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95% Design Report
Operable Unit 3
Soil Gas Interim Remedial Measure

Former Grumman Settling Ponds,

Bethpage, New York

Site # 1-30-003A

September 7, 2007

ARCADIS

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1. Introduction

This Operable Unit 3 (OU3) Soil Gas Interim Remedial Measure (soil gas IRM) 95% Design Report was prepared by ARCADIS of New York, Inc. (ARCADIS) on behalf of Northrop Grumman Systems Corporation (Northrop Grumman), and is being submitted pursuant to the Order On Consent (Consent Order or CO) Index # W1-0018-04-01 that was executed by the New York State Department of Environmental Conservation (NYSDEC) and Northrop Grumman, effective July 4, 2005 (NYSDEC 2005). The present day Bethpage Community Park property (Park), which the NYSDEC has termed the "Former Grumman Settling Ponds Area" and designated as OU3, is referred to herein as the Site. The Park has been owned and operated by the Town of Oyster Bay since 1962.

The CO allows the implementation of Interim Remedial Measures (IRMs) for OU3. In response to NYSDEC's December 22, 2006 letter to Northrop Grumman, Northrop Grumman has elected to implement a soil gas mitigation system as an IRM as outlined in the Operable Unit 3 – Soil Gas Interim Remedial Measure Work Plan, Former Grumman Settling Ponds, Bethpage, New York, Site #1-30-003A ([Work Plan] ARCADIS, February 16, 2007). This report describes and presents the 95% design for the soil gas IRM. Included in this report is a description of environmental conditions, objectives of the soil gas IRM, design criteria of the soil gas IRM, and a set of biddable construction drawings (95% completion level).

This report is organized into the following sections:

- Section 2 provides a brief description of the Site.
- Section 3 summarizes the soil gas IRM rationale and objectives.
- Section 4 presents a summary of the pneumatic conductivity test methodology and results.
- Section 5 describes the design criteria used for design calculations and development of the 95% design.
- Section 6 provides a description of the soil gas IRM components.
- Section 7 provides a description of the construction site controls that will be implemented during construction to protect human health and the environment.

- Section 8 presents a summary of the Operation, Maintenance, and Monitoring (OM&M) program and objectives.

- Section 9 discusses permit and/or permit equivalent requirements.

- Section 10 summarizes the permanent site security measures that will be implemented following construction completion.

- Section 11 summarizes the references cited within this document.

2. Project Background

The following subsections of this Plan summarize details regarding the Site description, location, history, and environmental setting. Much of the information related to site description and background that is presented herein was originally presented in the December 2003 Field Report - Town of Oyster Bay, Bethpage Community Park, Investigation Sampling Report, prepared by Dvirka & Bartilucci Consulting Engineers (D&B) on behalf of Northrop Grumman.

2.1 Site Description

The Site is bordered by Cherry Avenue Extension and the Robert Plan Company Building to the north, Stewart Avenue and Bethpage High School to the east, the Former Plant 24 Access Road and residential areas to the south, and a second Robert Plan Company Building (the former Northrop Grumman Plant 24) to the west. Other properties owned by Northrop Grumman, including the McKay Field property, ball fields and former nursery area are located to the west. The Site location is shown on Figure 1. The adjoining streets and properties, as well as current site features and structures are shown on Drawing 1.

The present-day Park is operated by the Town of Oyster Bay (TOB or Town) and is comprised of approximately 18 acres. The Park, up to about mid-2006, was open year-round and contained two swimming pools, an ice rink, offices, parking lot, picnic and playground areas, tennis courts, paddleball courts, basketball court, shuffleboard courts, horseshoe pits, baseball field, bicycle rack areas, and a stormwater recharge basin. Freon 12 and 22, which we believe is attributable to the Town's operation of the ice rink, has been found in soil gas and groundwater samples collected at the Park. Currently the Park is closed to the public to allow the Town to implement a soil IRM and redevelopment of the Park, including construction of a new ice rink. Adjoining the

Park property to the south and west is the former Plant 24 Access Road Property, which is a partially asphalt-paved/partially grassed area that runs east-west along the Park southern and western boundary. The former Plant 24 Access Road Property is owned by Northrop Grumman.

