4003	PID-4	Mercoid Div. - Dwyer Instruments Model # DA-531-2-7	Pressure switch high - brass bourdon tube actuated - 120 VAC SPDT N.C. snap action switch. 5-150 PSIG adj range. 1/4" MNPT bottom mtg conn.
PSV-4001	PID-4	Empire Speciality Co. Inc. Fig 901	Pressure safety valve - air release - 1/16" orifice - cast iron body - sta stl ball - for 150 # service - 1" FNPT inlet.
PSV-6001	PID-6	Supplied with P-601	Presure safety valve.
SIC-3001 - SIC-3030	PID-3	Furnas	Speed Controllers - Furnas Vee Arc Micro 5000.

TABLE 10-2
PLANT ALARMS

Alarm ID No.	Drawing No.	Local Indication on MCP	Autodialer Circuit	Alarm Condition	Plant Response
LAHH-6001A	PID-6	Yes		Level Alarm High, TK-601	None
LAHH-6001B	PID-6			Level Alarm High, Remote, TK-601	None
LAL-6001	PID-6	Yes	7	Level Alarm Low, TK-601	None
LAH-6001	PID-6	Yes	8	Level Alarm High, TK-601	None
LAHH-6002	PID-6	Yes	11	Level Alarm High, Wet Well	• Shut down Ground Water Recovery and Treatment Systems
PAH-4003	PID-4	Yes	10	Pressure Alarm High, GWR Header	• Shut down Ground Water Recovery and Treatment Systems • Shut down VSM Pump P-501
PAL-4001A	PID-4	Yes		Pressure Alarm Low, STR-401	• Shut down Ground Water Recovery and Treatment Systems and VSM Pump P-501
PAL-4001B	PID-4	Yes	1	Pressure Alarm Low, STR-401	• Shut down Ground Water Recovery and Treatment Systems and VSM Pump P-501
LSH-4001	PID-4	Yes	1	High Sump Level Alarm, STR-401	• Shut down Ground Water Recovery and Treatment Systems and VSM Pump P-501
PAL-4002A	PID-4	Yes		Pressure Alarm Low, STR-402	• Shut down Ground Water Recovery and Treatment Systems and VSM Pump P-501
PAL-4002B	PID-4	Yes	3	Pressure Alarm Low, STR-402	• Shut down Ground Water Recovery and Treatment Systems and VSM Pump P-501
LSH-4002	PID-4	Yes	3	High Sump Level Alarm, STR-402	• Shut down Ground Water Recovery and Treatment Systems and VSM Pump P-501
LAH-5001	PID-5	Yes	5	Level Alarm High, VSM-501	• Shut down Vapor Extraction Module, VEM-501 • TRANSFER Pump P-501 remains energized.
OA-5001	PID-5	Yes	6	Shutdown Alarm, VTM-501	• Shut down Vapor Extraction Module, VEM-501 • Shut down Ground Water Recovery and Treatment Systems and VSM Pump P-501 if stripper "Oxidizer/Bypass" switch is set to "Oxidizer".
FP-1	FP-1	Yes	13	Fire Alarm Status	None.

TABLE 10-3
AUTODIALER ALARMS

CHANNEL	ALARM DESCRIPTION	INPUT SIGNAL	MONITORING INSTRUMENT
	Power loss to Plant	Signal is monitored internally and does not require an assigned channel	Autodialer
1	Water level/Low air pressure		STR-401
2	Spare	None	None
3	Water level/Low air pressure		STR-402
4	Spare	None	None
5	High level VSM-501	LSHH-5001	LIC-5001 (Setpoints are in controller)
6	VTM-501 System Shutdown	VTM Run Status	VTM-501
7	TK-601 Low Sequestering Agent Tank Level	LSL-6001	LI-6001 (setpoints are in controller)
8	TK-601 High Sequestering Agent Tank Level	LSHH-6001	LI-6001 (setpoints are in controller)
9	Spare	None	None
10	Recovery Ground Water High Pressure	PSH-4003	PAH-4003 (setpoints in pressure indicator)
11	Wet Well High Level	LSHH-6002	LC-6002 (setpoints by adjusting probe level)
12	Spare	None	None
13	Fire Alarm	Smoke Alarms	Fire Protection Panel

11.0 MAINTENANCE MANAGEMENT

11.1 INTRODUCTION

The successful and economical operation of the Plant depends on the regular and systematic maintenance of Plant equipment, piping systems, and the Building and grounds. Routine preventive maintenance of mechanical equipment, such as pumps, motors, and drives, will ensure optimum equipment performance and reduce the frequency of equipment breakdown and interruptions to the Plant processes. Cleanliness of facilities and grounds contributes to the safety and health of the operating personnel, and presents a favorable impression to visitors and regulatory personnel. Proper maintenance requires the establishment of, and adherence to, a realistic maintenance program and schedule.

This Section is intended to provide the Plant operating personnel with the basic systems and procedures necessary to maintain the Plant in a good operating condition. It does not attempt to show step-by-step inspection, disassembly, adjustment, lubrication, or other maintenance details for specific items of equipment. The manufacturer's operation and maintenance manuals located in Appendix L should be consulted for these details. The systems and procedures outlined in this Section, when properly implemented and routinely followed, will ensure that the Plant performs its design functions at maximum efficiency and with minimum interruptions or breakdowns.

11.2 EQUIPMENT RECORD SYSTEM

11.2.1 Equipment Numbering

Each major item of equipment is assigned an equipment number for ease of identification and to ensure that the maintenance performed on the item is properly recorded. The equipment number is alpha-numeric (e.g., STR-402).

The first one, two, or three letters are an abbreviation of the equipment name (e.g., STR for stripper). The first number which follows the alphabetic abbreviation corresponds to the process and instrumentation (P&I diagram) Record Drawing number on which the item of equipment appears (e.g., STR-402 is shown on PID-4). The next two numbers, are assigned sequentially for similar equipment items on the same "PID" drawing (e.g., STR-401 and STR-402 correspond to the two air strippers which appear on PID-4). Each equipment identification number is unique to the assigned item of equipment.

11.2.2 *Instrument Numbering*

All instrumentation in the Plant is shown schematically on the P&I diagram (PID) Record Drawings. The instrument number is also alpha-numeric. Instrument identification is based on the function of the instrument and the PID drawing number on which it appears. Each identification number consists of a two to four letter acronym and a three to four digit number. The acronym summarizes the type of instrument in accordance with the instrument identification table shown on Drawing PID-1 (e.g., LSL = Level Switch Low). The first digit of the four digit number corresponds to the PID drawing number on which the instrument appears. For example, LSL-6001 is shown on Drawing PID-6. The last three digits of the number are used to differentiate between the same type of instrument on the same PID drawing (e.g., LSL-6001 and LSL-6002). All instrument numbers are unique.

A complete listing of all Plant instrumentation is given in Table 10-1.

11.2.3 *Valve Numbering*

All valves in the Plant are also assigned an identification number for ease of identification and to ensure that the maintenance performed on each valve is properly recorded. The valve numbers are also alpha-numeric and are designated in a manner somewhat similar to those for equipment items.

All valves have been designated according to their pipeline location. For example, Valve No. 204-3 refers to the third on pipeline 204. The first digit of the identification number corresponds to the PID drawing number on which the pipeline appears. Thus, pipeline 204 and associated valves can be found on Drawing PID-2.

All Plant valves are labeled on the P&I diagram (PID) Record Drawings included in Appendix B. A complete Valve Schedule is also included in Appendix E which identifies:

- Valve Code
- PID Drawing No.
- Line No.
- Valve No.
- Valve Size
- Valve Type
- Operator Type
- Normal Position
- Location
- Function

11.2.4 Equipment History Cards/Forms

Equipment History Cards/Forms should be prepared for each major item of equipment in the Plant. These cards contain all the information needed to identify the equipment, including the manufacturer, model, size, capacity, serial number, electrical requirements, etc. They also contain coded entries defining the preventive maintenance service required as discussed in Section 11.3.2.2. The reverse side of the Equipment History Card or second page of the Form is used to maintain a running history of the maintenance and repairs performed on each equipment item. A suggested format for the Equipment History Card/Form is included as Figure 11-1.

In lieu of hand written cards or forms, the equipment history information could also be tracked using a database on a personal computer.

11.3 PLANNING AND SCHEDULING

11.3.1 General Discussion

Plant maintenance work may be either preventive or corrective. Preventive maintenance consists of routine, recurring tasks performed periodically on facilities and equipment. These tasks include inspection, lubrication, adjustment, cleaning, belt replacement, minor repairs, painting, etc. Corrective maintenance, synonymous with repair, is the restoration of equipment to its original design capacity and efficiency through parts replacement, component reprocessing, overhaul, or rebuilding.

Planning and scheduling are essential to the effective implementation of a maintenance management system regardless of whether preventive maintenance or corrective maintenance is involved. Without planning and scheduling, maintenance work will be haphazard, costly, and ineffective.

11.3.2 Preventive Maintenance Program

The preventive maintenance program consists of a preventive maintenance task list and schedule for each item of Plant equipment and for each non-equipment Plant component, i.e., structures, piping systems, grounds maintenance etc., requiring periodic servicing. Guidelines for the development of these two preventive maintenance program components are contained in this Section.

11.3.2.1 Preventive Maintenance Task List

The preventive maintenance task list is prepared from data sources available to the Plant operator. These sources include inspection, maintenance, and lubrication schedules prepared for the Plant, manufacturers' operation and maintenance manuals, the equipment history card files, and the Plant Record Drawings. Certain tasks, such as exterior painting, fertilization of seeded areas, and parking area inspection and repair, are seasonal. Other items, such as the draining of the wet well for inspection must be related to predictable periods of Plant shutdown. Tasks should be related to a preventive maintenance standard or to a lubrication standard, as described in Section 11.3.4, where applicable.

The basic steps required to prepare the preventive maintenance task list are as follows:

- Step 1 - List all equipment, structures, and systems requiring preventive maintenance using the manufacturer's operation and maintenance manuals, equipment history cards, the Plant Record Drawings, and the Plant inspection reports.
- Step 2 - Determine the preventive maintenance requirements and their respective frequencies for each item of equipment, each structure, and each system listed.
- Step 3 - Using the preventive maintenance or lubrication standards described in Section 11.3.4, estimate the time and skills required to perform each preventive maintenance task.
- Step 4 - Total the man hour requirements for all preventive maintenance tasks and compare to the available man hours for preventive maintenance work.

11.3.2.2 Preventive Maintenance Schedule

The preventive maintenance schedule is prepared by balancing the man hour requirements developed from the preventive maintenance task list against the man hours available for preventive maintenance work. Equipment, structures, and systems must be rated as to their criticality in the Plant operation, and to their value, life expectancy, and replacement cost. The assigned priority rating is then used to determine the items on which the available preventive maintenance man hours will be scheduled and used. A suggested ranking system for making these priority determinations is presented below:

Priority A - Equipment such as the Vapor or Ground Water Treatment Systems or other items, where failure of a minor part or neglect of normal lubrication requirements may lead to major repairs and/or interruption in the Plant process.

Priority B - Equipment of significant replacement value such as redundant pumping equipment, or other items where an equipment breakdown is not likely to interrupt the Plant processes but may lead to expensive repairs or item replacement.

Priority C - Items of small to moderate dollar value such as lamps, non-essential piping systems, plumbing fixtures, and other items where failure will not interrupt the Plant processes, and where repair or replacement cost is not excessive.

The basic steps required to prepare the preventive maintenance schedule are as follows:

Step 1 - Develop a typical work week schedule from the man hour balancing step (Step 4) in Section 11.3.2.1, preceding.

Step 2 - On a yearly calendar select tentative dates for performing all monthly, quarterly, semi-annual and annual preventive maintenance procedures. Adjust the typical weekly schedule for planned corrective maintenance work, and for the man hours diverted to monthly, quarterly, semi-annual, and annual preventive maintenance procedures.

Step 3 - The typical weekly schedule becomes the basic preventive maintenance schedule from which schedule boards are maintained, weekly work assignments are made, and progress reports are prepared. Preventive maintenance schedules must be adjusted regularly for priority changes, weather related delays, carry over work from prior weeks, delays in replacement parts, and other justifiable reasons.

11.3.2.3 *Typical Preventive Maintenance and Lubrication Schedules*

The best sources of specific information on the performance of preventive maintenance tasks and recurring lubrication procedures for the Plant equipment are the manufacturer's operation and maintenance manuals and service bulletins provided for each item of equipment (See the last appendix to this Manual). Inspection, maintenance, and lubrication schedules are included in each manufacturer's operation and maintenance manual when applicable. The operator should ensure that these technical documents are complete, current, and are properly protected from damage or loss.

Inspection, maintenance, and lubrication requirements for all equipment items are summarized in one Inspection, Maintenance, and Lubrication Schedule included as Appendix J to this Manual.

The Lubrication Survey lists all equipment, the manufacturer's lubrication recommendations, and an interchangeable lubricants tabulation, standardizing and consolidating lubricants whenever possible. The Lubrication Survey is included as Appendix K to this Manual.

These typical schedules should be used as a general guide only and should not be considered as a substitute for the more comprehensive information contained in the manufacturer's technical documents.

11.3.3 *Corrective Maintenance*

Corrective maintenance is defined as the work required to accomplish major repairs and non-routine maintenance procedures. Planning and scheduling of maintenance work must make provisions to handle these non-recurring functions.

11.3.3.1 *Planning Corrective Maintenance*

Although actual equipment breakdown may precede the planning of corrective maintenance, resorting to "break-down" maintenance may cause disruptions in the Plant processes and costly overtime work. Accordingly, it is desirable to use anticipatory methods to plan corrective maintenance. These methods include periodic inspections of equipment, close review of equipment operating records, operator observations, and notations on the Operating Reports, and other analyses for the timely identification of impending problems.

Corrective maintenance planning may include the use of contractors and outside repair shop facilities for major repair work, if required. Man hour requirements for corrective maintenance work are determined by normal estimating procedures. When determined, these requirements are integrated into the weekly work schedule discussed in Section 11.3.2.2, preceding. Care must be exercised that the lead time necessary to obtain required spare parts is taken into consideration when the corrective maintenance work is integrated into the weekly work schedule.

11.3.3.2 *Work Orders*

The operator may wish to use a work order system to initiate, schedule, and record the accomplishment of all preventive maintenance and corrective maintenance tasks. There are two basic types of work orders.

(1) A standard work order, involving preventive or corrective maintenance, which can be performed by Konica mechanics or technicians.

(2) A job order that requires the services of non-Konica personnel, such as a major equipment repair, equipment vendor services, purchase requisitions, etc.

A standard work order is initiated by the Plant operator using standard Konica procedures. The Plant operator then follows-up and coordinates the work order activities. The operator may wish to document the standard work order using a form such as that given in Figure 11-2. The completed standard work orders are used to make the required maintenance history entries on the Equipment History Cards/Forms. They should be retained for use in analyzing cost trends, and for guidance in developing future schedules.

In lieu of hand written forms, the standard work order information could also be tracked using a database on a personal computer.

A job order is initiated by the Plant operator for work, services, or deliveries requiring the use of non-Konica personnel. The operator may wish to document the job order using a form such as that given in Figure 11-3. As with standard work orders, the summary information from completed job orders should be transferred to the applicable Equipment History Cards/Forms. The completed written job orders should be retained for a period of at least five years.

Again, the job order information could be tracked using a database on a personal computer.

11.3.4 Standard Maintenance Procedures

Standard maintenance procedures include preventive maintenance standards and lubrication standards applicable to each item of equipment and to each Plant component, or to each group of similar items. They are intended to provide a guide to the Plant operating personnel for the performance of these recurring maintenance tasks. When used as a check-off list by the performing personnel, they serve to assure that no item on the preventive maintenance task list is overlooked.

11.3.4.1 Preventive Maintenance Standards

Preventive maintenance standards are developed from the manufacturers' operation and maintenance manuals and from observations of the Plant operation over a period of time. They should be specific as to inspection points, measurements, tolerances, torque readings, adjustments, calibration, recurring maintenance and parts replacement requirements.

The labor hours required to perform the standard procedures can be derived initially from operator experience and available maintenance labor guides such as Universal Maintenance Standards (UMS) or the Navy's Engineered Performance Standard Public Works Maintenance. The initial labor standards, developed from these industrial or military standard sources, will usually require adjustment after actual use under local Plant conditions. It is important that the labor hours be a realistic reflection of the actual work requirements for the procedure involved. A significant understatement or overstatement of labor requirements will destroy the validity of the standard system and inhibit the preparation of a workable preventive maintenance schedule.

A locally developed preventive maintenance standard numbering system, based on the equipment numbering system, has been found to be a useful tool for scheduling these recurring maintenance procedures and for recording their accomplishment on the Equipment Record Cards.

11.3.4.2 Lubrication Standards

Lubrication standards are developed from the lubrication recommendations in the manufacturer's operation and maintenance manuals. The standard should be specific as to lubrication point, lubricating method, recommended lubricant, lubricating frequency, and any special lubricating instructions.

A Plant Lubrication Survey has been completed to enable the operator to reduce the number of lubricants required to be stocked at the Plant. A standardized lubricant stocking list can be prepared based on the information contained in the survey. The Lubrication Survey is included as Appendix K to this Manual.

11.4 STORAGE AREA AND SPARE PARTS INVENTORY MANAGEMENT

11.4.1 General Discussion

The ready availability of spare parts and materials for the expeditious accomplishment of preventive maintenance procedures and repairs to Plant equipment is critical to an effective maintenance program. This objective is achieved by the establishment and routine maintenance of a spare parts inventory and stock replenishment system.

11.4.2 Storage Area

A designated area should be provided for the storage of supplies, repair parts, and emergency tools. This will most likely be in the southeast corner of the Control Building. An additional satellite storage area should be provided for the storage of paints, oils and other flammable materials.

The main storage area should be outfitted with bins and shelves. These should be clearly marked and labeled to allow rapid access to needed items and to facilitate stock inventory.

11.4.3 Storage Inventory Cards

Because of the moderate size of the Plant and the limited Plant personnel available, a simple inventory card system can be used for all inventory purposes. The inventory card shows the following information:

- Part or material description (Mfr., Part No., Size, etc.).
- Stocking quantity (Maximum, Minimum, and Reorder).
- Usage information (Date, Quantity, and Person Using).
- Reorder information (Requisition No., Date of Order, and Date of Receipt).

A suggested inventory card format is shown as Figure 11-4.

In lieu of hand written cards or forms, the inventory information could be tracked using a database on a personal computer.

A physical inventory of the storage area contents should be conducted at least annually to reconcile the on-hand quantities of materials and spare parts with the quantities shown on the inventory cards.

11.4.4 Maintenance Materials

Maintenance materials to be stocked at moderately sized Plants are categorized as either consumable supplies or spare parts. Stocking levels for each category of maintenance material must be carefully evaluated in order to achieve an optimum balance between uneconomical overstocking and the loss of operational capability because of a lack of a needed spare part.

11.4.4.1 Consumable Supplies

The stocking of consumable supplies for a moderately sized Plant such as the Konica Plant deserves careful budgetary consideration. Most consumables are subject to pilferage, have short shelf-life, or are readily available from local commercial sources when needed. For reasons of economy, stocking of consumable supplies should be limited to items required for recurring maintenance or housekeeping tasks such as equipment lubrication or to those items needed for rapid response to emergency situations. A suggested list of consumables for the Plant is shown as Table 11-1. Except for emergency recovery supplies, stocking quantities are not shown. These must be established initially and adjusted periodically based on actual usage experience.