2.2 Park History

The December 2003 report prepared by D&B provides a detailed description of the Site and its history (D&B 2003).

2.3 Environmental Setting

This section of the Plan provides a brief, physical description of the Site, the local geology, and the area hydrogeology.

The Site is approximately 120 feet above mean sea level and, topographically, is generally flat. In general, the geology at the Site, from land surface down to the basal Magothy Formation, consists primarily of sand with interbedded lenses of silt, clay, and gravel. The uppermost sequence of these sediments is part of the Upper Pleistocene glacial outwash deposits, while the lower geologic sequence comprises the Magothy Formation. The Upper Pleistocene deposits in this area of Long Island tend to be coarser than the underlying upper portion of the Magothy Formation. Within the Magothy Formation, the deposits tend to become finer with depth, except for the basal Magothy, where coarse sand and gravel deposits are more prevalent. Vertical profile borings drilled at the Site indicate the presence of a low permeability zone (LPZ) that consists of interbedded slit, clay, and sandy silts and clays. The upper surface of the LPZ was encountered from approximately 36 to 46 feet below land surface (ft bls) and ranging in thickness from approximately 1 ft to greater than 20 ft, and underlies most of the Site between the recharge basin and the ball field, as well as the western portion of the parking lot. A more detailed description of the Site geology is provided in the March 2006 OU3 Remedial Investigation/Feasibility Study (RI/FS) Work Plan prepared by ARCADIS.

The principal aquifers underlying the project area are the Upper Glacial deposits and Magothy Formation; these hydrogeologic units are in direct hydraulic connection with each other. Groundwater in the Upper Glacial deposits and Magothy Formation occurs under unconfined conditions at and near the Site (although the Magothy Formation in other areas of Long Island can exhibit semi-confined conditions; the degree of confinement increases with depth due to stratification caused by numerous silt and clay lenses). Within the project area, the average horizontal hydraulic conductivity of the Upper Glacial deposits is approximately 270 feet per day (ft/d); with an anisotropy of approximately 10:1 (horizontal to vertical, respectively). The average horizontal hydraulic conductivity of the Magothy Formation in the project area is approximately 50 ft/d, with an anisotropy ratio of approximately 100:1 (horizontal to vertical, respectively) (Geraghty & Miller, Inc. 1994).

Depth to groundwater at the Site is approximately 55 ft bls. Water-level elevation data collected in the area of the Site indicate a resultant direction of shallow groundwater flow that is horizontally south-southeasterly and vertically, slightly downward. The on-site stormwater recharge basin may produce local, water-table mounding during intense storm events, however no data currently exist to verify this. Perched water is present above the LPZ described above.

3. Project Objectives

As outlined in the Work Plan, the specific objectives of the soil gas IRM are:

- To mitigate the off-site migration of non-Freon 12 and non-Freon 22 Volatile Organic Compounds (VOCs) in the on-site soil gas through the implementation of a soil gas control system along the former Plant 24 access road south of the Park.

- To comply with applicable NYSDEC Standards, Criteria and Guidelines (SCGs).

Subsequent to submittal of the Work Plan, site-related VOCs were found along the southwestern Park boundary. Accordingly, an additional objective of the soil gas IRM is:

- To mitigate the off-site migration of non-Freon 12 and non-Freon 22 VOCs in the on-site soil gas through the implementation of a soil gas control system along the former Plant 24 access road west of the Park.

4. Summary of Pre-Design Activities and Pneumatic Conductivity Testing

The following section provides a brief summary of the methodology and results for the pre-design investigatory and pneumatic conductivity testing activities conducted at the Site.

4.1 Pre-Design Investigatory Activities

As outlined in Section 6.1 of the Work Plan, the following pre-design investigation activities were completed to assist in the development of the soil gas IRM:

- Soil gas sampling was performed to investigate soil gas east, west and south of the Park and to refine the scope of the soil gas IRM. Results of this investigation will be presented in the CO required monthly progress reports. This data has been taken into consideration, as appropriate, during development of the soil gas IRM design.

- A series of cone penetrometer (CPT) borings were drilled along the former Plant 24 south access road to help delineate the low permeability zone (LPZ) in this area. This work provided information regarding perched water including where LPZ soils might be present. The results of the CPT boring program will be presented in the Remedial Investigation (RI) Report, currently under preparation.

- Perched water levels are periodically monitored along the Plant 24 south access road; the data will be presented in the RI Report.

4.2 Pneumatic Conductivity Testing

As outlined in the 50 to 75 % Design Report (ARCADIS 2007), pneumatic conductivity testing was conducted to collect site-specific field data for use in designing the full-scale soil gas IRM. A summary of the pneumatic conductivity testing methodology, objectives, and results are provided below. In addition, Appendix A provides as-built figures and a table summarizing the testing locations and the depressurization and monitoring well construction details, completed field parameter logs, and pertinent calculations.

4.2.1 Pneumatic Conductivity Testing Methodology

Pneumatic conductivity testing was completed according to the Pneumatic Conductivity Test Work Plan (ARCADIS 2007) which was provided as Appendix C of the Work Plan. Table 1 provides a summary of the depressurization and monitoring well network construction details. Figures A-1 and A-2 provide as-builts of the testing areas. As shown on Figures A-1 and A-2, six (6) tests were conducted at a total of three (3) testing locations (two test depths per location). All tests were completed using a 5 horsepower (hp) regenerative blower capable of 280 standard cubic feet per minute (scfm) at 8 inches of water column vacuum.

It should be noted that only active (e.g., traditional negative pressure generating blower) testing was performed. It was not necessary to perform testing for any passive (e.g. natural "barometric pumping" and/or the use of wind turbines or alternative measures) systems, as the results for the active system were acceptable.

4.2.2 Objectives

The primary objective of the pneumatic conductivity testing program was to collect site-specific field data for use in designing the full-scale soil gas IRM. The sub-objectives of the testing were as follows:

- Determine the site-specific pneumatic conductivity along the southern and western sections of the former Plant 24 access road above and below the LPZ, where encountered.
- Estimate the quantity of surface leakage in wells screened above the LPZ, where encountered.
- Estimate the quantity of water generation during subsurface depressurization.
- Estimate the influent vapor concentration and contaminant mass loading rate.
- Obtain additional site specific geologic data within the test area.

A brief summary of the results, conclusions, and recommendations is provided below.

4.2.3 Results, Conclusions, and Recommendations

The following results and design calculations are provided in Appendix A:

- The recorded field parameters for each pneumatic conductivity test location in Tables A-1 through A-6.
- A summary of the calculated pneumatic conductivity for each pneumatic conductivity test location is in Table A-7 with an example calculation.

- A summary of the vapor analytical results for each testing location and the total effluent is in Table A-8.

- A summary of the analytical results for collected condensate (knockout tank) generated during the test is in Table A-9.

- Lithology penetrated during well installation is presented in Figures A-1 and A-2 in Appendix A.

The following conclusions are made based on the results provided in Appendix A:

- Field parameters and soil lithology indicate that the vadose zone geology is suitable for subsurface depressurization technology. Specifically, soil gas depressurization can be accomplished at reasonable wellhead vacuums.

- The calculated pneumatic conductivity is consistent with the vadose zone geology. Likewise, it is consistent with published values for clean sands (USEPA, 1994). The calculated values further corroborate field parameters and indicate that the proposed technology is suitable for the site.

- As expected, considerable surface leakage was observed in the shallow zone. Although not quantified, surface leakage is evidenced by the observation of vacuum above the shallow well screens (for example, DW-1S screened 15-30 feet below land surface (ft bls) and vacuum levels greater than baseline readings observed in VMWC-1A screened 7.5-8.5 ft bls, Table A-1, Page 2.).

- Vapor analytical results were consistent with site investigatory data (i.e., analytical results for depressurization wells DW-2S and DW-2D were similar to results for soil gas point (SGP)-2 (15 and 40 foot interval, respectively), analytical results for DW-1S and DW-1D were similar to results for SGP-05 (34 and 49 foot intervals, respectively), and analytical results for DW-3S and DW-3D were similar to results for SGP-11D (20 and 45 foot intervals, respectively).