11.4.4.2 Spare Parts

The stocking of spare parts, like the stocking of consumable supplies, requires careful management attention. Failure to stock an adequate inventory of items which are used on a routine basis, such as belts, packing materials, seals, bearings, spare circuit boards, and similar frequently used replacement parts can adversely affect Plant operations and the execution of an effective preventive maintenance program. Conversely, the stocking of large and expensive items of replacement equipment as insurance items in some cases can be poor management practice and can unnecessarily reduce critical maintenance and capital funds.

Before making a management decision to stock any large part or replacement component such as a spare pump, an electric motor, a blower rotor, or any other major component, an analysis should be made considering the following factors:

- Off-the-shelf availability of the item from commercial sources;
- Lead time for manufacture and shipping of the item if it is not regularly stocked at manufacturers' stocking points;
- Importance of item to the continuity of proper Plant operations;
- Availability of secure and protected storage facilities for long term storage of major replacement components.

Each manufacturer's operation and maintenance manual contains a parts listing for the covered equipment, a recommended spare part listing for local stocking, and the address and telephone number for ordering non-stocked replacement parts. These manuals are the principal sources available to the Plant operating personnel for spare parts stocking and ordering information and should be referred to in all cases.

A complete list of all recommended spare parts and special tools is included as Appendix I.

Locally stocked spare parts are accounted for on the Storage Inventory Cards, Figure 11-4, which record usage information, stocking levels, and reordering data. Inventories of stocked spare parts should be made annually and the Storage Inventory Cards reconciled with actual quantities on hand.

11.5 SITE MAINTENANCE

11.5.1 Introduction

The Remedial Design for the Former Columbia Ribbon and Carbon Co. Disposal Site incorporates many components other than the actual process equipment and Building, that require periodic inspection and maintenance. The ongoing maintenance of the following features is critical to the successful implementation of the Remedial Program:

- Recovery and monitoring wells
- Handholes
- Building
- Perimeter Fencing

Specific inspection and maintenance procedures regarding these components are discussed below. All inspection findings and maintenance performed should be recorded on Figure 5-17, which is located at the end of Section 5.0.

11.5.2 *Recovery and Monitoring Wells*

The ground water recovery wells, vapor recovery wells, air inlet wells and Site monitoring wells must be inspected on a regular basis and maintained as necessary to prevent fouling of the well screens. Fouling may be caused by biological activity (slime), dissolved metals (e.g., iron sludge), chemical reactions (e.g., solidification of dissolved resins), natural siltation, or any combination of the above.

If fouling occurs, the operator must identify the cause and implement corrective measures. These measures may include the introduction of weak chemical or acid solutions into the well, or redevelopment of the well. Konica representatives must be advised and consulted before any chemicals are introduced into the Remediation Area as a corrective measure. The NYSDEC may be required to be advised also if any chemicals are introduced. Konica's knowledge of past disposal practices within the Remediation Area will be helpful in identifying potential chemical reactions which might occur between any proposed corrective chemicals, and chemicals already present within the Remediation Area.

All wells should be inspected monthly, and the vegetation and soil around the wells maintained so that the wells remain visible and accessible.

The handholes are installed flush with final grade. The area between the handhole lids and well caps should be inspected monthly and cleaned out as necessary so that soil, debris and vegetation do not build up within the handholes. The well caps should be removed and inspected as part of the well inspection, to ensure that they remain in working condition.

The Site monitoring wells are installed with locking covers. The locks on the covers should be inspected and lubricated monthly.

11.5.3 Handholes

The thirty (30) ground water recovery handholes contain equipment that is critical to proper Plant operations. Refer to Section 9.0. It is essential that the handholes be maintained in a clean, dry condition to allow safe and efficient access to the equipment contained within the handholes.

The handholes have been designed and constructed to be water and vapor tight, and should be inspected periodically to ensure that each handhole is water tight. If water is entering a handhole, the operator should check the following parts of the handhole:

- All handhole penetrations have been sealed with waterproof grout. These seals should not require maintenance, and should not be adjusted unless there is clear evidence (e.g., visible drip stains) of a leak through a penetration. If a seal is leaking, it should be carefully inspected, and replaced if necessary, in accordance with the instructions contained in the manufacturer's O&M Manual located in Appendix L.

- Each handhole contains a joint around the entire handhole perimeter, that is sealed with a rubber gasket. If the gasket is not seated correctly, the handhole will leak. The operator should check these joints for visible signs of leakage, and repair any defects that exist.

No water should be allowed to accumulate in the handholes, and any leaks must be corrected as they are identified.

The handholes must also be kept free of dirt. Any accumulated dirt should be periodically removed with a shovel or small dust pan. A brush and dust pan should also be used as necessary to remove dirt from the handhole equipment.

11.5.4 Building

Basic maintenance of the Building should be performed as listed below.

The Building roof is equipped with gutters which should be inspected seasonally, and cleaned as necessary, to ensure that stormwater is properly diverted away from the Building.

All penetrations through the Building walls should be inspected on a monthly basis for deterioration and evidence of leaks. The caulking around these penetrations should be replaced as necessary to provide leak-proof seals.

11.5.5 Perimeter Fencing

The perimeter fencing around the oxidizer area should be inspected monthly for tears or breaks. Due to the potential for vandalism, any breaks should be repaired, and Konica notified immediately.

Brush and trees close to the exterior of the fence should be removed to eliminate a means for access to the Site over the fence. The locks on the gates should be inspected and lubricated regularly, and replaced if necessary due to rusting or other damage.

11.6 Maintenance Tools and Equipment

11.6.1 Maintenance Tools

Good maintenance depends on the availability of proper tools to do the job. A standard set of mechanics hand tools, with socket and end wrench sizes to 1¼ inches and torque wrench capabilities to 150 foot pounds, should be either provided in a secure and protected location at the Plant, or available at the Konica facility, for routine Plant maintenance. The standard tool set should be supplemented with the special tools listed in Table 11-2 for the specialized maintenance and repair tasks encountered occasionally in the Plant.

Hand shovels, brooms and other articles necessary for general Site maintenance and cleanup should be available on-Site. Carpenter hand tools should be provided and maintained in good condition with a protective coating of an approved rust preventive compound.

11.6.2 Maintenance Equipment

Large items of maintenance equipment which are used infrequently should be obtained from equipment rental sources as needed. A listing of more frequently used maintenance equipment to be stored at the Plant is given in Table 11-3. Emergency recovery equipment is listed in Section 14.0 as Table 14-3. Safety equipment is listed in Section 6.0 as Tables 6-2 and 6-4.

TABLE 11-1
RECOMMENDED CONSUMABLE SUPPLIES

Category	Item	Remarks
Lubricants	Refer to Plant Lubrication Survey	
Housekeeping	Detergent, Industrial Grade Mechanics' Handsoap	Space and Equipment Cleaning Personal Cleanliness
Plant Maintenance Equipment	Mineral Spirits PVC Pipe Glue Pipe Joint Teflon Tape Electric Insulating Tape	Cleaning Joining PVC Pipe Joining PVC Pipe Joining PVC or Metal Pipe Electrical Repairs
Emergency	PVC Pipe - 2", 3", 4", and 6"	1 length each size

TABLE 11-2
RECOMMENDED SPECIAL MAINTENANCE TOOLS

Item	Purpose	Remarks
Megohmeter	Testing Equipment Resistance to Ground	Range 0 to Infinity
Electric Multimeter	Testing Electric Circuits and Equipment	Capacity to 500 VAC
Clamp-on Ammeter	Checking Current Flow	Capacity to 100 amps
Thermometer with Sensor Probe	Checking Bearing Temperatures	Range to 300°F

TABLE 11-3
RECOMMENDED MAINTENANCE EQUIPMENT

Item	Purpose	Remarks
Generator, portable, gasoline powered	Operate electrical tools in the field	Capacity 5 KW 230/115 VAC
Portable blower with hose	Ventilate Areas	Capacity 750 CFM
Drill, Electric, Reversing and Variable Speed	General Purpose	Capacity to 1/2"
Non-metal Extension Ladder	Building Maintenance	Extended length 20'
Wheelbarrow	General Purpose	Medium Capacity

Figure 11-1

EQUIPMENT RECORD CARD					
EQUIPMENT		ELECTRICAL			
NAME	I.D. No.	NAME		I.D. No.	
SERIAL No.		SERIAL No.			
MODEL No.		TYPE			
SIZE		VOLTS	AMPS	RPM	
MFGR.		PHASE	FRAME	HP	
		MFGR.			

PROC. No.	PREVENTIVE MAINTENANCE		FREQUENCY

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SERVICE RECORD					
DATE	WORK DONE	SIGNED	DATE	WORK DONE	SIGNED

Figure 11-2

STANDARD WORK ORDER

STANDARD No.: ____________ DATE: ____________

STANDARD No.: ______________________________________

____

____

APPLICABLE TO: (LIST EQUIPMENT NUMBER) ____________________

____

WORK REQUIREMENTS:

EQUIPT. No.	COMPLETION DUE ON OR BEFORE	ESTIMATED WORK HOURS	ACTUAL WORK HOURS

TASK No.	TASK DESCRIPTION

Figure 11-3

JOB ORDER FORM

JOB ORDER NO: ____________

DATE: ____________

EQUIPMENT NAME   NUMBER

PRIORITY: ____________

INITIATED BY: ____________

REASON: ____________

WORK DESCRIPTION: ____________

JOB ESTIMATE

LABOR: ____________

MATERIALS: ____________

WORK RECORD

PERSONNEL ASSIGNED	MAN/HOURS	DATE	WORK DONE	PART/MAT'LS

TOTAL ____________

WORK COMPLETED: ____________ (Signature) DATE: ____________

WORK ACCEPTED: ____________ (Signature) DATE: ____________

Figure 11-4

STOREROOM INVENTORY CARD

ITEM IDENTIFICATION

PART/ITEM No. : ______________________

EQUIPT./COMPONENT: ______________________

____

ITEM DESCRIPTION: ______________________

____

STORAGE LOCATION

STOCKING INFORMATION (QUANTITY)

MAXIMUM: ____________ MINIMUM: ____________ REORDER: ____________

INVENTORY INFORMATION

QUANTITY USED/STOCKED	DATE	SIGNED	QUANTITY ON HAND	USAGE/RESTOCKING DATA

12.0 EMERGENCY PROCEDURES

12.1 INTRODUCTION

Emergency preparedness is essential to ensuring the continuous effective operation of the Plant under emergency conditions. The purpose of this Section is to present an Emergency Response Plan for the Plant. The objectives of the Emergency Response Plan are to:

- Eliminate or reduce adverse effects to human health and the environment resulting from emergency situations affecting the Plant.
- Establish procedures for timely and appropriate response to emergency situations.
- Provide definitive instructions to allow operating personnel to understand and execute their responsibilities.
- Establish sources of emergency assistance and list emergency supplies and equipment available to recover from emergency situations.

This Section addresses the Plant safeguards and procedures that should be utilized by Plant personnel in responding to one or more of the emergency situations listed in Table 12-1. Routine health and safety practices are described in Section 6.0.

Effective emergency planning requires substantial coordination and forethought by all individuals involved in the operation of the Plant. This Section has been prepared to be as complete and comprehensive as possible. However, since Plant personnel may have a better perspective on optimum emergency response and their own capabilities, revisions and additions to the Emergency Response Plan are encouraged.

Equipment malfunction, fires, spills, power failures, and natural disasters are often dramatic, unexpected occurrences which can cause personnel to momentarily forget or ignore basic emergency procedures. Therefore, it is important for Plant personnel to become completely familiar and comfortable with Plant emergency procedures and safeguards.

12.2 EMERGENCY PREVENTION MEASURES

In order to reduce or eliminate the likelihood of emergency events occurring at the Plant, emergency prevention measures have been established for and built into the Plant construction and operation. These prevention measures include the following, and are described below:

- Duplicate equipment
- Fire protection system
- Security system
- Autodialer alarm call-out system

12.2.1 Duplicate Equipment

Some of the major Plant equipment is installed with a duplicate item of equipment. The duplicate item can remain on-line if another equipment item malfunctions. The equipment listed below is installed with a duplicate. The quantity of each type appears to the right of each item.

- Low Profile Air Strippers (2)
- Transfer Pumps (2)
- Unit Heaters (2)

Equipment redundancy and its implementation in emergency situations is discussed in Section 12.3.6.

12.2.2 Fire Protection System

Two portable fire extinguishers are located in the Building. The extinguishers are ABC-class extinguishers which use Halon as an extinguishing agent, to protect the electronic equipment inside the Building. Refer to Section 6.2.3 for further details regarding the extinguishers.

All Plant personnel should be trained in the use and operation of these portable extinguishers. Portable extinguishers should be used in an upright position. Before approaching a fire, the extinguisher should be checked by removing the safety pin and briefly squeezing the handle or grip. The extinguisher discharge should be directed at the base of the fire, with the nozzle moving in a rapid side-to-side sweeping motion.

Two photoelectric smoke detectors have been installed along the centerline of the building. These smoke detectors are connected to the Fire Alarm Control Panel (FACP), Model "FireQuest" 200, which is located alongside the control panel PP-1 along the south wall of the building. Also connected to the FACP are the three manual alarm buttons located at each door in the building and the horn/strobe which is mounted on the middle column of the south wall.

All the above equipment should be inspected regularly, and if required, recharged immediately following their use or as needed based on the inspections. Refer to Section 6.2.3 for further inspection requirements.

12.2.3 Security System

In order to prevent unauthorized entry, fencing surrounds the entire Site. In addition, a chain link fence is installed around the VTM.

The opening of any doors will activate an alarm during unauthorized entry.

12.2.4 *Autodialer Alarm System*

The Plant is equipped with an automatic alarm dialer to notify off-Site personnel of critical alarms in the Plant. The autodialer is described in more detail in Section 10.6.

12.3 *EMERGENCY RESPONSE PLAN*

12.3.1 *General Discussion*

The following sequence of steps should be followed by Plant personnel when responding to an emergency situation:

- Identify emergency
- Perform initial investigation
- Take initial action
- Take corrective action
- Perform follow-up investigation

Identifying an emergency is usually a simple task because the effects of an emergency are readily apparent. In some cases, the operator may have prior warning of an emergency. For example, weather reports can provide warning of approaching hurricanes, windstorms, blizzards, or other natural occurrences.

Once Plant personnel are aware that an emergency condition exists or is impending, all persons in and around the Plant should be notified and an immediate initial investigation should be performed. The operator is responsible for quickly coordinating the investigation and assigning personnel to investigative duties. The purpose of the initial investigation is to assess the severity of the situation and to collect enough information to make an action decision. The assessment should include identifying any injured persons, observing equipment damage, noting impending damage if corrective action is not taken immediately, and itemizing equipment and materials required to remedy the situation.

Once the extent of the emergency is known, the operator is to then make an immediate decision as to what initial action should be taken in compliance with this Emergency Response Plan. All Plant personnel are responsible for ensuring that any actions taken conform to the procedures in this plan.

In the event of large scale emergencies, usually the initial action would be to contact emergency services and local authorities such as the fire and police departments. These agencies and their telephone numbers are listed in Table 6-1, which should be posted next to the Plant telephone at all times. A route map to the Community Hospital in Glen Cove, New York should be posted in a conspicuous location, and in a manner that it can be quickly removed without damage, for use during emergency transportation. If the condition involves a spill or accidental discharge, NYSDEC should be contacted, as well as other emergency services and agencies as deemed appropriate and as required by law.

After all appropriate emergency contacts have been notified, Plant personnel should initiate remedial procedures, within limitation. Personnel should not endanger themselves or others by attempting tasks for which they are not qualified or for which proper equipment is not available. In all cases, if in doubt, wait until qualified help arrives.

When emergency response authorities arrive, Plant personnel should immediately inform them of the details of the situation, including the chemicals and hazards that may be encountered. Corrective action should proceed until the situation is either under control or completely rectified. If remedial action will take considerable time (days or weeks), Plant personnel should consult with Konica personnel to outline long term efforts to complete the task.

After the emergency situation has been corrected, Plant personnel should critically analyze the events leading up to the emergency, as well as the response. The purpose of the follow-up investigation is to minimize the risk of recurrence and to assess the effectiveness of the emergency response. Steps should then be taken to eliminate identified deficiencies.

The HASP, which is located in Appendix F, is a comprehensive plan for dealing with health and safety issues and emergencies on the Site, including the handling of ground water and associated health concerns and precautions. The following subsections are intended only as general guidelines for emergency procedures during specific situations. Key Konica personnel must be notified of all emergencies.

12.3.2 Injuries to Plant Personnel or Visitors

Early recognition of the symptoms of various injuries and exposures is important for effective treatment and recovery. The signs and symptoms of various injuries, chemical exposure, and shock are listed in Table 12-2.

In the event of minor injuries such as cuts, bruises, or sprains, the injured person should be taken to the Community Hospital in Glen Cove, New York, if mentally alert and ambulatory. In the event of a serious injury or chemical exposure, the local Emergency Medical Services (EMS)/Poison Control Center should be contacted immediately at (516) 676-1000.

The person contacting the local EMS should be prepared to provide the following information:

- Exact location of the emergency
- Telephone number he/she is calling from
- Type of injury(ies)
- How many persons have been injured
- What assistance or first aid is being given to the injured person(s)

Do NOT hang up unless told to do so. In most cases, the EMS dispatcher will require the caller to stay on the telephone.

While awaiting the arrival of medical assistance, first aid should be administered. The basic procedures for assisting an injured person are as follows:

- Remain calm and quickly evaluate the injury.
- Do not move the injured person unless necessary to avoid a life-threatening situation.
- If possible, move any physical and chemical hazards from the area of the injured person.
- Take care of the most serious injuries: stop bleeding, restore breathing, etc.
- Cover injured person with jackets, coats, or blankets to keep warm.

Detailed descriptions of first aid procedures are given in the American Red Cross Standard First Aid Manual, located in Appendix G.

12.3.3 Fire or Explosion

Plant emergency equipment is identified in Table 12-3 at the end of this Section. All incidents of fire, explosion, or related Plant shutdown must be reported to Konica and NYSDEC.

Portable fire extinguishers are located in the Building based on the classes of anticipated fires, and on the size and degree of hazard which would affect their use. The two tri-class Halon extinguishers are mounted on columns; one in the southeast corner of the Building and the other alongside the eyewash and safety shower.

The fire extinguishers must be visually inspected and hydrostatically tested by a fire extinguisher service company on an annual basis.

In the event of a fire or explosion, Plant personnel should take the following steps:

1. Account for all Plant personnel and visitors on the Site, and identify injuries, if any.

2. In the event of a major fire or explosion, evacuate the Building and/or area of fire immediately, and telephone the Glen Cove Fire Department at (516) 676-1366 from a nearby location as soon as possible.

3. In the event of a localized fire, implement Step 2 above, and attempt to extinguish the fire if there is no potential for explosion.

4. Initiate the Plant Emergency Shutdown Procedures listed in Section 12.4 if Plant operation is threatened by fire or explosion.

5. Upon arrival of fire fighting personnel, apprise them of the situation, including the potential chemical and physical hazards within the Building.

12.3.4 Electrical Power Loss

An autodialer "power loss" alarm may be caused by any of the conditions listed below. The operator must quickly inspect the Plant to determine the cause of the power outage, and implement necessary response measures.

1. Loss of Utility (LILCO) power feed to the Site.

2. Utility power feed failure <u>on the Site</u> (e.g., downed power line, transformer failure).

3. Failure or trip of the 600 Amp LILCO breaker inside the Building.

4. Blown fuse which powers the Autodialer. The fuse is located inside the MCP.

5. Autodialer failure.

This Section discusses the impacts and associated corrective actions to be implemented due to an autodialer "power loss" alarm.

If the power loss alarm is due to conditions 1, 2 or 3 above (i.e., a "blackout"), the entire Plant processes will shut down. During this shutdown, none of the process streams are capable of being released to the environment.

In the event of a power loss alarm, the time of the alarm and any actions taken by the operator should be recorded on the Plant Alarm Log, which is included in Section 5.0 of this Manual.

If a power outage occurs during periods of cold weather, the operator must immediately evaluate possible freezing of the ground water pipes within the Building, and the need to bring in auxiliary heat sources to warm the Building. The Building is well insulated and should retain a fair amount of heat during a power outage. Options would include kerosene heaters, or an electric generator to power the unit heaters (EUH-1 and EUH-2). **All options must be implemented only with the operator present on-Site, and must not be implemented when the Building is unattended. Further, no temporary heat measures should be implemented until the Building space is properly monitored for VOCs, percent LEL, and oxygen content. Monitoring should continue periodically during temporary heating.**

After return of electric power to the Plant, the operator must implement specific restart procedures, which are detailed in Table 12-4 in the recommended order of implementation.

12.3.5 Failure of Plant Equipment

Some of the Plant equipment is installed with a duplicate item of equipment. Therefore, if one item of equipment malfunctions, the duplicate item can be used alone while repairs are being made. The operating personnel will have to activate the "backup" item to serve both functions (e.g., using one air stripper while the other is shut down). Refer to Section 9.3.4 which outlines some of these procedures.

The unit heaters were designed to be operated <u>together</u> at all times, so that they share the heating load in the Building. If one of the heaters malfunctions, however, the remaining heater can be used for a <u>short</u> time to prevent freezing in the Building.

In the event that equipment or controls malfunction, an immediate investigation should be made to determine the cause, and appropriate actions should then be taken. Descriptions of the Plant emergency alarms and conditions for an automatic shutdown of Plant equipment are given in Sections 7.0, 8.0, 9.0 and 10.0 of this Manual. Emergency procedures for <u>manual</u> Plant shutdown are given in Section 12.4. .

If either the VTM or ground water treatment system are shut down for a significant period of time, the shutdown should be noted in the periodic reports submitted to NYSDEC which are described in Section 5.0. Due to the fact that the Remediation Area is not contained by a slurry wall or cap, it is critical to correct process problems immediately to bring the Plant on-line as fast as possible.

12.3.6 Spill or Uncontrolled Release of Ground Water, Sediments, or Vapors

All spills or uncontrolled releases of ground water, sediments, or vapors to the environment are to be reported immediately to the NYSDEC Emergency Action Hotline at (800) 457-7362. If the release is contained within the Building and can be recovered without being released to the environment, the incident should be reported to NYSDEC as part of the next regular project report. Additionally, if a major spill or release occurs that presents a risk to the health or safety of the general public, contact the Police and Fire

Departments. If a leak occurs in one of the handholes, the operator must ensure that the water is directed back into the Remediation Area and not allowed to run off to other areas of the facility.

12.3.7 Natural Emergencies

12.3.7.1 Severe Windstorm, Hurricane, or Tornado

Plant personnel will typically be alerted to the possibility of severe weather conditions by broadcast, telephone warning, and notices issued by the regional forecasting facilities of the National Weather Service. Konica should consider implementing communication measures to ensure that Plant personnel are kept apprised of severe weather events that are forecast for the region. In the event of a severe weather warning, protective measures such as securing outside equipment so that it is not blown away should be implemented. The Building doors should be closed during windstorms and hurricanes. During tornadoes, doors facing the approaching tornado should be closed; doors on the opposite side of the Building should be opened.

Damage will be predominantly fallen power lines, trees, fences, signs, etc., and damage to equipment and structures from flying debris. If power lines are blown down during the windstorm, electric power to the Site and/or Building will be lost. As soon as the storm has ceased, the operator should assess the damage and inform Konica as to the nature and extent of the damage. It may be necessary to inform NYSDEC of the nature and extent of the damage. Steps should then be taken to return the Plant to normal operating conditions as quickly as possible.

CAUTION: Plant personnel should be aware that downed power lines on the Site may still be live.

12.3.7.2 *Freezing*

During the winter months, the possibility of freeze damage to the Plant is a concern. The ground water recovery and treatment system will operate through during the coldest winter months.

Because a majority of Plant piping is constructed of plastic, it is recommended that flame torches not be used to thaw frozen pipes. Refer to Section 12.3.4 for temporary heat provisions for the Building.

12.3.7.3 *Flooding*

The Building is located on a gradual slope from the north to the south of the Site. Grading modifications were designed and constructed so that stormwater runoff from the Remediation Area will be easily diverted to on-Site storm water catch basins throughout the Site where stormwater is collected and directed away from the Site.

Due to this grading, it is not expected that flooding will be a concern to the Plant. If a major storm event does occur, the handholes should be checked for water infiltration.

12.4 *PLANT EMERGENCY SHUTDOWN PROCEDURES*

If the operator must manually shutdown the Plant due to an emergency, the following procedures should be implemented.

- Turn off all speed controllers by turning the H-O-A switches to "OFF" to avoid damage to the speed controllers.
- Open the 600 Amp LILCO circuit breaker in the MDP which is located on the south interior wall of the Building.

During normal operations, these circuit breakers should never be locked in a closed position. It is much safer to accidentally shut down the Plant and have to restart it, than to have a delay in shutdown procedures during an emergency.

An emergency shutdown of the Plant will trigger autodialer alarms for "power loss", "VTM shutdown", and "Ground Water Treatment shutdown".

12.5 EMERGENCY EQUIPMENT AND MATERIALS

A comprehensive emergency equipment and materials inventory should be prepared and maintained at the Plant. The inventory should list the quantity and location of all items of equipment and of all supplies stocked. A suggested stocking list of emergency equipment and materials to be procured in advance and to be stored in a secure, readily accessible location at the Plant is shown in Table 12-3. Additional emergency equipment which should be available at the Plant, and the intended use of this equipment, is included in Tables 6-2, 6-3 and 6-4.

The source, and a telephone contact number, for obtaining additional backup equipment such as portable generators, compressors, or blowers should be shown on the emergency equipment inventory maintained at the Plant.

It is recommended that Konica store some duplicate emergency equipment (e.g., respirators, health and safety equipment) at their manufacturing facility, so that in the event of a Building emergency, unprotected personnel do not have to enter the Building to access the safety equipment.

The ready availability of spare parts is an important factor in expediting recovery from emergency conditions which involve equipment breakdown. To assure their availability, spare parts used in normal maintenance and repairs should be reordered immediately after use. Stocking locations for spare parts which are not normally purchased before they are needed, are listed with a contact telephone number and address in the manufacturer's O&M Manuals included as Appendix L to this Manual. A list of recommended spare parts is included as Appendix I.

TABLE 12-1

POSSIBLE EMERGENCY SITUATIONS

1. Injury to Plant personnel or visitors.

2. Fire or explosion.

3. Loss of electric power.

4. Spill or uncontrolled release of untreated ground water, sediments, or vapors.

5. Natural emergencies.

TABLE 12-2
SYMPTOMS OF VARIOUS TYPES OF INJURIES, EXPOSURES, AND SHOCK

Type of Injury or Exposure	Symptom
Bone Fracture	Signs and symptoms of fractures include the sound of bone "snapping" a grating sensation of bones burring together, obvious deformities, pain, tenderness, swelling, bruising, and an inability to move the injured part. Victims with fractured ribs may feel pain as they breathe.
Dislocation	Signs and symptoms of a dislocation are similar to those of a fracture. They include swelling, deformity, pain in a joint, loss of movement, and tenderness.
Sprain	Signs and symptoms of sprains include pain at the joint, tenderness when touched, discoloration, and swelling.
Internal Bleeding	Signs and symptoms of internal bleeding are: • Bruised, swollen, tender; or rigid abdomen. • Bruises on chest or signs of fractured ribs. • Blood in vomit. • Wounds that have penetrated the chest or abdomen. • Bleeding from the rectum or vagina. • Fractures of the pelvis. • Abnormal pulse and difficult breathing. • Cool, moist skin.

TABLE 12-2
SYMPTOMS OF VARIOUS TYPES OF INJURIES, EXPOSURES, AND SHOCK

Shock	Shock has many signs and symptoms. These include confused behavior, very fast or very slow pulse rate; very fast or very slow breathing; trembling and weakness in arms and legs; cool and moist skin; pale or bluish skin, lips, and fingernails; and enlarged pupils.
Chemical Exposure, Ingestion, or Inhalation	Symptoms of chemical exposure, ingestion, or inhalation may include one or more of the following: • Abnormal Pulse • Behavioral changes • Breathing difficulties or abnormal breathing • Changes in complexion or skin color • Convulsions • Coordination difficulties • Coughing • Dizziness or drowsiness • Drooling • Diarrhea • Fatigue and/or weakness • Irritation of eyes, nose, respiratory tract, skin, throat, mouth, or lips • Headache • Itching • Light-Headedness • Nausea/vomiting • Skin irritation or rash • Sneezing • Sweating • Tearing • Tightness in the chest • Unconsciousness

TABLE 12-2
SYMPTOMS OF VARIOUS TYPES OF INJURIES, EXPOSURES, AND SHOCK

Heat Stroke	Signs and symptoms of heat stroke are hot, red skin; very small pupils; and very high body temperature - sometimes as high as 105 degrees. If the victim was sweating from heavy work or exercise, his or her skin may be wet; otherwise, it will feel dry.
Heat Exhaustion	The usual signs and symptoms of heat exhaustion are cool, pale, and moist skin; heavy sweating; dilated pupils, headache, nausea; dizziness; and vomiting. Body temperature will be nearly normal.
Frostbite	The first sign of frostbite may be that the skin is slightly flushed. The skin color of the frostbitten area then changes to white or grayish yellow and finally grayish blue, as the frostbite develops. Pain is sometimes felt early on but later goes away. The frostbitten part feel very cold and numb. The victim may not be aware of the injury.
Hypothermia	The signs and symptoms of hypothermia include shivering, dizziness, numbness, confusion, weakness, impaired judgement, impaired vision, and drowsiness. The stages are: 1. Shivering 2. Apathy 3. Loss of consciousness 4. Decreasing pulse rate and breathing rate 5. Death As hypothermia progresses, the victim may move clumsily and have trouble holding things. In the later stages, he or she may stop shivering.

TABLE 12-3
SUGGESTED EMERGENCY RECOVERY EQUIPMENT AND MATERIALS

Electric Generator

Portable Centrifugal Pump, Gasoline Powered

Gasoline Cans with Reserve Fuel

Portable Ventilating Blower with hose, gasoline powered

Ladders (Step and Emergency)

Rope

Safety Harnesses

Flashlights

Hand Shovels

Hand Saws (Wood and Metal)

Note: Refer to the HASP, located in Appendix F, for a list of general health and safety equipment, including Level C and Level B personal protective equipment.

TABLE 12-4
PLANT RESTART PROCEDURES

NOTE: Implement restart procedures in the order shown.

Equipment Item	Restart Procedures
Circuit Breakers	Verify that the following breakers are closed (on): 1. 600 Amp LILCO Breaker. 2. All Main Distribution Panel (MDP) Breakers (unless intended to be off for other reasons). 3. All PP-1 Breakers.
Speed Controllers	At <u>each</u> speed controller keypad: 1. Input a desired well level setpoint in hz, using the numeric keypad (see chart on MDP). 2. Press the "Run" key.
Transfer Pumps	Verify that each pump's selector switches are in "Normal" and "Auto" positions.
Exhaust Fan EF-1	Verify that selector switch is in "Auto" position.
VTM	Restart the unit in accordance with manufacturer's O&M Manual located in Appendix L.
Ground Water Treatment Module	Restart the unit in accordance with manufacturer's O&M Manual located in Appendix L.

APPENDIX A:

REMEDIATION SYSTEM EQUIPMENT DESIGN CRITERIA SUMMARY

The purpose of this appendix is to summarize the Plant equipment design criteria and operational characteristics. It is organized in a manner which reflects the order of the process flow.

1. Ground Water Submersible Recovery Pumps

Design Basis

A. Flow Rate Range: 0.35-7 gpm each
B. Design Flow Rate: 0.35-1 gpm each
C. Total Dynamic Head: 62 feet W.C.

Equipment Description

A. Item Numbers: P-301 to P-330
B. Manufacturer: Grundfos Pumps
C. Model: Redi-Flo4 Series 5E5
D. Size: 3.97" diameter pump, 1" NPT discharge
E. Type: Submersible centrifugal, cylindrical inlet screen, top discharge.

Note: Recovery pumps will shut down on high pressure signal from recovery header line and during air stripper alarm.

2. Ground Water Recovery Treatment System Air Strippers

Design Basis

A. Flow Rate Range: 0-30 gpm
B. Design Flow Rate: 14 gpm
C. Total Dynamic Head: 50 feet W.C. (Discharge Pumps)
D. Air Flow Rate: 300 cfm each @ 18" W.C.
E. Ground Water Characteristics:
   i. 20 ppm total VOCs
   ii. Temp. 50°F
F. Destruction Efficiency: 99.95% Toluene when operated in series mode

Equipment Description

A. Item Numbers: STR-401 and STR-402
B. Manufacturer: North East Environmental Products, Inc.
C. Model: Shallow Tray Model 2341
D. Treatment Technology: Low profile counter current mass transfer.

E. Configuration: Series or individual flow, single control panel, individual transfer pumps.
F. Transfer Pump Size: 1.5 HP, 30 gpm @ 50 Ft TDH
G. Electrical Requirements: 208 V, 3 phase, 60 Hz.

Note: Air strippers will shut down on low air pressure, high stripper sump water level or an external alarm from the VTM if internal bypass switch is set to "Oxidizer". Interlock with high level wet well alarm.

3. Wet Well Sump Pump

Design Basis

A. Flow Rate Range: 0-70 gpm
B. Design Flow Rate: 15 gpm
C. Total Dynamic Head: 30 feet W.C.

Equipment Description

A. Item Number: P-602
B. Manufacturer: Ebara Corporation
C. Model: 50DSU6.75
D. Size: 2" discharge, 5/16" particles
E. Type: Submersible, centrifugal with bottom inlet strainer
F. Materials: Cast Iron Body
G. Electrical Requirements: 1 HP, 208 VAC, 3 phase, 60 Hz.

Note: On/Off control through level switches located in the wet well.

4. Vapor Separation Module

Design Basis

A. Flow Rate Range: 0-500 cfm
B. Design Flow Rate: 240 cfm

Equipment Description

A. Item Number: VSM-501
B. Manufacturer: Global Technologies, Inc.
C. Model: VSM 5
D. Size: 4 inch inlet/outlet
E. Capacity: 75 gallons
F. Treatment Technology: Centrifugal Separation

5. Vapor Separator Transfer Pump

Design Basis

A. Flow Rate Range: 0-50 gpm
B. Design Flow Rate: 5 gpm
C. Total Dynamic Head: 60 feet W.C.

Equipment Description

A. Item No: P-501
B. Manufacturer: MP Pumps, Inc.
C. Model: Series 60, 4.10
D. Size: 1¼ inch x 1 inch
E. Type: Centrifugal with recirculation line
F. Materials: Viton seal, stainless steel fittings, cast iron body
G. Electrical: 3/4 HP, 208 VAC, 3 phase, 60 Hz

Note: On/Off control through level sensors located in knock-out pot and interlock with air strippers.

6. Vapor Extraction Module

Design Basis

A. Flow Rate Range: 0-650 cfm
B. Design Flow Rate: 240 cfm
C. Vacuum Range: 41 inches W.C. @ 650 cfm
D. Design vacuum: 80 inches W.C. @ 240 cfm

Equipment Description

A. Item No. VEM-501
B. Manufacturer: Global Technologies, Inc.
C. Model: Unit No. VEM-0030, Lamson Turbotron TURB10-MI
D. Size: 4 inch inlet, 3 inch outlet
E. Type: Regenerative type blower, belt driven
F. Materials: Aluminum casing and impeller
G. Electrical Requirements: 10 HP, 208 VAC, 3 phase, 60 Hz

Note: On/Off control through VTM equipment interconnection, manual reset required.

7. Vapor Treatment Module

Design Basis

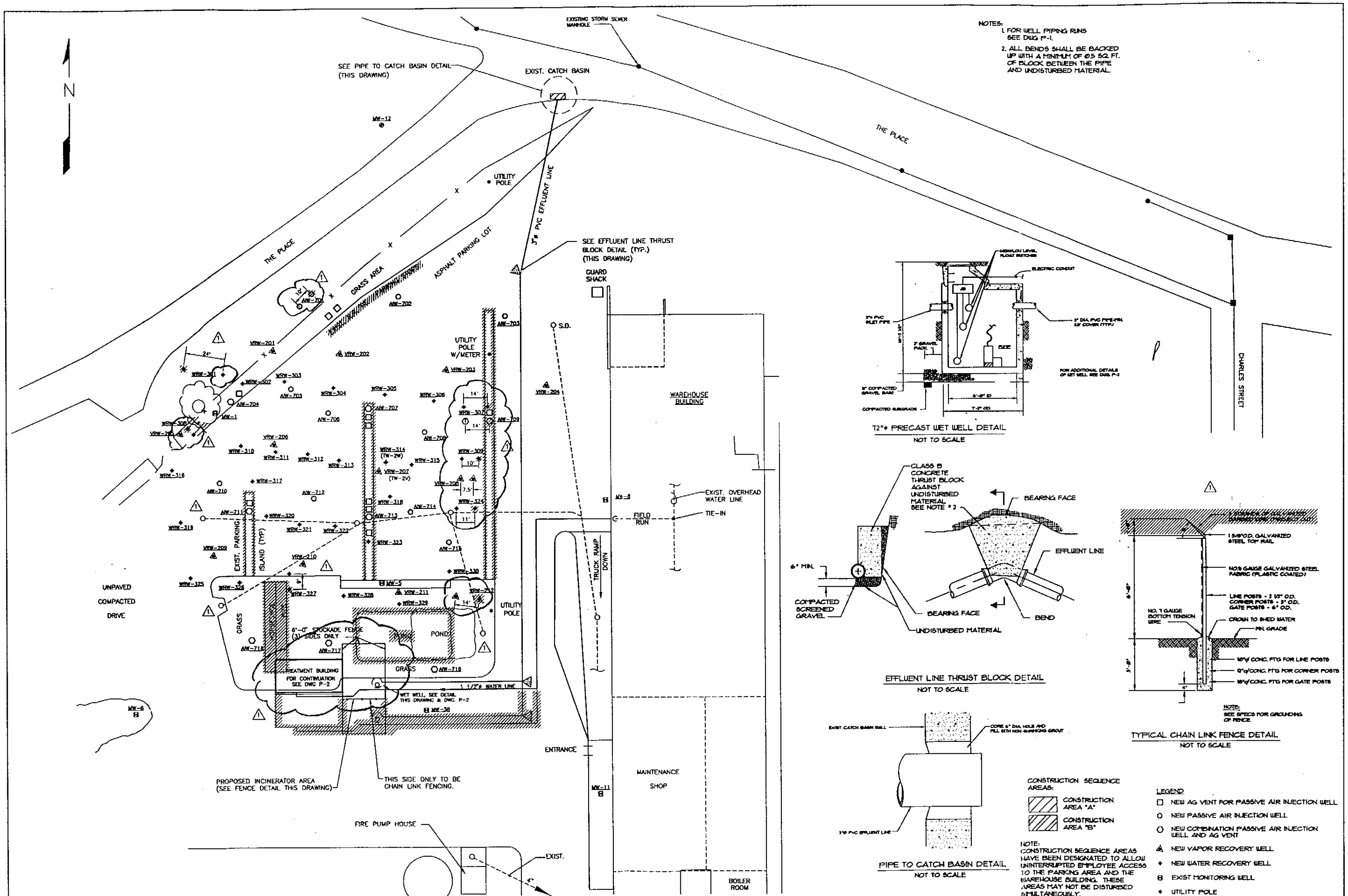
A. Flow Rate: 1000 cfm
B. Soil Vapor Flow Rate: 240-500 cfm
C. Dilution Air Flow Rate: 0-1000 cfm
D. Soil Vapor Solvent Loading: 3.0 lbs/hr.
E. Soil Vapor LEL: 0-90%
F. Soil Vapor Methane Loading: 0-90%
G. Destruction Efficiency: 99%
H. Heat Recovery: 50%

Equipment Description

A. Item Number: VTM-501
B. Manufacturer: ThermTech, Inc.
C. Model: Cat Vac 100, Vapor Check
D. Treatment Technology: Destruction by catalytic oxidation
E. Fuel: Liquid petroleum gas
F. Operation: Automatic dilution air and fuel flow control based on catalyst bed temperature, LEL monitor.
G. Electrical: 208 VAC, 3 phase, 60 Hz., 7.5 HP Process booster blower, 1.5 HP Combustion blower.