- Minimal water was generated as part of the pneumatic conductivity testing. A total of 1 quart of water was collected, over an 8-hour time period at one of the six depressurization well points (DW-2D).

- Analytical results for collected condensate were non-detect for all compounds analyzed.

In summary, the pneumatic conductivity results are consistent with published values for clean sands, and indicates that subsurface depressurization technology using vertical radial depressurization wells is an efficient and effective technology to prevent the off-site migration of on-site soil gas.

5. Design Criteria

Design criteria were established for the soil gas IRM based on the overall objectives of the system and based on the results of the currently available pre-design activities data referenced previously. Accordingly, the following design criteria have been established:

- The system will mitigate the off-site migration of non-Freon 12 and non-Freon 22 VOCs in the on-site soil gas through the implementation of a soil gas control system along the former Plant 24 south access road and along the former Plant 24 access road west of the Park.
- Mitigation will be provided through the generation of negative pressure and/or through the removal of existing soil gas.
- The system will be designed to maintain 0.1 inches of water column (IWC) of negative pressure within the negative pressure curtain (e.g., along the southern and western access roads) based on a twelve-month rolling average.
- Collected vapors will initially be treated until it is demonstrated that all VOCs in the influent (untreated) vapor stream are less than the NYSDEC DAR-1 Annual Guidance Concentrations (AGCs) on a twelve-month rolling average and Short-Term Guidance Concentrations (SGCs) for any given grab sample (NYSDEC 2003).
- Collected condensate will initially be transferred to the point of discharge under the existing approval for OU3 wells. The point of discharge, located near the Northrop Grumman OU2 Treatment Building 96, ultimately discharges to the Town of Oyster Bay's Cedar Creek treatment facility. The condensate may be transferred to the OU3 groundwater IRM following its construction if appropriate.
- Operation of the soil gas IRM will allow for ease of visual monitoring, testing, and maintenance, with automatic control of the principal equipment units.

- Piping connections and valving will provide flexibility in operation of the recovery and treatment system.

A summary of the proposed soil gas IRM design based on the above criteria is provided below.

6. Depressurization System Design

The following subsections of this design report identify the primary components of the system, discuss design considerations, and present descriptions of the treatment equipment, the treatment building, emission controls, and process controls and operation. A set of biddable construction drawings (95% completion level) are provided in Drawings 1 through 9. Finally, design calculations have been provided in Appendix B.

6.1 Overall System Process

The soil gas IRM system will consist of the following major components:

- Vertical Depressurization Wells and Recovery Pipelines – A series of vertical depressurization wells (herein after referred to as depressurization wells) will be installed along the former Plant 24 south access road property and along the western leg of the access road to extract vapors (soil gas) from the vadose zone soils. Individual pipelines will be connected to each depressurization well to convey soil gas to the treatment facility. The number of depressurization wells, well spacing, design rationale, and well construction details are provided in Section 6.2.

- Depressurization System – Regenerative type blowers will be connected to recovery pipelines and used to generate negative pressure within the vadose zone and to push extracted soil gas through the emission control system. A detailed description of the proposed depressurization system and design rationale is provided in Section 6.3.

- Temporary Emission Control System – Prior to atmospheric discharge, the soil gas will be treated with a temporary vapor phase granular activated carbon (VPGAC) adsorption bed. A detailed description of the proposed emission control system and design rationale is provided in Section 6.4.

- Treatment Buildings – The blowers and the majority of the process equipment, system instrumentation and electrical controls will be housed in two (2) treatment buildings located immediately north of the Robert Plan building (Drawing 1) on an existing concrete slab. A detailed description of the proposed treatment buildings and layouts are provided in Section 6.5.