APPENDIX B:

PROCESS AND INSTRUMENTATION DIAGRAMS



AS-BUILT REVISIONS

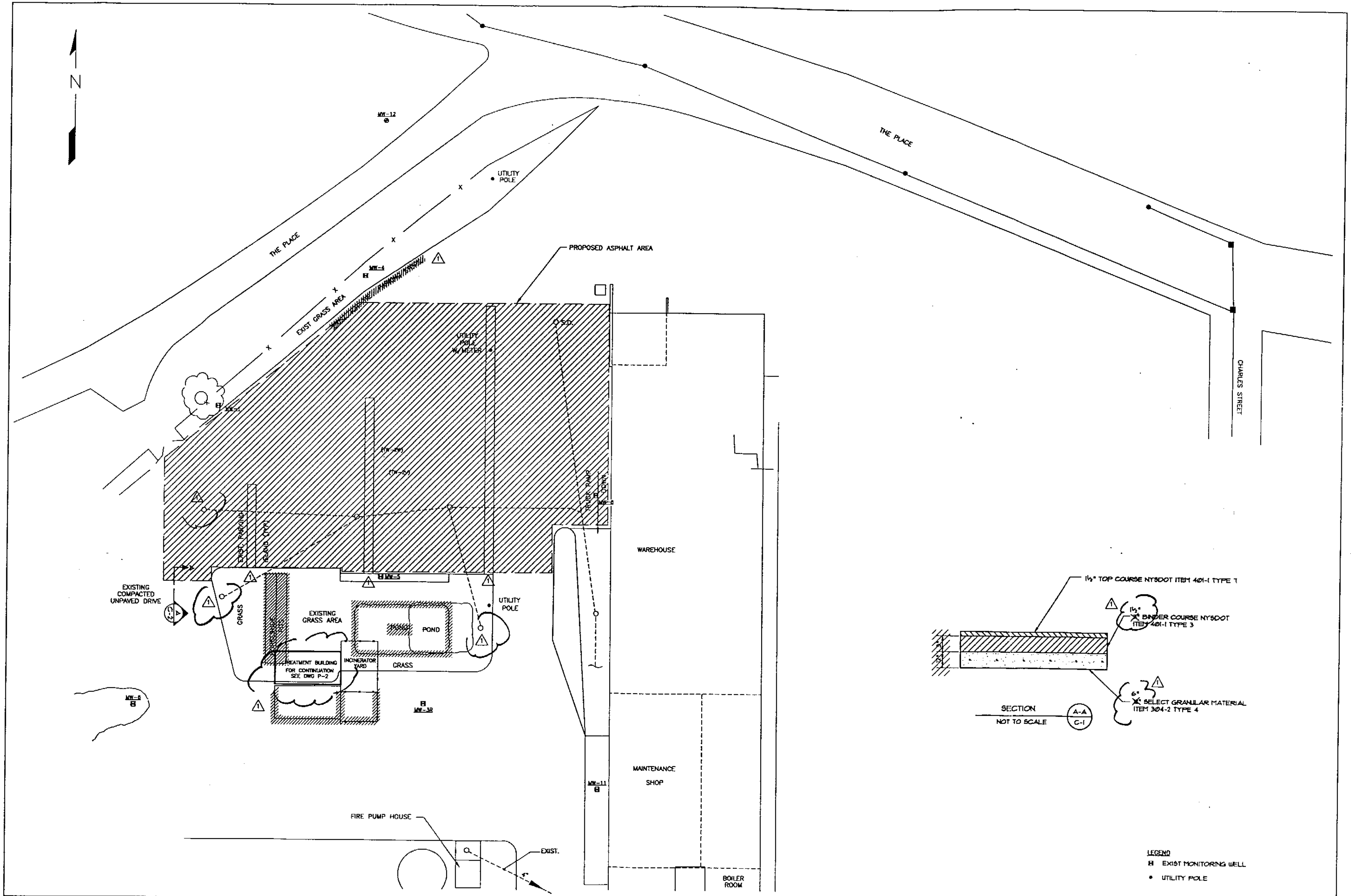
FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GLEN COVE, NY

J.T. DUGAN

SITE PLAN

C-1



AS-BUILT REVISIONS

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GLEN COVE, NY

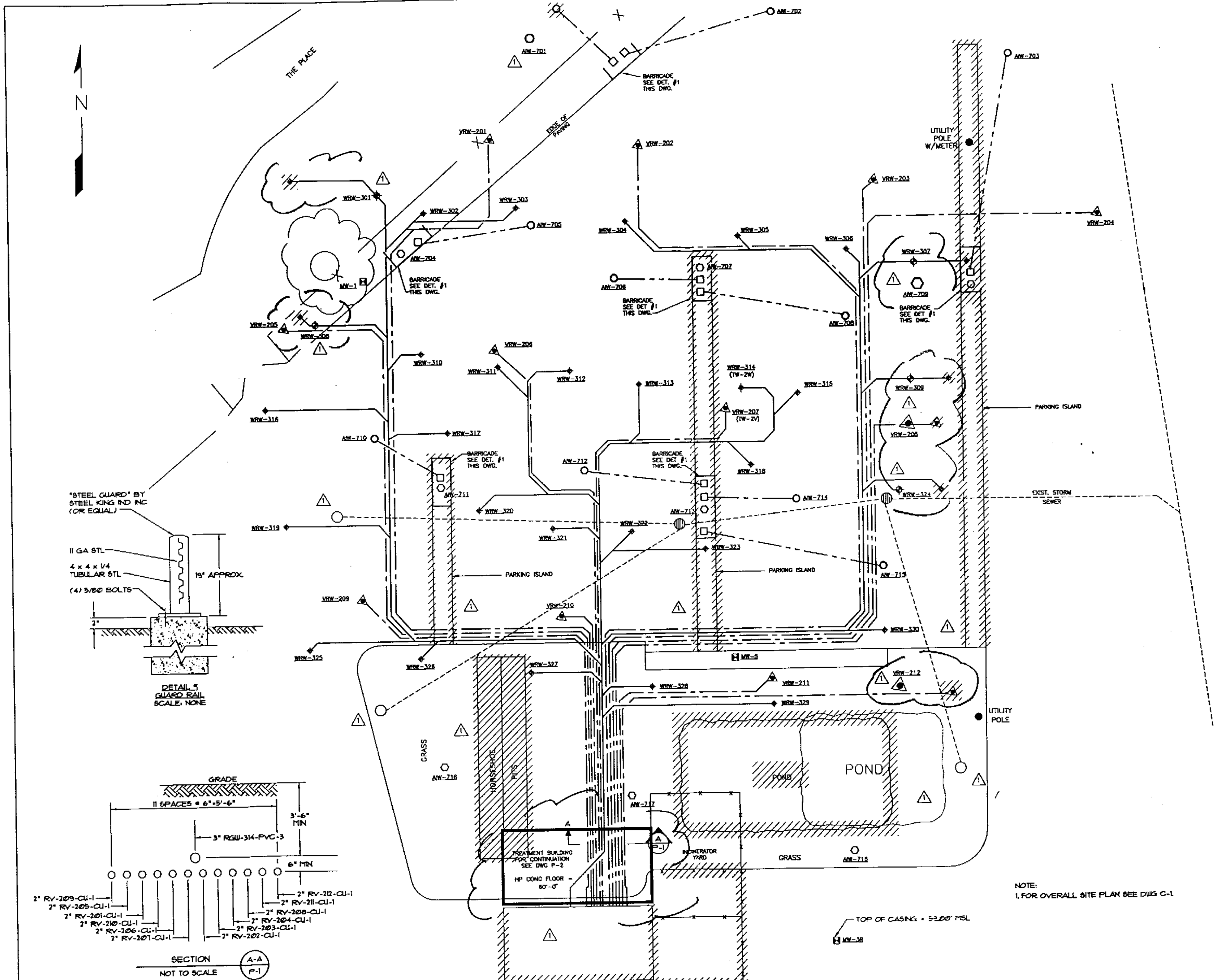
ERM-Northeast
Environmental Resources Management
ERM

ASPHALT LAYOUT

C-2

E.M./S.P.

NOV. 23, 1994



NOTE:
1. FOR OVERALL SITE PLAN SEE DWG C-1

WELL INVERT TABLE		
WELL NO.	INV. OF TEE	LINE NO. @ TEE
WRW-301	35' BELOW FIN. GRADE	½" RGW-301-PVC-3
WRW-302		½" RGW-302-PVC-3
WRW-303		½" RGW-303-PVC-3
WRW-304		½" RGW-304-PVC-3
WRW-305		½" RGW-305-PVC-3
WRW-306		½" RGW-306-PVC-3
WRW-307		½" RGW-307-PVC-3
WRW-308		½" RGW-308-PVC-3
WRW-309		½" RGW-309-PVC-3
WRW-310		½" RGW-310-PVC-3
WRW-311		½" RGW-311-PVC-3
WRW-312		½" RGW-312-PVC-3
WRW-313		½" RGW-313-PVC-3
WRW-314		½" RGW-314-PVC-3
WRW-315		½" RGW-315-PVC-3
WRW-316		½" RGW-316-PVC-3
WRW-317		½" RGW-317-PVC-3
WRW-318		½" RGW-318-PVC-3
WRW-319		½" RGW-319-PVC-3
WRW-320		½" RGW-320-PVC-3
WRW-321		½" RGW-321-PVC-3
WRW-322		½" RGW-322-PVC-3
WRW-323		½" RGW-323-PVC-3
WRW-324		½" RGW-324-PVC-3
WRW-325		½" RGW-325-PVC-3
WRW-326		½" RGW-326-PVC-3
WRW-327		½" RGW-327-PVC-3
WRW-328		½" RGW-328-PVC-3
WRW-329		½" RGW-329-PVC-3
WRW-330	35' BELOW FIN. GRADE	½" RGW-330-PVC-3
VRW-201	54.6'	2" RV-201-CU-1
VRW-202	54.3'	2" RV-202-CU-1
VRW-203	54.6'	2" RV-203-CU-1
VRW-204	54.3	2" RV-204-CU-1
VRW-205	54.8'	2" RV-205-CU-1
VRW-206	55.2'	2" RV-206-CU-1
VRW-207	55.2'	2" RV-207-CU-1
VRW-208	54.9'	2" RV-208-CU-1
VRW-209	55.3'	2" RV-209-CU-1
VRW-210	55.5'	2" RV-210-CU-1
VRW-211	55.5'	2" RV-211-CU-1
VRW-212	55.3'	2" RV-212-CU-1
AIW-701	SEE PID-7	
AIW-702	SEE PID-7	
AIW-703	SEE PID-7	
AIW-704	—	
AIW-705	SEE PID-7	
AIW-706	SEE PID-7	
AIW-707	—	
AIW-708	SEE PID-7	
AIW-709	—	
AIW-710	SEE PID-7	
AIW-711	—	
AIW-712	SEE PID-7	
AIW-713	—	
AIW-714	SEE PID-7	
AIW-715	SEE PID-7	
AIW-716	—	
AIW-717	—	
AIW-718	—	

LEGEND

- EXIST UG STORM SEWER
- NEW UG RECOVERED GROUND WATER
- NEW UG RECOVERED VAPOR
- NEW UG AIR INJECTION
- NEW PASSIVE AIR INJECTION WELL SEE DWG PID-7 FOR DETAILS
- NEW AG VENT FOR PASSIVE AIR INJECTION WELL - SEE DWG PID-7 FOR DETAILS
- NEW COMBINATION PASSIVE AIR INJECTION WELL & AG VENT - SEE DWG PID-7 FOR DETAILS
- NEW VAPOR RECOVERY WELL SEE DWG PID-2 FOR DETAILS
- NEW WATER RECOVERY WELL SEE DWG PID-3 FOR DETAILS
- EXIST MONITORING WELL
- UTILITY POLE
- STORM DRAIN

1	12/4/94	AS-BUILT REVISIONS

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GLEN COVE, NY

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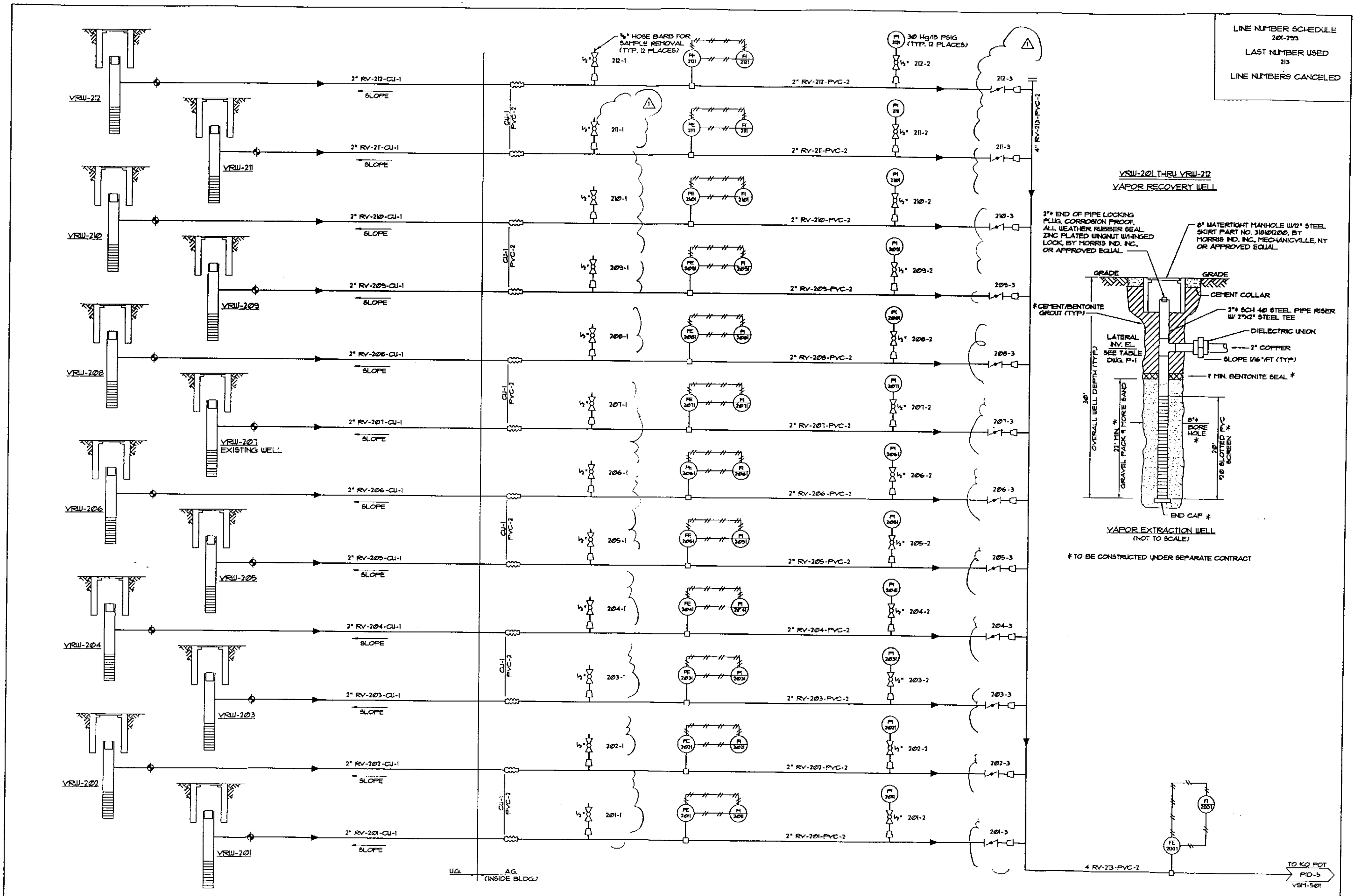
Environmental Resources Management
ERM

J.T. DUGAN 3/22/93

UNDERGROUND WELL PIPING

P-1

EM/BG. MAR. 23, 1993
1"=10'-0" 515.003 A38-P-1



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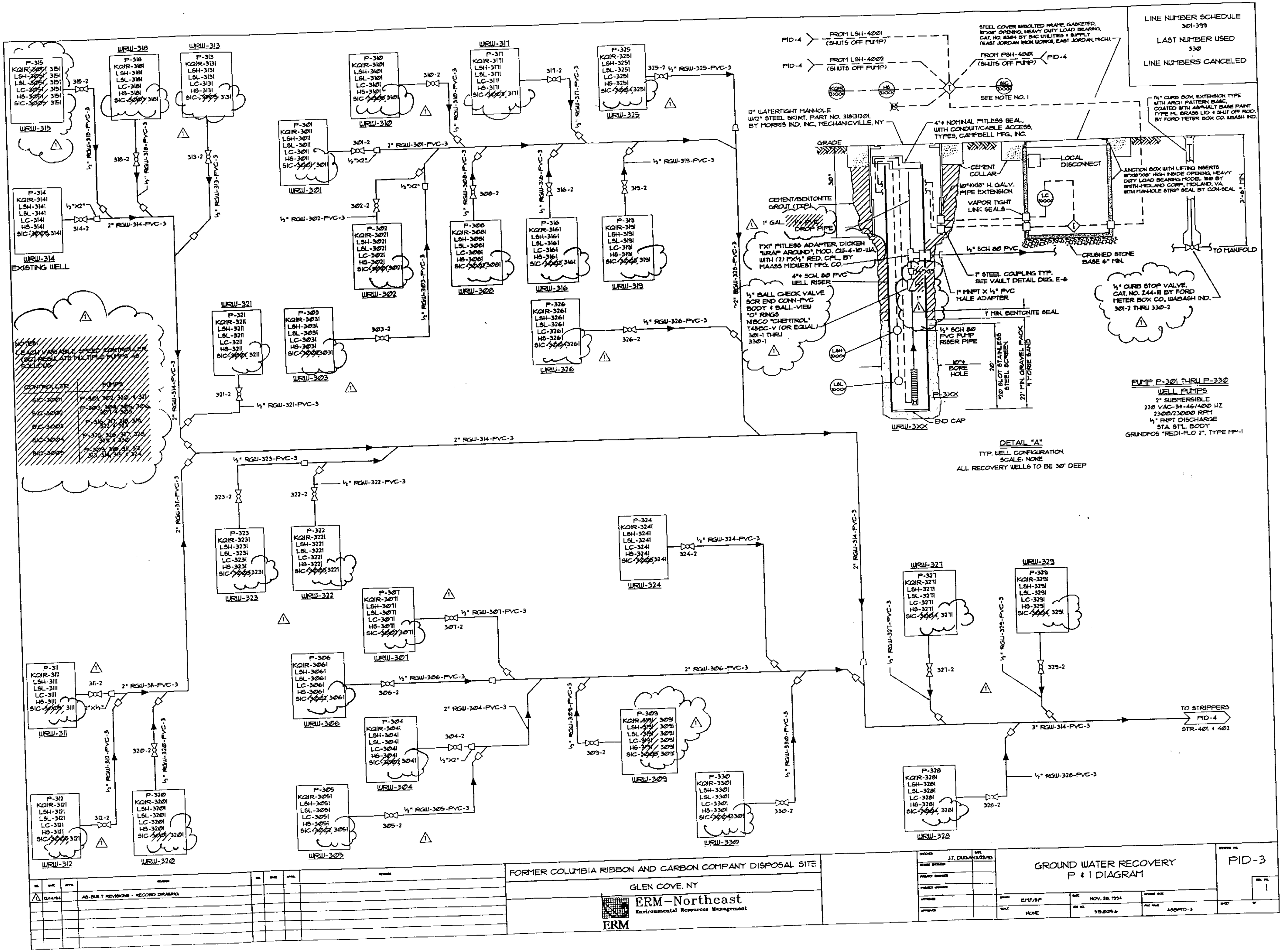
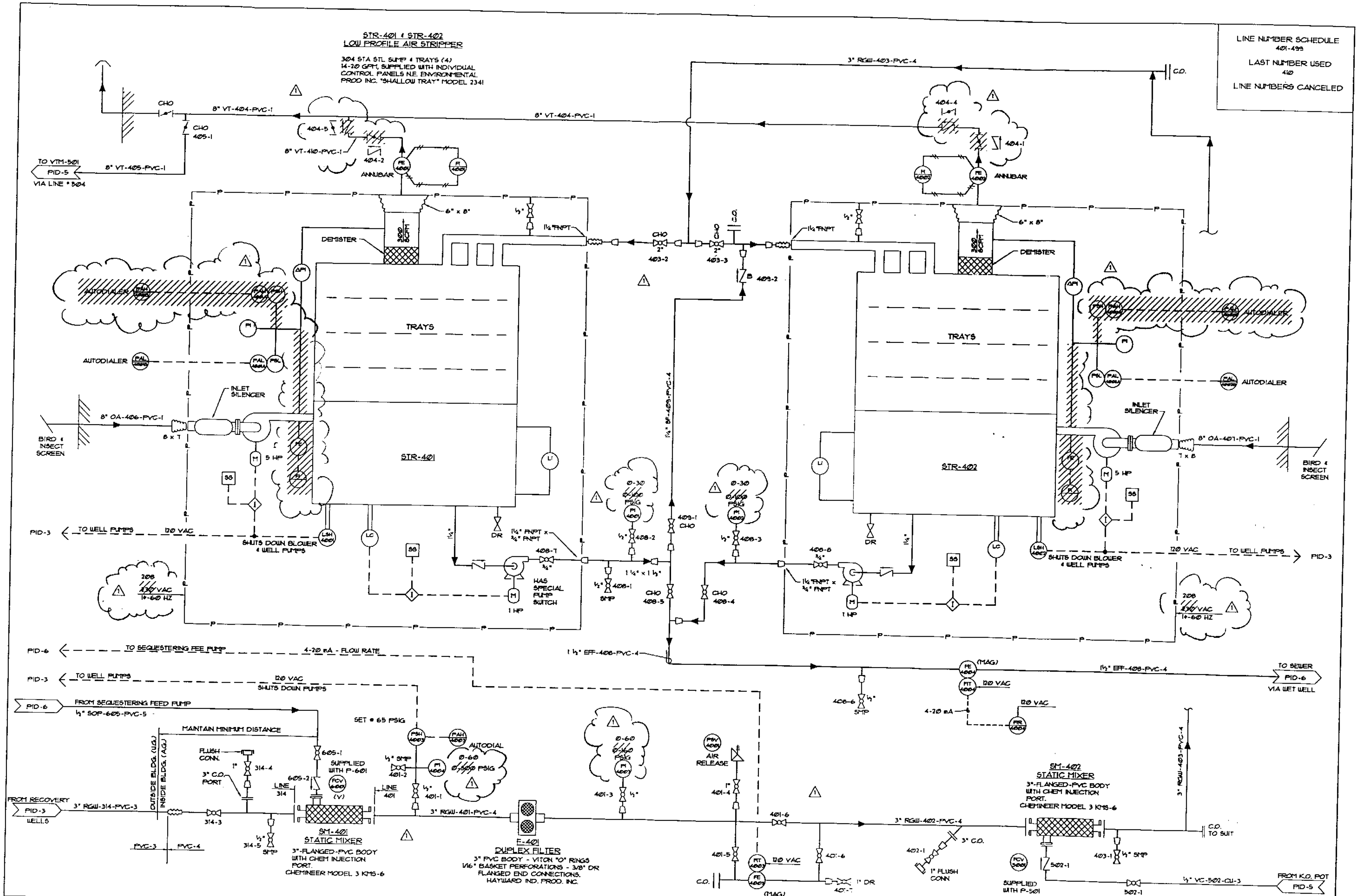
SOIL VAPOR EXTRACTION
P & I DIAGRAM

PID-2


LINE NUMBER SCHEDULE
301-399
LAST NUMBER USED
330
LINE NUMBERS CANCELED
NOTES:
1. EACH VARIABLE SPEED CONTROLLER (SC) REGULATES MULTIPLE PUMPS AS FOLLOWS:
CONTROLLER
PUMPS
DETAIL "A"
TYP. WELL CONFIGURATION
SCALE: NONE
ALL RECOVERY WELLS TO BE 30' DEEP
PUMP P-301 THRU P-330
WELL PUMPS
2" SUBMERSIBLE
220 VAC-3φ-46/400 HZ
2300/23000 RPM
½" FNPT DISCHARGE
STA STL BODY
GRUNDFOS "REDI-FLO 2", TYPE MP-1
TO STRIPPERS
PID-4
STR-401 & 402
2" RGW-314-PVC-3
3" RGW-314-PVC-3
2" RGW-306-PVC-3
2" RGW-311-PVC-3
AS-BUILT REVISIONS - RECORD DRAWING
FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE
GLEN COVE, NY
ERM-Northeast
Environmental Resources Management
ERM
GROUND WATER RECOVERY
P & I DIAGRAM
PID-3
J.T. DUGAN 3/22/95
EMF/SP.
NOV. 28, 1994
NONE
35809.6
ASBPID-3



△	12/14/94		AS-BUILT REVISIONS - RECORD DRAWING

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GLEN COVE, NY

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GROUND WATER TREATMENT
P & I DIAGRAM

PID-4

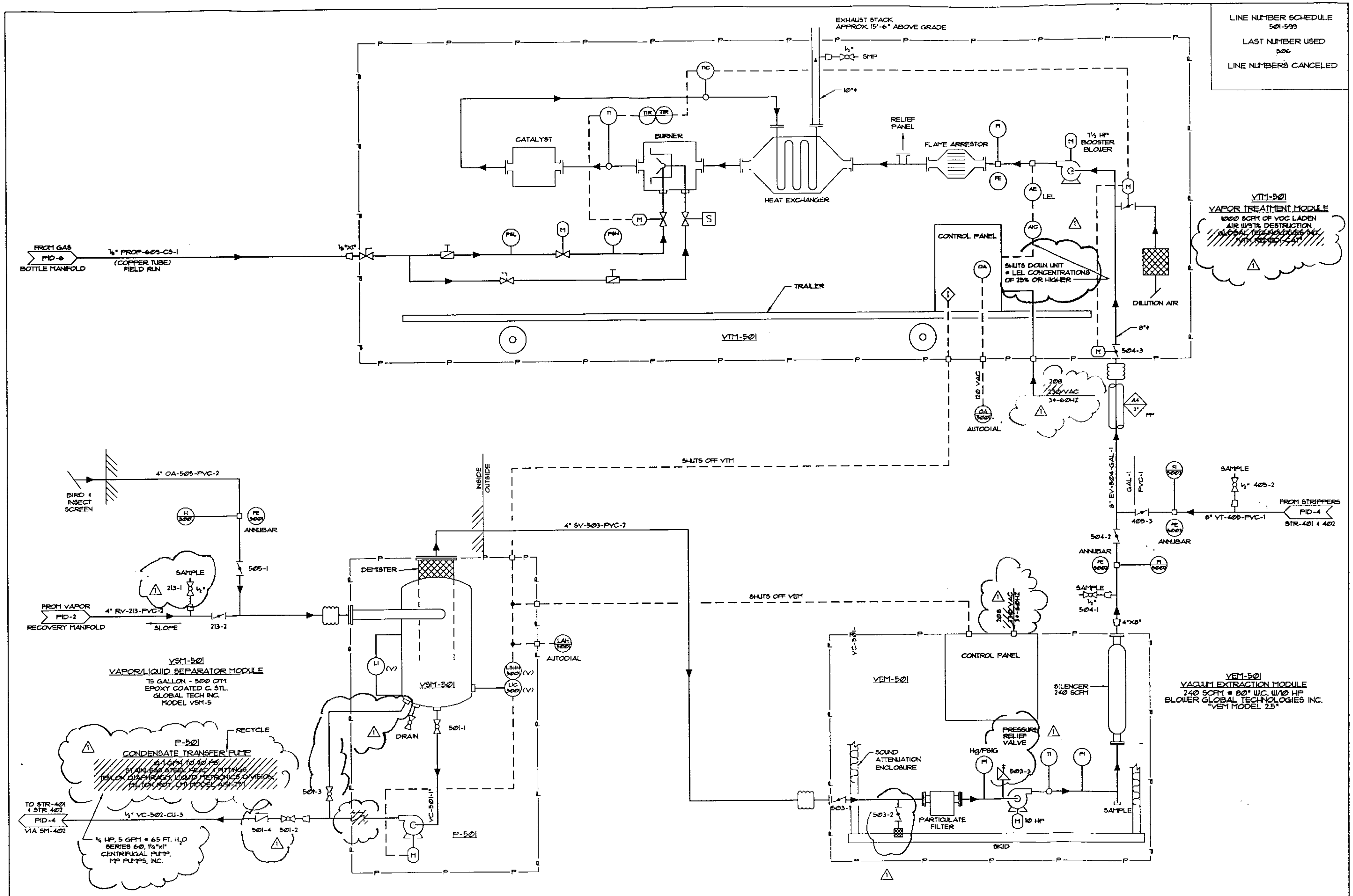
EMV/J.P.

MAR. 25, 1993

NOV. 28, 1994

NONE

1



NO.	DATE	APPR.	REVISION
1	2/14/94		AS-BUILT REVISIONS - RECORD DRAWINGS

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GLEN COVE, NY

ERM–Northeast
Environmental Resources Management

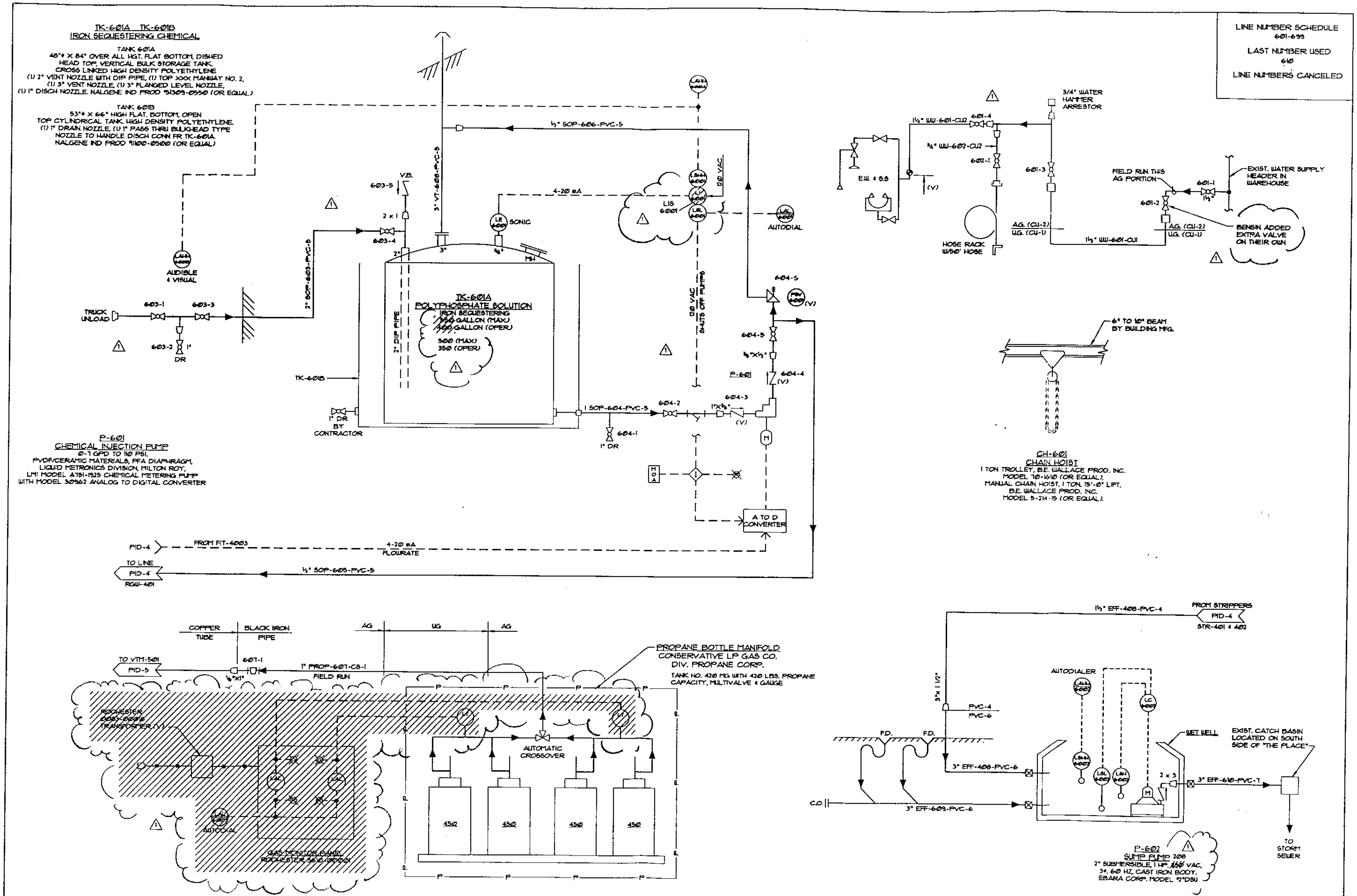
CHECKED: J.T. DUGAN — DATE: 3/24/93

VAPOR EXTRACTION & TREATMENT
P & I DIAGRAM

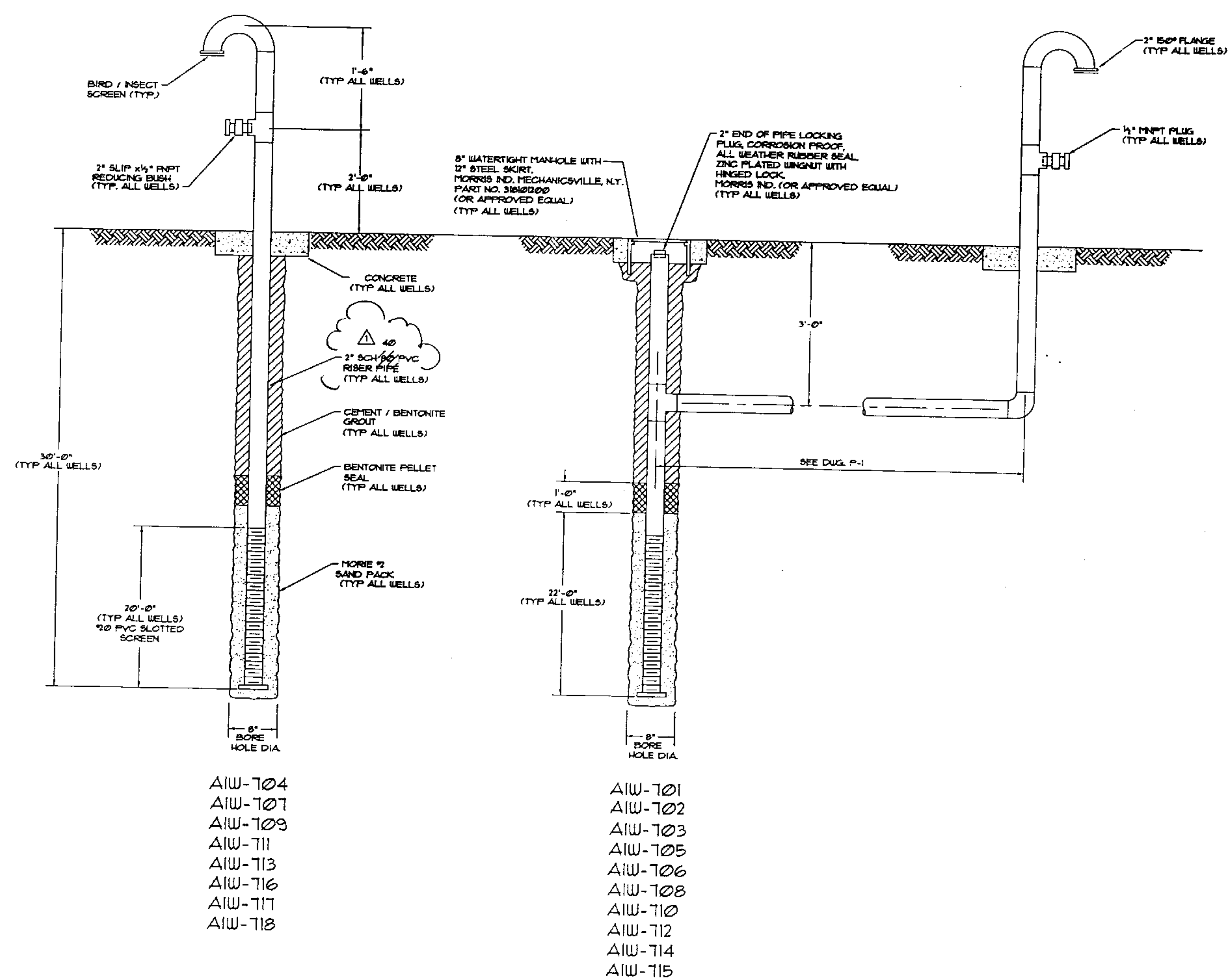
DRAWN: EMF/SP. — DATE: MAR 26, 1993 — REVISED DATE: NOV. 28, 1994