6.2 Wells and Pipeline

Drawing 1 shows the locations of the proposed and existing depressurization wells, proposed and existing vacuum monitoring wells, and recovery pipelines. Proposed and existing depressurization wells have been labeled with the prefix "DW" (e.g., DW-1S, DW-2S, etc…). Proposed and existing vacuum monitoring wells have been labeled with the prefix "VMWC" (e.g., VMWC-1A, VMWC-2A, etc…). Table 1 provides a summary of the construction details for the wells to be incorporated into the soil gas IRM. As shown on Drawing 1, 11 shallow and 7 deep depressurization wells will be used to maintain negative pressure within the subsurface along the entire target zone of the soil gas IRM system. The proposed or existing well locations were selected using a distance-vacuum approach for each pilot study depressurization well. The subsurface geology at VP-4 and pneumatic conductivity test wells DW-3S/3D was used as the cutoff location for determining which pilot test data to use for the full-scale design. More specifically, for all southern access road wells the pneumatic conductivity was assumed to be similar to pilot test well locations DW-2S and DW-2D for all locations east of VP-4 and to be similar to pilot test well locations DW-1S and DW-1D for all locations west of VP-4. For all western access road wells, the pneumatic conductivity was assumed to be similar to pilot test well locations DW-3S and DW-3D. The assumption for the southern access road was based on the change in depth and nature of the LPZ in the vicinity of VP-4. Distance-vacuum calculations and the selected flowrate and radius of influence for each well tested are provided in Tables B-1 through B-6 of Appendix B. Figure 2 shows the location and anticipated radius of influence for the soil gas depressurization system. Each depressurization well will be enclosed in a 12-inch diameter traffic rated well vault that will house the well head and a vacuum gauge (Drawing 6).

A network of vacuum monitoring wells consisting of existing (pneumatic conductivity test monitoring wells) and proposed wells will be used to monitor negative pressure within the subsurface. The locations of the vacuum monitoring points were strategically selected to monitor negative pressure within the target zone both vertically and horizontally. In summary, a total of 18 monitoring well clusters (where a cluster includes one to four individual monitoring well depths depending on location and the clusters corresponding depressurization well construction) will be provided to monitor subsurface vacuum.

Soil gas will be conveyed through individual well pipelines. Accordingly, the remaining flow controls, electrical devices, and accessories associated with the well will be housed inside Treatment Building Number 1. Individual well recovery pipelines will be standard diameter ratio (SDR) 17 high density polyethylene (HDPE). Piping will be installed using conventional trenching and backfilling methods. A below grade piping size schedule is provided as Table B-7 in Appendix B. Pipe sizes were selected to keep the total head loss per pipeline below grade equal to or less than 10 IWC. Above grade piping installed at or within the treatment sheds and emission control unit will be constructed of various materials and sizes suitable for intended purpose of the piping. Specifically, schedule (Sch.) 80 polyvinyl chloride (PVC) pipe will generally be used for all vapor pipe prior to the extraction blowers and Sch. 40 carbon steel or aluminum duct will be used for all vapor pipe following the extraction blowers.

6.3 Depressurization System

As referenced previously, regenerative type blowers will be connected to recovery pipelines and used to generate negative pressure within the vadose zone and to push extracted soil gas through the temporary emission control system. Specifically, one Rotron Model EN14 30-horsepower (hp) blower (or equivalent) will be connected to deep zone wells DW-1D through DW-7D and two Rotron Model EN979 20-hp blowers (or equivalent) will be operated in parallel and will be connected to shallow zone wells DW-1S through DW-11S. All blowers will be connected in such a way that they can be used as "backups" during routine OM&M or emergency OM&M, if needed. The blowers were selected based on the design flowrates provided in Table B-8 and design vacuum and pressure heads provided in Tables B-9 and B-10. As shown in Tables B-9 and B-10, each blower was designed to accommodate the use of permanent emission controls, if necessary. Furthermore, each blower was designed with a 1.3 factor of safety on flow to account for seasonal variations in efficiency and/or unknown site conditions.

Each blower will have a dedicated moisture separator and air filter to remove condensate and particulates prior to entering the blowers and temporary emission control system. Each blower will be operated with a variable frequency drive (VFD) to allow flexibility in system operation and account for seasonal variability in operation. Finally, collected moisture will be transferred to a 400-gallon polyethylene bulk storage tank and then transferred to the publicly owned treatment works through manual means (under the existing approval).