DRAWING NO. PID-5

REV. NO. 1



AS-BUILT REVISIONS - RECORD DRAWING	FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE	J.T. DUGAN 3/8/93	POLYPHOSPHATE SOLUTION STORAGE, PLANT EFFLUENT & MISC. UTILITIES P & I DIAGRAM
	GLEN COVE, NY		PID-6



NO.	DATE	APPR.	REVISION
1	2/14/94		AS-BUILT REVISIONS - RECORD DRAWING

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GLEN COVE, NY

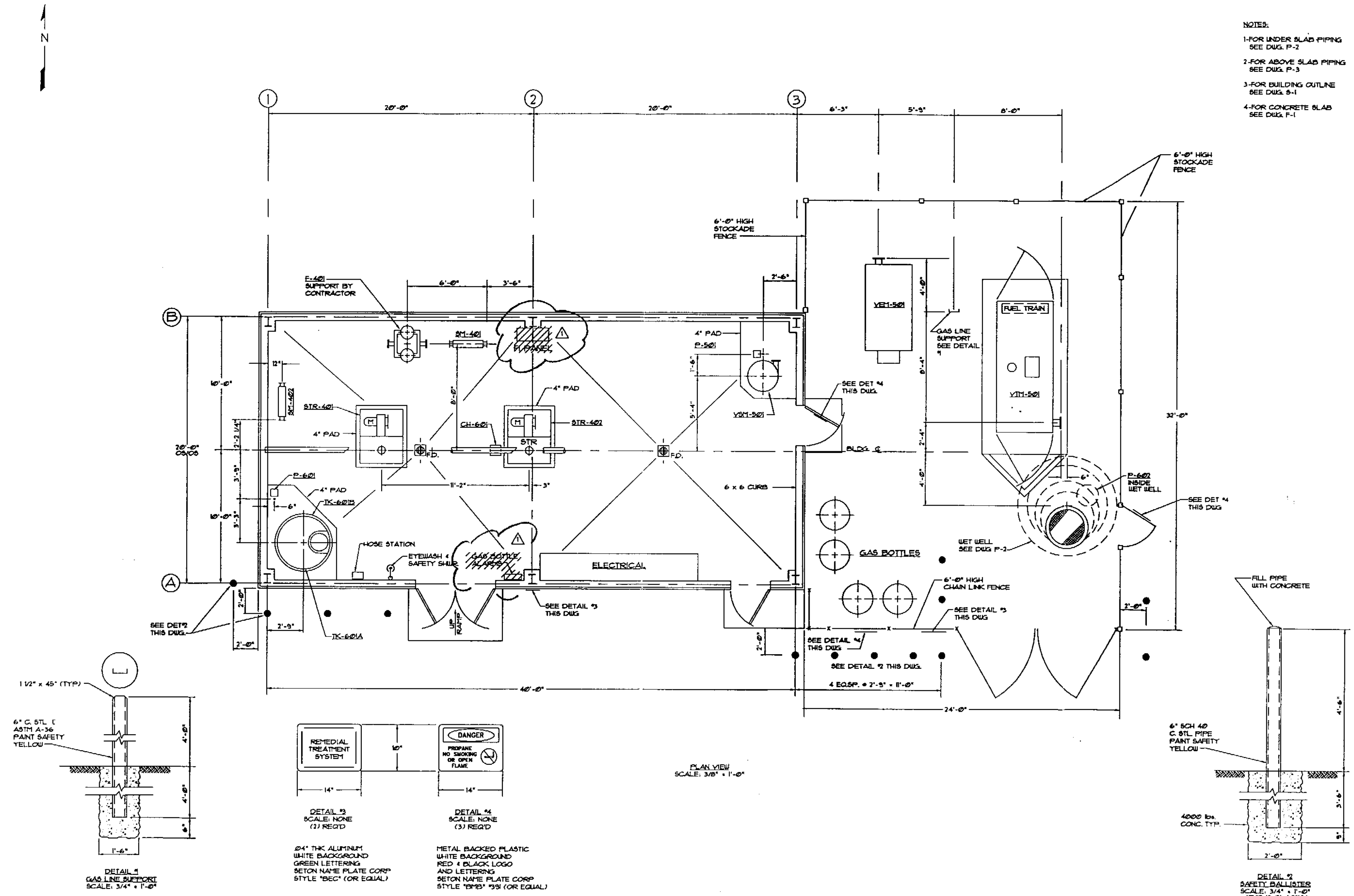
ERM-Northeast
Environmental Resources Management

J.T. DUGAN	3/23/93

PASSIVE AIR INJECTION WELLS
P & I DIAGRAM

PID-1

EMT/SP. MAR. 23, 1993



NOTES:

1-FOR UNDER SLAB PIPING SEE DWG. P-2
2-FOR ABOVE SLAB PIPING SEE DWG. P-3
3-FOR BUILDING OUTLINE SEE DWG. S-1
4-FOR CONCRETE SLAB SEE DWG. F-1

NO.	DATE	APPR.	REVISION
1	2/14/94		AS-BUILT REVISIONS

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GLEN COVE, NY

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Environmental Resources Management

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EQUIPMENT ARRANGEMENT
PLAN VIEW & DETAILS

EA-1

1

APPENDIX C:

PERFORMANCE ANALYSIS AND DESIGN MODIFICATION PLAN

PERFORMANCE ANALYSIS AND DESIGN MODIFICATION PLAN

Former Columbia Ribbon and
Carbon Company Disposal Site
Glen Cove, New York
NYSDEC Site Code No. 1-30-028

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Prepared For:

Konica Imaging, U.S.A., Inc.
71 Charles Street
Glen Cove, NY 11542-9001

Prepared By:

ERM-NORTHEAST, INC.
175 Froehlich Farm Boulevard
Woodbury, New York 11797

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1.0 INTRODUCTION

The Performance Analysis and Design Modification Plan (PADMP) for the Former Columbia Ribbon and Carbon Company Disposal Site (Site Code No. 1-30-028) was prepared in accordance with the New York State Department of Environmental Conservation (NYSDEC) Order on Consent, Index No. W1-0547-91-07, executed on May 12, 1993. A summary description of the PADMP was contained in the document entitled, REMEDIAL DESIGN REPORT, Former Columbia Ribbon and Carbon Company Disposal Site, Glen Cove, New York which was prepared on behalf on Konica Imaging USA, Inc. in May, 1993.

The PADMP is intended to achieve four objectives. These objectives are

1) evaluate the performance of the individual components of the remedial system to gauge whether they are operating in accordance with the design intent of the combined ground water and vapor extraction system;

2) evaluate the effectiveness of the operating combined ground water and vapor extraction system in achieving the remedial goals established in the NYSDEC Record of Decision;

3) define monitoring requirements, methods of data analysis and decision making processes to effect operational changes or design modifications to the combined ground water and vapor extraction system to meet recovery and treatment requirements or substantially improve the ability of the remedy to achieve the remedial goals; and,

4) establish a mechanism to implement a two phased shutdown of the combined ground water and vapor extraction system.

This PADMP refers to both performance and effectiveness criteria. While performance relates to the adequacy of the operating elements of the combined ground water and vapor extraction system, effectiveness pertains to the degree of success of the combined ground water and vapor extraction system in meeting the remedial goals.

The performance aspect of the PADMP for the combined ground water and vapor extraction system identifies the adjustable components and recording keeping procedures for each of the recovery and treatment elements in the system. Based on these, specific operational adjustments are defined which would assist the recovery and treatment elements in meeting design objectives.

The effectiveness evaluation in the PADMP for the combined ground water and vapor extraction system espouses two concepts. The first concept relies on a comparison of the cumulative mass of chemicals removed to a baseline initial mass of chemical present in the subsurface. The calculation of the initial mass of chemical in the subsurface is based on a number of assumptions as well as existing data. The second concept considers the temporal monitoring data to judge whether continued operation of the combined ground water and vapor extraction system is likely to create a condition of depreciating returns with respect to chemical mass removal.

The shutdown evaluation for the combined ground water and vapor extraction system is comprised of an initial, temporary shutdown followed by a permanent shutdown of the system. The permanent shutdown phase will be followed by a period of post-shutdown monitoring.

Since the remedial goals established in the ROD are for ground water, temporary shutdown is needed to allow ground water to recover into the dewatered area so that monitoring can determine the extent to which the combined ground water and vapor system has removed chemicals to achieve the remedial goals. The PADMP outlines criteria which will likely be employed to optimize the timing of temporary shutdown.

Additionally, the PADMP outlines criteria that will be used to decide that the combined ground water and vapor recovery system has, to the extent practical, achieved the remedial goals such that the project can move into the post-shutdown monitoring phase.

1.1 SITE DESCRIPTION AND HISTORY

The Former Columbia Ribbon and Carbon Company Disposal Site (hereinafter referred to as the Site) is located in Glen Cove, New York. The properties to the north and east of the Site are predominantly residential. An industrial corridor that includes four other inactive hazardous waste disposal sites is located to the south and west of the Site. The Site is defined as a 0.8 acre area of concern which is contaminated by the disposal of industrial waste from the former Columbia Ribbon and Carbon Company.

The site was acquired by Powers Chemco, Inc., in 1979. Powers Chemco, Inc., was renamed Chemco Technologies, Inc. which was subsequently purchased by Konica. After the purchase by Konica, the company was renamed Konica Imaging USA, Inc.

A Remedial Investigation and Feasibility Study for the site (RI/FS) was finalized in January, 1991. This RI/FS was the basis for the NYSDEC Record of Decision (ROD) for the Site which was issued in March 1991. The ROD identified combined ground water and vapor extraction as the preferred remedial action but conditioned its final selection on, amongst other items, performance of a pilot test to evaluate the feasibility of the preferred remedy. Konica Imaging USA, Inc. (Konica) entered into a order on consent to implement the pilot study specified in the ROD. The pilot study was completed by an environmental consultant on behalf of Konica and the results of the pilot study were presented in a report that was subsequently approved by the NYSDEC in October, 1992.

Based on the pilot study report, combined ground water and vapor extraction was confirmed as the selected remedy for the Site. Konica entered into its second order on consent in May 1993 to complete a remedial design and implement the remedial action (RD/RA). The RD was finalized in May, 1993 and approved by the NYSDEC as of August 1, 1993.

1.2 REMEDIAL OBJECTIVES

The goals of the selected remedial action are stated in the ROD. These goals are:

- treat ground water such that, to the extent technically feasible, the concentration of contaminants is reduced to within promulgated standards;

- ensure that remedial activities do not increase the potential for the migration of contaminated ground water by damaging the naturally occurring confining unit;

- treat soil to prevent the recontamination of ground water by the leaching of chemicals out of the soil mass.

The selected remedial action to achieve these goals is the combined ground water and vapor extraction system (remedial system). Table 4 in the ROD summarizes potential applicable or relevant and appropriate requirements for ground water for the target chemical contaminants. The section in the ROD entitled **Compliance with State Standards, Criteria, and Guidance** (ROD page 14) states that NYS quality standards for ground water are the chemical specific goals for the ground water remediation while soil cleanup will be based on preventing further ground water contamination via leaching to levels above the aforementioned ground water standards. The chemical specific goals for ground water apply to nine volatile organic compounds (VOC's). These nine VOC's are:

- Benzene
- Chloroethane
- Dichloroethane (all isomers)
- Dichloroethene (all isomers)
- Ethylbenzene
- Tetrachloroethane
- Toluene
- Trichloroethene
- Xylenes (all isomers)

In each case, the chemical specific goal for each VOC or its isomer is 5 parts per billion (ppb). This value represents the standard contained in the NYS Sanitary Code Subpart 5-1, Public Water Supplies. Although the parameters lead and arsenic were also noted on Table 4 of the ROD as having NYS Sanitary Code Sub-part 5-1 standards, the analysis of these constituents during the pilot test indicated they were not detected in all samples except monitoring well MW-8. Arsenic was the only inorganic parameter detected in this well. Consequently, the discharge from the air stripping treatment units will be monitored for arsenic and lead until such time as Konica and NYSDEC concur that these constituents are consistently below the discharge criteria. At that time, these constituents will no longer be chemical specific goals.

1.3 DESCRIPTION OF THE COMBINED GROUND WATER AND VAPOR EXTRACTION SYSTEM

The remedial system that has been designed for the Site in accordance with the ROD is comprised of four components. These are ground water recovery, soil vapor extraction, ground water treatment and soil vapor treatment. The following is a brief summary of each of the components of the remedial system.

1.3.1 Ground Water Recovery

The ground water recovery system is comprised of 30 wells to dewater the area where contamination is present. The position of the recovery wells is shown on Drawing No. C-1 of the Remedial Design (RD).

Ground water modelling indicates a sustained pumping rate of a total of 14 gallons per minute (gpm) will depress the water table in the affected area and expose saturated soils so that they can subsequently be vented.

1.3.2 Soil Vapor Recovery

The soil vapor extraction system consists of 12 extraction wells and 18 passive air injection wells. The moisture from the extracted vapor will be removed in a separator. Dilution air will be added, when necessary, to the collected vapor stream to reduce the percent lower explosive limit of the raw soil vapor and to meet safety requirements.

The RD specifies that each vapor extraction well will be fitted with a valve so that vapor flow and vacuum can be regulated at each point. The total design capacity of the vapor extraction system is a rate of 240 cubic feet per minute (cfm).

1.3.3 Ground Water Treatment

The recovered ground water will be treated by two low profile air strippers configured for operation in series and parallel. Furthermore, naturally occurring iron in ground water at the Site will require addition of a polyphosphate sequestering agent upstream of the air stripping units. This agent will keep the majority of the naturally occurring iron in solution as it passes through the trays to effect VOC removal.

Treated ground water from the air stripping units will be conveyed to the Glen Cove storm sewer system in accordance with the stated discharge limitations. The off-gas from the stripping units will be convey to a catalytic oxidation unit for treatment prior to atmospheric discharge.

1.3.4 Vapor Treatment

The soil vapor extracted from the soil vent wells along with the vapor effluent from the air stripping units will be conveyed to a catalytic oxidizer for treatment. Initially, due to the expected presence of methane in the vapor stream, sufficient BTU's should be available to oxidize the chemicals in the vapor stream. However, the catalytic oxidizer will have a supplemental propane fuel source to ensure continuous destruction of VOC's.

The catalytic oxidizer is capable of treating up to 1,000 cfm including dilution air. The vapor which is treated in the catalytic oxidizer will be discharged to the atmosphere in accordance with the discharge limits specified for the pilot study (6 NYCRR Part 212 and Air Guide 1).

1.4 ORGANIZATION OF PADMP

The remainder of this PADMP is organized into three sections. These three remaining sections outline the activities and options that are available with this remedial system to monitor and/or modify its operation.
Section 2.0 presents a discussion of the performance analysis aspects of the elements of the remedial system, including the record keeping procedures and available operational adjustments that can be used to improve performance.

Section 3.0 discusses the approach to evaluating the effectiveness of the remedial system. As mentioned earlier, this approach is based on two concepts which attempt to quantitate how well the system has done in removing chemical mass from the subsurface. Specific data collection (record keeping) procedures as well as approaches to enhance chemical mass removal are presented in Section 3.0.

Section 4.0 establishes a basis for determining when to shutdown the remedial system. Two phases of shutdown are considered. A temporary phase is intended to allow ground water levels to recover. After sufficient recovery, samples will be uses to determine the effect chemical removal has had on VOC concentrations in ground water. A permanent phase of shutdown will be decided when it is determined the system has, to the extent practical, reduce the chemical mass sufficiently such that residual impacts, if any, from the remaining chemical mass will not adversely impact human health and the environment.

2.0 PERFORMANCE ANALYSIS AND ADJUSTMENT

System performance is defined as the ability of the each of the four basic systems to meet specific design objectives. The four basic systems are: ground water recovery, soil vapor extraction, ground water treatment and vapor treatment. System performance is judged by monitoring each component of the remedial system to determine whether it is operating in an adequate manner.

2.1 GROUND WATER RECOVERY SYSTEM

This section presents a basis for monitoring the performance of the ground water recovery system in meeting its objective as well as a discussion of operational and design modifications that can be made to improve its effectiveness.

2.1.1 Objective of Ground Water Recovery System

The objective of the ground water recovery system is to lower the water table in the VOC source area to the greatest extent practical. The lowering of the water table is intended to expose the contaminated soil to the flow of air induced by the soil vapor extraction (SVE) system.

2.1.2 System Components

The ground water recovery system is comprised of 30 well points. The locations of these wells (WRW-301 to 330) are shown on drawing number C-1 of the design documents. A process and instrumentation diagram of the ground water recovery system is presented in drawings P-3 and P-4 of the design documents. Each well point is fitted with a variable frequency drive submersible pump whose speed will manually set in the treatment building. In this way, the pump rate in each well can be individually adjusted. The pumps are also controlled by in-well liquid level switches, which cycle the pumps based on selected high and low water levels in the well. A running time meter has been fitted to each submersible pump to identify if the recovery well is pumping at too low a rate, which would be identified by running times equal to real time, or at too high a rate which would be identified by running times that are significantly less than real time.

For system performance monitoring, liquid level monitoring points are located within the VOC source area. These monitoring points include a total of 18 passive air inlet wells which are located within the source area. These wells (AIW-701 to 718) are also shown on Drawing C-1. Liquid level measurements in these wells are intended to gauge the extent of dewatering that has been achieved by the ground water recovery system. If, in the future, additional dewatering is required in the vicinity of existing monitoring well MW-4, an additional ground water recovery well could be easily connected to the recovery system piping and powered through spare conduit and a junction box provided in the initial design.

2.1.3 *Adjustable Components*

There are two adjustable components to the ground water recovery system which can be adjusted to facilitate dewatering. These adjustable components are: 1) the frequency of each well pump; and 2) the high liquid level set point in each well.

The controller will set the frequency of each well pump such that the pump is pumping water out at slightly greater rate than the ground water recharge. The high level set point will be as low as possible (closest to the low level set point) without resulting in excessive pump cycling which could result in the pump running dry. This setting will be selected at the time of startup-shakedown of the remedial system and is not considered a control parameter.

These adjustable components were incorporated into the design of the ground water recovery system because the modeling effort in this area of the site indicated less dewatering because it was at the perimeter of the area. Since the remedial design includes vapor recovery wells in this area, there was a concern that dewatering would not be adequate to expose formerly saturated soils to the influence of the vapor recovery well. During the operation of the system, measurements will be taken to determine the extent of dewatering, ground water quality, and soil vapor quality in the area. Based on the combined analysis of these three components, Konica and NYSDEC will jointly decide whether an additional ground water recovery well is needed in this area.

2.1.4 *Record Keeping*

Tables 2-1 and 2-2 present sample data files which is to be completed by the operator. The files are available on both excel and lotus formats.

Table 2-1 includes data relevant to the ground water recovery pumps. For each of the 30 pumps, the operator needs set and record the frequency of each pump and the elevation of the level switches in each well. Then, the operator will record the date and time, run time reading and line pressure. Additionally, if the frequency of any pump and/or the elevation of the level switches in one or more well is changed, it will be re-recorded. Once these values are input, the program will estimate the instantaneous and average flow rate from each well and calculate the percent run time since the previous reading. The correlation formula used to estimate the instantaneous and average flow rate from each well may need to be adjusted to correlate with the total ground water flow to the air stripper as measured by the flow totalizer.