A network of control valves, mechanical gauges (e.g., vacuum gauges, pressure gauges, flow meters, temperature gauges, etc.), electronic controls and interlocks, and sample ports will be used to control and monitor the system. The Process and Instrumentation Diagram (Drawing 3) shows the location of all proposed control equipment. A detailed description of the electronic controls and interlocks is provided in Section 6.7.

6.4 Temporary Emission Control System

An air model was prepared using the NYSDEC DAR-1 air model. Specifically, influent design concentrations were developed using existing soil gas data collected as part of the RI and the results of the soil gas data from the pneumatic conductivity testing program as referenced in Section 4.2. When a proposed full-scale design well was not located adjacent to a pneumatic conductivity test well, the nearest RI soil gas concentration (at the most applicable depth) was used as the design basis. A summary of the design concentrations and design basis for each proposed depressurization well location is provided in Table B-11. Next, the design concentrations were converted into an influent mass loading rate based on the design flowrate for each respective depressurization well. A summary of the design mass loading rates is provided in Table B-12. Finally, the influent mass loading rate and design concentrations were evaluated using the NYSDEC DAR-1 air model and compared to each compound's respective Annual Guidance Concentration (AGC); which represents the most conservative (stringent) regulatory level. The results of the air model are provided in Table B-13. As shown in Table B-13, treatment of the collected soil gas will initially be required to meet applicable discharge criteria based on the assumed design variables. However, it is anticipated that the concentrations in the collected soil gas will drop down to levels below applicable discharge criteria within a short time period.

In accordance with the air model analysis provided herein, a 30-foot high stack will be provided to ensure that all emissions are below their applicable discharge criteria. The stack will be constructed of rigid aluminum duct and will be supported with a 30-foot tall, 12-inch diameter American Institute of Timber Construction (AITC) approved timber utility pole (Drawing 6). The stack diameter was designed conservatively at 16-inches to allow for its' future use for other remedial components (e.g. OU3 groundwater

IRM and/or the full-scale remedy), if necessary. The stack will be located immediately northwest of the temporary VPGAC unit (Drawing 1).

A single 10,000 lb VPGAC unit (minimum) will be provided to remove VOCs (primarily trichloroethylene [TCE]) from the recovered soil-gas prior to discharge to the atmosphere during startup. The sizing and configuration of the VPGAC were determined based on expected air flow rates, VOC characteristics and loadings. Finally, a fan-drafted heat exchanger will be provided before the temporary VPGAC to lower the discharge temperature of the process air prior to entering the VPGAC and/or stack. The fan-drafted heat exchanger is designed to reduce the blower discharge temperature from approximately 150 degrees Fahrenheit (deg F) to 100 deg F at approximately 2,087 standard cubic feet per minute (scfm).

The temporary VPGAC unit will be taken off-line upon confirmation (through laboratory analytical results for the influent vapor stream) that the influent mass loading rate is below applicable standards. If influent vapor analytical data indicate that VPGAC is needed for a longer period, consideration will be given to installing a permanent emission control system. It should be noted that the depressurization blowers have been designed to accommodate the use of permanent emission controls, if needed.

6.5 Treatment Buildings

All process related mechanical equipment and electrical controls will be housed within two 20-foot by 8-foot by 8-foot "dry van" type storage containers. The treatment building equipment layout and elevations are presented on Drawings 4 and 5, respectively. As shown on Drawing 4, Treatment Building Number 1 will house the influent depressurization well manifold, the moisture separators, air filters, and transfer pumps, the liquid storage tank, and associated piping and controls. Treatment Building Number 2 will enclose the regenerative blowers, electrical controls, and associated piping and appurtenances.

Each building will be provided with double doors to allow for access of mechanical equipment during maintenance activities. In addition, each building will contain appropriate heating, ventilation, air conditioning, insulation, and lighting to adequately maintain the environment for proper operation of the system. All building, mechanical, and electrical components will be installed in strict conformance with Town of Oyster Bay, New York State, and Federal building code requirements.

6.6 Utility Service

Electric service will be obtained from an existing transformer located west of the proposed treatment building. The power will be transferred via underground conduit from the power pole to Treatment Building Number 2. Telephone service will be provided to Treatment Building Number 2 for operation of the proposed autodialer.