TABLE 2-1

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GROUND WATER RECOVERY PUMP OPERATING DATA

DATE	TIME	PUMP NO.	RUN TIME	LINE PRESS. (PSIG)	FREQ. (HZ)	FLOW GPM	DEPTH TO LSL FT.	DEPTH TO LSH FT.	PERCENT RUNNING	AVG FLOW GPM
03-Jul-93	09:10	1	26.2	10	40	0.80	24	19	58.3%	0.47
03-Jul-93	09:20	2	29.1	10	40	0.80	26	21	58.3%	0.47
03-Jul-93	09:30	3	23.3	10	40	0.80	30	25	58.3%	0.47
03-Jul-93	09:40	4	28.7	10	40	0.80	28	23	58.3%	0.47
03-Jul-93	09:50	5	25.6	10	40	0.80	29	24	58.3%	0.47
03-Jul-93	10:00	6	22.7	10	40	0.80	24	19	58.3%	0.47
03-Jul-93	10:10	7	26.2	10	40	0.80	26	21	58.3%	0.47
03-Jul-93	10:20	8	25.5	10	40	0.80	30	25	58.3%	0.47
03-Jul-93	10:30	9	26.2	10	40	0.80	28	23	58.3%	0.47
03-Jul-93	10:40	10	29.1	10	40	0.80	29	24	58.3%	0.47
03-Jul-93	10:50	11	23.3	10	40	0.80	30	25	58.3%	0.47
03-Jul-93	11:00	12	28.7	10	40	0.80	28	23	58.3%	0.47
03-Jul-93	11:10	13	25.6	10	40	0.80	29	24	58.3%	0.47
03-Jul-93	11:20	14	22.7	10	40	0.80	24	19	58.3%	0.47
03-Jul-93	11:30	15	26.2	10	40	0.80	26	21	58.3%	0.47
03-Jul-93	11:40	16	25.5	10	40	0.80	30	25	58.3%	0.47
03-Jul-93	11:50	17	26.2	10	40	0.80	28	23	58.3%	0.47
03-Jul-93	12:00	18	25.5	10	40	0.80	29	24	58.3%	0.47
03-Jul-93	12:10	19	26.2	10	40	0.80	24	19	58.3%	0.47
03-Jul-93	12:20	20	29.1	10	40	0.80	26	21	58.3%	0.47
03-Jul-93	12:30	21	23.3	10	40	0.80	30	25	58.3%	0.47
03-Jul-93	12:40	22	28.7	10	40	0.80	28	23	58.3%	0.47
03-Jul-93	12:50	23	25.6	10	40	0.80	29	24	58.3%	0.47
03-Jul-93	13:00	24	22.7	10	40	0.80	30	25	58.3%	0.47
03-Jul-93	13:10	25	26.2	10	40	0.80	28	23	58.3%	0.47
03-Jul-93	13:20	26	25.5	10	40	0.80	29	24	58.3%	0.47
03-Jul-93	13:30	27	23.7	10	40	0.80	24	19	58.3%	0.47
03-Jul-93	13:40	28	26.7	10	40	0.80	26	21	58.3%	0.47
03-Jul-93	13:50	29	29.4	10	40	0.80	30	25	58.3%	0.47
03-Jul-93	14:00	30	25.6	10	40	0.80	28	23	58.3%	0.47
TOTAL,GPM						23.20				14.00
TOTAL,GPD						556.8				20,160
TOTAL TO STRIPPER (PER FLOW METER)						24.0				21000

Note:

Light shading Indicates that the value must be inputted.

Dark shading indicates that the value is calculated

TABLE 2-2

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

GROUND WATER LEVEL DATA

DATE	TIME	WELL NO.	DEPTH TO BOTTOM (FEET)	DEPTH TO WATER (FEET)	WATER COLUMN (FEET)	TOTAL DRAW-DOWN (FEET)	DELTA DRAW-DOWN PER DAY (IN./DAY)
03-Jul-93	10:10	AIW-1	28.20	10.80	17.40	0.40	2.40
03-Jul-93	10:20	AIW-2	32.10	10.20	21.90	0.70	2.40
03-Jul-93	10:30	AIW-3	29.60	11.80	17.80	0.50	3.60
03-Jul-93	10:40	AIW-4	28.70	10.50	18.20	0.30	2.40
03-Jul-93	10:50	AIW-5	29.50	11.70	17.80	0.50	2.40
03-Jul-93	11:00	AIW-6	30.90	10.30	20.60	0.90	3.60
03-Jul-93	11:10	AIW-7	32.10	11.00	21.10	0.60	2.40
03-Jul-93	11:20	AIW-8	29.60	11.20	18.40	0.80	2.40
03-Jul-93	11:30	AIW-9	28.70	10.40	18.30	0.90	7.20
03-Jul-93	11:40	AIW-10	29.50	11.90	17.60	0.60	1.20
03-Jul-93	11:50	AIW-11	30.90	10.80	20.10	0.60	3.60
03-Jul-93	12:00	AIW-12	31.50	11.90	19.60	0.70	3.60
03-Jul-93	12:10	AIW-13	29.80	10.40	19.40	1.00	4.80
03-Jul-93	12:20	AIW-14	29.50	11.10	18.40	0.70	3.60
03-Jul-93	12:30	AIW-15	30.90	11.70	19.20	0.40	2.40
03-Jul-93	12:40	AIW-16	31.50	10.80	20.70	0.60	3.60
03-Jul-93	12:50	AIW-17	29.80	11.90	17.90	0.70	4.80
03-Jul-93	13:00	AIW-18	29.70	10.50	19.20	1.10	4.80
AVERAGE			30.14	11.05	19.09	0.67	3.40

NOTES:
LIGHT SHADING INDICATES THAT THE VALUE MUST BE INPUTTED
DARK SHADING INDICATES THAT THE VALUE IS CALCULATED

Table 2-2 includes data relevant to the ground water dewatering within the source area. For each of the 18 air inlet wells, the operator will measure and record the depth to water, using a water level indicator, and the date and time of the measurement. The program will calculate the water column height, the total draw-down since the initial static water level reading, and the change in draw-down since the last reading.

2.1.5 *Operational Adjustments*

As the system continues to operate, it is expected that several operational adjustments will be needed to enhance the systems ability to dewater the source area. The decisions for making adjustments will be based on the data obtained, as discussed in Section 2.1.4, and per the discussion presented below.

Dewatering the source area is a slow developing process. Ground water modeling was performed to predict the draw-down versus time relationship. As determined by the modeling, it may take approximately 2 months to achieve 50% of the maximum attainable draw-down, about 6 months to achieve 75 to 80% and a full year to achieve 90 to 95% of the maximum draw-down. Once maximum draw-down (or close to it) has been achieved, a temporary system shut-down would allow the water table to rapidly rise, and a much longer period would be required to regain the attained draw-down.

Because of the dewatering characteristics described above, it is imperative that the system is operated and maintained in a manner that will prevent shut down of the ground water recovery and also the ground water treatment system. This can be accomplished by maintaining the equipment (see Operation and Maintenance Manual) and correctly setting the system parameters at the onset of operation. The discussion below pertains to the set points of the system's adjustable parameters listed in Section 2.1.2.

To control pump cycling, the high liquid level set point and the pump frequency must be adjusted. These two control parameters are interrelated and the optimum set point for each will only be established by trial and error. Initially, it may be necessary to begin with high level set points which are relatively high and flow rates which are relatively low. This may be necessary to avoid excessive pump cycling upon start-up. The flow rate can be gradually increased until pump cycling begins to occur. Then, the high level set point can be gradually lowered until sufficient dewatering has been achieved, as indicated by the water levels in the monitoring points. As the system equilibrates, it may be necessary to reduce pump frequency.

The higher the liquid level set point, the less frequent the pump will cycle. However, as the liquid level set point is increased, the hydraulic gradient towards the recovery well decreases and therefore the dewatering performance decreases. Therefore, the optimum high level set point for each well is the minimum level where pump cycling is acceptable (refer to O & M manual). This optimum level will have to be re-adjusted as dewatering progresses and each time the pump frequency is changed.

Pump cycling is also affected by the pump frequency. The closer the pump flow rate is matched to the well yield, the less frequent the pump will cycle. The line pressure and frequency values in Table 2-1 are used to estimate instantaneous and average flow from each well yield. The pump frequency can then be set such that the pumping flow rate is just above (less than 10% above) the yield of the well. As the pumping rate is matched closer to the yield of the well, the pump will be operating most of the time (as would be indicated by high percent running data). It may then be possible to lower the high level set point, which would optimize the performance of the dewatering system. As dewatering progresses, the well yield is expected to decrease. Therefore, the pump frequency will need to be continually evaluated and re-adjusted in order to maintain the optimum settings.

The ground water level data shown in Table 2-2 provides an indication of the dewatering systems performance. Consequently, the high liquid level set point and pump frequency in the recovery wells in that area will be monitored. These set points will be optimized to achieve sufficient dewatering. Once a data base for system operation is established, subsequent data should indicate the affects of any operational changes.

2.2 *SOIL VAPOR RECOVERY SYSTEM*

This section presents a basis for monitoring the performance of the soil vapor recovery system in meeting its objective as well as a discussion of operational and design modifications that can be made to improve its performance.

2.2.1 *Objective of Soil Vapor Recovery System*

The objective of the vapor recovery system is to induce a flow of soil vapor such that soil vapor flow is established throughout the entire source area and recovered by the vapor recovery wells. As uncontaminated soil vapor from outlying area and atmospheric air (introduced through the air inlet wells) is drawn across the VOC contaminated soil, the VOCs vaporize into the soil vapor. The VOC laden soil vapor is then withdrawn out of the ground through the vapor recovery wells.

2.2.2 *System Components*

The soil vapor recovery system is comprised of 12 vapor recovery wells and 18 air inlet wells. The locations of these wells are shown on drawing number C-1 of the design documents. A process and instrumentation diagram of the vapor recovery system is shown on drawings P-2 and P-5 and the design documents. The soil vapor is extracted from all 12 recovery wells by one soil vapor extraction (SVE) blower, located outside the treatment building. Separate piping from each extraction well will run into the treatment building. Each well line will include a vapor flow meter and a throttling valve located in the treatment building to monitor and control the extraction rate from each well and a vacuum gauge to monitor the vacuum applied to the vapor recovery well (less line losses). Following the flow control valve, the piping will join together into one common header. The header pipe also includes a flow meter to monitor the total flow of soil vapor. A dilution air inlet line joins into the header at a point down stream of this flow meter. The dilution air inlet piping includes an air flow meter and throttling valve. The header pipe will then convey the air through a moisture separator, where any condensate will be separated out of the vapor stream. The header pipe then exits the building and goes to the explosion proof SVE blower. The discharge of the SVE blower goes to the emission control system.

2.2.3 *Adjustable Components*

The major adjustable components are the soil vapor throttling valves for the vapor recovery wells and the dilution air throttling valve. These valves will be used to control the subsurface movement of soil vapor through the source area. The recovery well valves could be use to either completely close off selected wells from the vapor extraction, or to just reduce the flow of soil vapor from that well.

A less frequently adjusted component is the speed of the SVE blower. Initially, the blower speed will correspond to a capacity of 240 cfm of soil vapor and dilution air at an 80 inch water column (WC) vacuum. The speed could be adjusted by changing the configuration of the belt drive system. This could increase the capacity of the system to 400 cfm without changing the motor. This option will be considered in the event system monitoring indicates higher air flow or greater vacuum is required to remove soil vapor over the impacted area.

2.2.4 *Record Keeping*

Tables 2-3, 2-4 and 2-5 present sample data files which will be completed by the operator. The files are available on both excel and lotus formats.

The data in Table 2-3 pertains to the soil vapor extraction system. Data to be input by the operator includes:

- the vacuum applied to each well,
- the soil vapor flow rates from each well and from dilution air,
- valve status,
- toluene concentration from each well and from the fence-line observation points (FL-3 and FL-5 which are located on the North border of the site),
- and the date and time of measurements.

For toluene concentration, the operator would use a field photoionization detector (PID) organic vapor meter, which would measure total VOCs (excluding methane). The toluene concentration will be estimated from the PID readings based on a correlation from less frequently obtained laboratory analysis from the header pipe (and recorded in Table 2-5). From the input data the computer program would calculate the toluene

TABLE 2-3

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

SOIL VAPOR EXTRACTION OPERATING DATA

From PID

DATE	TIME	WELL NO. (VRW-#)	VACUUM (IN. WC)	FLOW RATE (CFM)	VALVE POSITION 0-100%	TOLUENE CONC. (PPM)	TOLUENE REMOVAL RATE (LBS./HR.)	TOLUENE REMOVED TO DATE (LBS.)
03-Jul-93	14:10	201	60.0	25.0	100%	350.0	0.126	6.2
03-Jul-93	14:20	202	60.0	25.0	100%	360.0	0.129	6.4
03-Jul-93	14:30	203	60.0	25.0	100%	300.0	0.108	5.2
03-Jul-93	14:40	204	60.0	25.0	100%	260.0	0.093	4.4
03-Jul-93	14:50	205	60.0	25.0	100%	500.0	0.179	9.0
03-Jul-93	15:00	206	40.0	15.0	50%	420.0	0.090	4.3
03-Jul-93	15:10	207	40.0	15.0	50%	500.0	0.108	5.3
03-Jul-93	15:20	208	40.0	15.0	50%	600.0	0.129	6.6
03-Jul-93	15:30	209	40.0	15.0	30%	190.0	0.041	2.0
03-Jul-93	15:40	210	0.0	0.0	0%	DNA	0.000	0.0
03-Jul-93	15:50	211	0.0	0.0	0%	DNA	0.000	0.0
03-Jul-93	16:00	212	0.0	0.0	0%	DNA	0.000	0.0
TOTAL				185.0			1.003	49.4
AVERAGE				15.4		290.0	0.084	
01-Jul-93	16:10	DIL. AIR	NA	0	0	NA	NA	NA
01-Jul-93	16:30	FL-3	NA	NA	NA	0.2	NA	NA
01-Jul-93	16:50	FL-5	NA	NA	NA	0.3	NA	NA

NOTES:
LIGHT SHADING INDICATES DATA TO BE INPUTTED
DARK SHADING INDICATES VALUE IS CALCULATED

TABLE 2-4

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

PNEUMATIC RESPONSE DATA -AIR INLET WELLS

DATE	APPROX. TIME	WELL NUMBER AIW-# 701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718
		VACUUM, INCHES WATER COLUMN																	
01-Jul-93	14:00	0.50	1.20	0.40	0.60	0.90	0.50	0.25	0.65	0.55	0.36	0.87	0.29	0.89	1.60	2.50	0.97	2.30	1.20
15-Jul-93	08:00	0.50	1.20	0.40	0.60	0.90	0.50	0.25	0.65	0.55	0.36	0.87	0.29	0.89	1.60	2.50	0.97	2.30	1.20
30-Jul-93	11:00	0.50	1.20	0.40	0.60	0.90	0.50	0.25	0.65	0.55	0.36	0.87	0.29	0.89	1.60	2.50	0.97	2.30	1.20

TABLE 2-5

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

SOIL VAPOR CHARACTERIZATION DATA

	03-Jul-93					
VAC. @ BLOWER INLET, IN. HG	5.10					
PRESS. @ BLOWER OUTLET, PSIG	0.72					
TEMP. @ BLOWER OUTLET, F	180.0					
DISCHARGE FLOW, CFM	240.0					
SOIL VAPOR FLOW, CFM	240.0					
DILUTION AIR FLOW, CFM	0.0					
DILUTION FACTOR	1.0					
SOIL VAPOR DATA:						
PID READING, PPM	750.0					
PERCENT LEL	12.1%					
PERCENT OXYGEN	20.1%					
PERCENT CO2	0.05%					
LAB ANALYSIS, PPM:						
TOLUENE	540.00					
XYLENES	27.00					
ETHLY BENZENE	24.00					
BENZENE	0.60					
1,1 DICHLOROETHANE	1.20					
TETRACHLOROETHENE	0.12					
TRICHLOROETHENE	0.26					
TOTAL VOCs	593.18					
TOLUENE:PID READING	0.720					
TOTAL VOCs;PID READING	0.791					
MASS REMOVAL, LBS/DAY						
TOLUENE	44.64					
XYLENES	2.57					
ETHLY BENZENE	2.29					
BENZENE	0.04					
1,1 DICHLOROETHANE	0.11					
TETRACHLOROETHENE	0.02					
TRICHLOROETHENE	0.03					
TOTAL VOCs	49.70					
EST. OF TOLUENE REMOVAL FROM BIODEGRADATION, #/DAY	6.19					

NOTE:
LIGHT SHADING INDICATES DATA IS AN INPUT
DARK SHADING INDICATES VALUE IS CALCULATED

removal rate from each well and the total, as well as the total toluene removed to date from each well and the total.

The data in Table 2-4 pertains to the pneumatic response at the air inlet wells. To obtain this data, the operator will place a cap over the inlet well. The cap will be fitted with a petcock valve which can be connected to a vacuum gauge.

The data in Table 2-5 is for recording the results of the laboratory analysis of the soil vapor in the header pipe. This table also includes data pertaining to the soil vapor extraction blower operation, total flow rates of soil vapor and dilution air and reading from field meters, including PID readings, and percent oxygen.

2.2.5 Operational Adjustments

As the system continues to operate, it is expected that several operational adjustments will be needed to enhance the systems ability to induce a flow of soil vapor through the source area. The decisions for making adjustments will be based on the data obtained, as discussed in Section 2.2.4, and per the discussion presented below.

When starting up the SVE system all 12 of the valves to the vapor recovery wells would be 100% open, the header soil vapor valve would be closed and the dilution air valve would be 100% open. The soil vapor valve would then be opened and the dilution air valve gradually closed. As the dilution air valve is closing, the soil vapor flow from the 12 wells would increase. The operational intent of the soil vapor extraction system will be to maximize the flow of soil vapor from the wells to the vapor treatment system. The vapor control system will be monitored to assure that it can treat the combined soil vapor without resulting in a condition where the explosive level in the vapor treatment inlet is too high (as discussed in Section 2.4).

Once the dilution air valve has been set, which would dictate the total flow of soil vapor, the data shown in Tables 2-3 and 2-4 would be obtained. The vacuum response data shown in Table 2-4 would indicate whether there is a sufficient radius of influence around each well such that the entire source area is affected by the SVE system. The criteria is a vacuum at the inlet well of at least 0.2 inches of water column (WC) after the air inlet wells are capped off. If the vacuum is at least 0.2 inches WC, all 12 valves would remain open. If the vacuum is less than 0.2 inches WC, each well will be individually assessed and those exhibiting a vacuum greater than 0.2 inches WC will be throttled down to reduce the vacuum response in that area (but still keep it above 0.2 inches WC). This would allow a greater flow of soil vapor from the other wells which would increase the vacuum in those other areas. The vacuums of the air inlet wells within the area of the wells which are on-line would then be checked to determine if a 0.2 inch WC vacuum has been achieved.

If these adjustments do not achieve the specified vacuum of 0.2 inch WC, then some wells will be taken off line until the appropriate vacuum has been reached. If all twelve wells cannot remain on-line at the same time, it will be necessary to develop a well rotating program, where certain wells would be on-line for a given period of time. At some time, these wells would be taken off-line and replaced with others. The criteria for determining which well is taken off line will be based on PID readings. The wells where the PID readings have dropped off to the lowest levels will be taken off-line. This will allow natural diffusion to take place in those areas so that the removal of VOC vapor can be optimized when the wells are placed back on-line at a later date.

As the VOC concentrations (and methane concentration) drop-off, the vapor treatment system would be capable of handling a greater flow of soil vapor. This may allow more wells to be on-line at a given time. The dilution valve (unless already closed), would be adjusted to maximize the total flow of soil vapor.

The PID readings of the fence-line observation points (FL-3 and 5) will indicate whether VOCs are migrating away from the source area. If elevated VOC readings are recorded, then the flow rate from the perimeter vapor recovery wells (VRW-201 and 205) would be increased.

2.3 *GROUND WATER TREATMENT SYSTEM*

2.3.1 *Objective of System*

The objective of the ground water treatment system is to reduce the concentrations of VOCs in the recovered ground water in order to comply with NYSPDES discharge criteria. These criteria are listed in Table 2-6.

2.3.2 *Components of System*

In order to remove VOCs, the recovered ground water will be treated by two low-profile tray air strippers operated in series or parallel flow configuration. Influent to the strippers also includes water from the vapor-liquid separator in the Vapor Treatment System (see Section 2.4). Due to the high levels of naturally occurring iron in the ground water, a polyphosphate sequestering agent will be injected into the recovered ground water upstream of the two air strippers. The addition of the sequestering agent will reduce the amount of iron that precipitates out of solution. The treated effluent will be discharged to the City of Glen Cove storm sewer system. The off-gas from the strippers will be conveyed to the catalytic oxidizer unit for treatment prior to release to the atmosphere. (See Section 2.4).

A description of the treatment system's primary components is provided below. A detailed description of all the treatment system equipment and operating procedures is provided in the Operation and Maintenance Manual for this

Table 2-6

NYSPDES Surface Water Discharge Criteria
Former Columbia Ribbon and Carbon Co. Disposal Site
Ground Water Treatment System

	Discharge Limit, ppb[1]	Discharge Limit, lbs./day
Xylenes, total	10	0.003
Benzene	10	0.003
Toluene	10	0.003
Ethylbenzene	10	0.003
Trichloroethene	10	0.003
Tetrachloroethane	10	0.003
1,1-Dichloroethane	10	0.003
Iron, total[2]	70,000	21
Phosphate (as PO_4)[2]	35,000	10.5

1 Concentration limit is based on the mass limit and on a flow rate of 25 gpm.

2 Discharge levels of iron and phosphate are not remedial goals for treatment but instead are based on estimated dissolved iron concentrations, based on observations during the pilot study, which require a proportional amount of sequestering agent. Hence, remedial operation may indicate a range of natural iron concentrations, which will in turn, require varying the feed rate of sequestering agent.

system. Process and instrumentation diagrams for the Ground Water Treatment System are provided in Drawings PID-4 and PID-6 of the design documents.

Iron Sequestering Agent Feed System

The polyphosphate solution will be stored in a 400 gallon HDPE aboveground tank. The sequestering agent will be fed by a seven gpd (max.) variable-speed diaphragm pump to an in-line static mixer located in the force main between the ground water recovery system and the air strippers.

Air Stripper System

The Air Stripper System will consist of two low-profile Shallow Tray Model 2341 aerators. Each unit will include:

- inlet screen and damper
- 304L stainless steel demister
- air pressure gauge
- spray nozzle
- site tube
- demister
- stainless steel latches
- schedule 80 PVC piping
- aeration tray cleanout ports
- four stainless steel aeration trays
- steel frame
- 300 cfm blower with inlet particulate filter
- 25 gpm discharge pump
- sampling ports

- control panel with pump level controls, alarm interlocks, motor starter, panel light, low air pressure alarm switch, high water level alarm switch, and discharge pump level switch.

2.3.3 *Adjustable Components*

The performance of the ground water treatment system will be affected by many variables such as water quality, temperature and flow rate. Two operating conditions can be controlled and adjusted at specific stages of the system to optimize overall treatment performance. These system components or controllers are discussed below.

Sequestering Agent Feed System

The concentration of the sequestering agent in the stripper influent is controlled by the flow rate setting of the feed pump.

Air Stripper

The air flow rate through each tray aeration unit is controlled independently by the air inlet damper for each unit.

The air stripper units can be operated in either of two configurations: series or parallel. In parallel operation, one unit can be shut down and remain in a "standby" mode until the other unit requires maintenance.

Finally, the frequency of some routine scheduled maintenance can affect treatment performance.

2.3.4 *Recordkeeping*

The following operating data and information is to be documented for the ground water treatment system:

- Treated effluent quality monitoring: as required by the Administrative Order on Consent for the parameters listed on Table 2-6
- Ground Water influent quality monitoring
- Intermediate air stripper unit water quality (For series operation mode, this point would be the effluent from the first stripper. For parallel operation mode, this point would be the effluent from tray number 2 of the four-tray stripper).
- Water flow rate
- Stripper inlet air pressure
- Air and water temperature
- Concentration of sequestering agent
- Concentration of dissolved iron in stripper influent and effluent
- Color of stripper influent and effluent (visual indication of iron content and state)
- Maintenance performed, including description of problem, maintenance procedure and date of occurrence. (See Operations and Maintenance Manual for a complete description of this requirement).

The flow rate data and concentrations will be used to calculate the mass of contaminants extracted from the source area and the mass of contaminants which are in the stripper off-gas.

The flow rate data and concentrations will be used to calculate the mass of contaminants extracted from the source area and the mass of contaminants which are in the stripper off-gas.

2.3.5 *Operational Adjustments*

Iron Sequestering Feed System

Iron precipitation and fouling within the air stripper units can cause a significant loss in treatment performance. As the extent of iron fouling increases, VOC removal efficiencies decrease and compliance with the discharge criteria will not be possible. Extensive aerator tray fouling or discolored ground water can be an indication that the sequestering agent is not adequately inhibiting iron precipitation. To overcome this problem, the sequestering agent pump rate will be increased. If iron precipitation problems persists, an alternate sequestering agent will be evaluated.

Air Stripper

VOC removal performance can be increased by adjusting the air inlet damper to allow a higher air flow rate through the aeration unit. However, due to several factors, the rate of VOC removal will reach a maximum level at a certain air flow rate. Increasing the air flow beyond that optimum point will not increase treatment performance, and will only generate excess discharge air that may have to be treated by the catalytic oxidizer.

Initially, the air stripper units will be operated in series due to the elevated VOC concentrations that are expected when ground water recovery begins. However, VOC concentrations will begin to decrease and, eventually, operating the system in the in-series mode will not be necessary to achieve discharge criteria compliance. When this occurs, the system configuration will be changed to the parallel operation mode with one unit on standby. This will allow transferring operation between the two units for maintenance needs while maintaining full-time operation of the entire remedial system. This change-over of the system configuration should occur when the VOC effluent concentration from the primary stripper unit (in series mode) consistently remains below 25% of the discharge criteria.

2.4 VAPOR TREATMENT SYSTEM

#9796
MW vinyl chloride 62.5

2.4.1 Objective of System

The objective of the vapor treatment system is to reduce the concentrations of VOCs in the extracted soil vapor and ground water treatment system off gasses in order to comply with NYSDEC Air Discharge and Air Quality Criteria, specifically 6 NYCRR Part 212 and Air Guide-1.

Specific indicator compounds have been previously identified in the NYSDEC approved "Work Plan for Pilot Study and Additional Data Acquisition Proposed Groundwater and Vapor Extraction Program" dated August 22, 1991. These listed compounds include: Toluene, Xylenes, Ethylbenzene, Benzene, 1,1 Dichloroethane, Tetrachloroethene, Trichloroethene and Vinyl Chloride. Except for vinyl chloride, all of these compounds had been detected in the soil vapor during the pilot study. Vinyl chloride is not detected by most air sampling methods. However, during the pilot test, a special method was utilized from the purpose of determining if vinyl chloride was present. Vinyl chloride was not detected in any air samples, and the detection limit was 12.5 ug/m^3 or 4.8 ppb. At this concentration and a soil vapor flow rate of 240 cfm, the mass removal of vinyl chloride would be 1.12 x 10^{-5} lbs./hr. Applying the screening procedure established in Air Guide-1 (with a 15.5 foot stack height), the annual average ambient concentration of vinyl chloride would be 0.00013 ug/m^3 which is 150 times below the AGC and the short term concentration would be 0.053

ug/m^3 which is 24,500 times below the SGC. It has therefore been determined that vinyl chloride is not a parameter of concern. To avoid specialized sampling, vinyl chloride has been excluded from the list of indicator compounds.

For the remaining indicator compounds, specific discharge limits have been established based on the NYSDEC Criteria, the air impact screening calculation (presented in Air Guide-1) and the emission point stack height of 15.5 feet. These discharge limits are presented in Table 2-7.

2.4.2 *Components of System*

The extracted soil vapor and stripper exhaust will be treated for VOCs by a catalytic oxidizer. The recovered soil vapor is first passed through a 500 cfm/75 gallon vapor-liquid separator situated on the inlet (suction) side of the vapor extraction blower. The vapor can be diluted if necessary, as explained later. The condensate from the separator will be pumped to the ground water treatment system. The vapor extraction blower exhaust is combined with the air stripper system exhaust and enters the catalytic oxidation unit. The vapor treatment unit uses propane as a supplemental fuel to ensure continuous destruction of VOCs. The trailer mounted unit and propane cylinders will be located in the fenced area adjacent to the treatment building. The unit is capable of treating up to 1,000 cfm including dilution air.

During operation, VOC laden air is drawn into the Catalytic Oxidizer Module by a 7.5 hp booster fan and is sent to the units heat exchanger. The air passes through the tube side of the heat exchanger and into the

TABLE 2-7

FORMER COLUMBIA RIBBON AND CARBON COMPANY DISPOSAL SITE

AIR EMISSION LIMITS FOR SELECT INDICATOR COMPOUNDS

PARAMETER	SGC (ug/m3)	AGC (ug/m3)	MAXIMUM EMISSION RATE, LBS./HR.		EMISSION RATE LIMIT (LBS./HR.)
			BASED ON SGC	BASED ON AGC	
TOLUENE	89000	2000	18.713	176.620	3.50
XYLENES	100000	300	21.026	26.493	3.50
ETHYL BENZENE	100000	1000	21.026	88.310	3.50
BENZENE	30	0.12	0.006	0.011	0.0063
1,1 DICHLORETHANE	190000	500	39.950	44.155	3.50
TETRACHLOROETHENE	81000	0.075	17.031	0.007	0.0066
TRICHLOROETHENE	33000	0.045	6.939	0.004	0.0040
TOTAL					3.50

NOTE:
MAX. EMISSION RATE IS BASED ON FOLLOWING:

AGC< (EMISSION RATE) * (4218) / (He^2.16)
AND
SGC< (420) * (EMISSION RATE) * (4218)/(He^2.16)

WHERE,
He, FT. = 15.5
EMISSION RATE IN LBS./HR.
AGC & SGC IN ug/m3

burner, where the contaminated air is raised to the catalyzing temperature. When the VOC laden air passes through the catalyst, an exothermic reaction takes place. The VOCs in the air stream are converted to carbon dioxide and water vapor. The hot purified air then passes on the shell side of the heat exchanger where the energy released by the reaction is used to preheat the incoming air. The treated vapor is exhausted into the atmosphere.

A process flow diagram of the vapor treatment system is provided in Drawing PID-5 of the design documents. A description of the system's primary components is presented below. A detailed discussion of all the treatment system equipment and operating procedures is provided in the Operation and Maintenance Manual.

Vapor-Liquid Separator

- Vessel:

The vapor-liquid separator will protect the downstream Vapor Extraction System components from entrained water. The pressure vessel will consist of an epoxy painted cylindrical steel tank with flanged tangential, side inlet and flanged top outlet. Baffle plates located within the vessel will act as a vortex breaker.

- Demister:

A packaged stainless steel demister will be included within the vessel for small water droplet removal.

- Condensate Transfer Pump

The condensate transfer pump will automatically operate on high liquid level and will inject the condensate into the air stripper ground water recovery influent line at a manually set rate.

- Sight Glass:

A liquid level indicator will be used for viewing of the water level within the vessel.

Catalytic Oxidation Module

- Dilution Air Control:

Automatic modulating dampers and air dilution controls will dilute the inlet air stream during high VOC concentrations. The amount of dilution air will be controlled by the exit temperature of the catalyst to keep the system operating within the designed temperature range.

- System Booster Fan:

The Catalytic Oxidation Module will include a high performance, AMCA Type C spark resistant, industrial grade fan, powered by a 7.5 HP 208V/3 PH TEFC, high efficiency motor.

- LEL Monitor:

A solid state LEL sensor will be located at the outlet of the Catalytic Oxidizer system booster fan. The LEL monitor will terminate operation of the system at inlet concentrations of 25% LEL or above. The sensor will be connected to a monitor mounted near the control panel.

- Flame Arrestor:

A metal grid type flame arrestor will be located between the system booster fan and heat exchanger inlet.

- Gas Burner:

The propane fired gas burner will have a maximum firing rate of 500,000 BTU/hour. The burner will bring the reactor up to catalyst ready temperature with ambient air during startup. The burner will maintain operating temperatures during VOC free, full air flow conditions. The expected system heat-up time will be approximately 5 to 15 minutes from a cold start.

- Catalyst:

The catalyst will have the following specifications

Catalyst Type	Nobel Metal Monolith
Minimum Catalyst Inlet Temperature	500°F
Maximum Catalyst Outlet Temperature	1,000°F
Non-Methane Destruction Efficiency	97%
Minimum Operational Life	15,000 Hours

- Heat Exchanger:

A shell and tube 50% efficient heat exchanger will preheat the incoming air stream and reduce auxiliary fuel consumption. The heat exchanger will be constructed of 304L series stainless steel. The VOC laden air will pass through the tube side of the exchanger and the hot purified air will pass through the shell side. The heat exchanger will have a manual by-pass damper to prevent overheating of the reactor inlet air under high VOC loading conditions.

2.4.3 *Adjustable Components*

The treatment performance of the catalytic oxidizer can be optimized by adjusting the dilution air on the inlet to the unit. This is achieved by adjusting the amount of dilution air that is introduced into the system. Dilution air intake dampers are located at the inlets to the vapor-liquid separator and the catalytic oxidizer module. In addition, the stripper exhaust can bypass the oxidizer and be vented when VOC concentrations are sufficiently low and do not require treatment.

Treatment performance is also affected by operating temperature. The propane feed rate can be adjusted to maintain optimum reactor temperature. This will ensure maximum treatment during periods of low methane and VOC concentrations.

2.4.4 *Recordkeeping*

The following operating data and information is to be recorded for the Vapor Treatment System.

- Exhaust air quality monitoring for VOCs to ensure compliance of discharge limits
- Inlet air quality monitoring
- Flow rate from SVE System
- Flow rate from air stripping system
- Dilution air flow rate
- Propane usage

- Catalytic Oxidizer operating temperature

For monitoring of oxidizer inlet and exhaust air quality, samples would be obtained from inlet and exhaust sample points and measurements will be made in the field using a PID organic vapor meter, and an explosimeter to measure % of LEL and % oxygen. Samples will also be obtained for laboratory analysis per NIOSH Method 1500, for the parameters listed in Table 2-7. Calculations will be made to determine the percent removal of each parameter and the mass emission rate of each parameter. The mass emission rate would be compared to the limits presented in Table 2-7. If stripper off-gas is vented directly to the atmosphere, the stripper emission rates (determined from the ground water quality data as described in Section 2.3.4) would be added to the oxidizer emission rates and the sum would be compared to the limits presented in Table 2-7.

2.4.5 Operational Adjustments

The operating procedures for the catalytic oxidizer are provided in the manufacturer's Operation and Maintenance (O&M) Manual. The general operating guidelines discussed in this section are intended to supplement the procedures presented in the O&M Manual.

As methane and VOC concentrations decrease so does the requirement for dilution air. Dilution air supply will be reduced when possible by closing the dilution air inlet points. This will reduce the total flow through the oxidizer, thereby increasing the retention time and increasing the VOC removal efficiency. The order of preference for closing off the dilution air points is as follows:

1. Vapor Extraction Blower inlet (at the Vapor-liquid Separator inlet)
2. Catalytic Oxidizer inlet

3. Stripper Exhaust

In eliminating the stripper exhaust discharge to the oxidizer, the second-stage exhaust will be by-passed first, while the first-stage exhaust remains on-line if the ground water total VOC concentration is greater than 2 ppm. A concentration of 2 ppm results in an untreated VOC emission rate of less than 0.5 pounds per day. It is expected that the increase in the oxidizer removal efficiency obtained by eliminating the stripper off-gas, will result in a net reduction of VOCs emitted. Before allowing the stripper off-gas to bypass the oxidizer, all contaminants in the stripper influent will be evaluated with respect to the emission limits in Table 2-7.

The oxidizer operating temperature and exhaust quality must be carefully monitored during adjustment of the dilution air feed. A reduction of the dilution air may cause the oxygen level to fall below minimum requirements for complete treatment.

3.0 EFFECTIVENESS EVALUATION

The effectiveness evaluation of the remedial system is a measure of the system's ability to meet, to the extent practical, the remedial objectives. The remedial goals stated in Section 1.2, are the ground water standards for each parameter of concern. The means by which the remedial system's effectiveness will be measured is discussed below.

3.1 MECHANISM OF REMOVAL

There are three mechanisms of VOC removal. These are recovery of VOC laden soil vapor, recovery of contaminated ground water and in-situ biodegradation. The most predominant removal mechanism is recovery of VOC laden soil vapor, which is the primary intent of the remedial system. The toluene removal rate and the total mass of toluene removed will be obtained as part of the soil vapor extraction operating data presented in Table 2-3. The mass removals presented in Table 2-3 are calculated based on frequent PID readings of extracted soil vapor along with laboratory analysis to provide a correlation of toluene concentration to PID readings (as shown in Table 2-5), flow rate data, and the vapor density of toluene (0.239 lbs./cu. ft.). The formula for toluene removal is:

Mass (lbs) = Flow ($ft.^3$) * conc.(ppm) * 10^{-6} * 0.239#/ft^3.

Significant removal of VOCs through ground water recovery is expected, especially at the initial stages of dewatering. However, once the Site has been dewatered, the ground water which infiltrates into the source area will likely be present only at low elevations, below the most contaminated soil. Therefore, the concentration of VOCs in the recovered ground water is expected to drop-off substantially once the Site is dewatered. The VOC concentrations and the ground water flow rate will be monitored, as described in Section 2.3. The mass of toluene is calculated based on the volume of ground water extracted and the concentration of toluene. The formula for toluene removal rate is:

Mass (lbs) = flow (gal.) * conc. (ppm) * 8.34 * 10^{-6}

It is likely that VOCs will be removed through biodegradation as result of soil vapor extraction. During the pilot testing, methane was found to be present within the sub-soils at the Site. The presence of methane is indicative of anaerobic biological activity. Once soil vapor extraction is performed it is possible that the biological activity will change from anaerobic to aerobic. Aerobic biological organisms have been known to effectively degrade certain types of VOCs, including toluene, ethylbenzene and xylenes.

3.2 RECORD KEEPING

On a monthly basis, data pertinent to mass removal, which is recorded as part of the system performance analysis discussed in Section 2.0, will be evaluated and compiled to form a monthly toluene mass removal report. This will summarize the monthly mass removal and the total mass removal of toluene via VOC laded soil vapor, contaminated ground water and biological degradation. The more detailed information regarding toluene removal from each of the 12 vapor recovery wells is available in Table 2-3, which is discussed in Section 2.2.

3.3 ASSESSMENT AND OPTIMIZATION OF MASS REMOVAL

The monthly mass removal will be compared to previous monthly removals to evaluate the affects of any operational changes, to determine if there are trends towards declining removal rates, and to assess the benefits of continued operation.