6.7 Process Controls and Operation

The process control system is designed to provide the necessary safeties and interlocks to ensure that the components of the soil gas IRM operate smoothly, efficiently, and as one unit. The process control system will be designed with a graphical user interface (GUI) to allow the user to adjust control set points. Additionally, the system will include an autodialer which will notify the operator(s) of any system fault. Controls and instrumentation will be interconnected via serial network, utilizing network wiring installed in exposed conduit. The main control panel (MCP), located in Treatment Building Number 2, will house a programmable logic controller (PLC) to monitor and integrate the operation of the system.

6.7.1 Operation and Programmable Logic Controller

As referenced above, a PLC will be housed within the MCP which will serve as the central operating point for the system. The MCP façade will be equipped with a GUI, reset button, and emergency stop button. Each system motor (with the exception of system HVAC and lighting components) will be equipped with a virtual type hand-off-auto (H-O-A) switch on the GUI. When in the off position, the individual system motor/component will not operate. When in the hand position, the individual component will run manually (e.g., will override the system alarms and interlocks). While in the auto position, the individual component will be subject to the system alarms and interlocks described below.

6.7.2 System Interlocks

The soil gas IRM will include a series of main system interlocks and a series of minor system interlocks. All main system interlocks will result in shutdown of all system components and will call the autodialer callout recipients with the specific system alarm condition. All minor system interlocks will result in autodialer callout only for a period of 24-hours. If the minor alarm is not cleared within 24-hours, the main system interlock will engage resulting in shutdown of the entire system. All main system interlock conditions will require manual clearing of associated alarm conditions and manual restart of the system. A summary of the controls, alarms, and interlocks is provided below and on Drawing 3. A summary of the major and minor interlock conditions is provided below.

6.7.2.1 Main System Interlocks

The following alarm conditions will result in triggering of the main system interlock:

- Motor fault (FL) 200, FL-300, and FL-400 - Blower BL-200, BL-300, or BL-400 motor fault.
- Level alarm high-high (LAHH) 200, 300, and 400 – Knockout tank KO-200, KO-300, or KO-400 high water level alarm.
- Vacuum alarm high-high (VAHH) 202, 302, and 402 – Blower BL-200, BL-300, or BL-400 high vacuum alarm.
- Vacuum alarm low (VAL) 202, 302, and 402 – Blower BL-200, BL-300, or BL-400 low vacuum alarm.
- LAHH-510 – Liquid storage tank ST-510 high water level alarm.
- Pressure alarm high (PAH) 601 – Blower effluent air stream high pressure alarm; and,
- Temperature alarm high (TAH) 602 – Blower effluent air stream high temperature alarm.
- Temperature alarm high (TAH) 701 – Treatment Building Number 2 high temperature alarm.

6.7.2.2 Minor System Interlocks

The following alarm conditions will result in triggering of the minor system interlock:

- FL-210, 310, and 410 – Transfer pump TP-210, TP-310, or TP-410 motor failure.

- Vacuum alarm high (VAH) 202, 302, and 402 – Blower BL-200, BL-300, or BL-400 high vacuum warning.

- Level alarm high (LAH) 510 – Liquid storage tank ST-510 liquid high level warning.

- FL-600 – Heat exchanger HX-600 motor failure.

7. Construction Site Controls

The goals of site controls are to prevent access to the project areas by unauthorized personnel, identify and delineate the various locations within the project area, manage the flow of activity within and between the various work locations, and provide protection of the public, site workers, and the environment during construction. A description of the proposed construction site controls is provided below.

7.1 Site Security

To reduce the risk of vandalism during construction and provide protection of the public, the following temporary security measures are specified in the building/site design:

- The Former Plant 24 south access road will be closed for the length of construction.

- Traffic flow along the western access road will be controlled with temporary site barriers, signage, and flagmen (during loading/offloading of material for offsite disposal and/or backfilling and during trenching and well drilling, when necessary).

- Signage will be posted at strategic locations to deter the public from entering the limits of disturbance.

- All equipment will be stored within the 6-foot fence around McKay Field with locking gates.

A description of the proposed erosion and sediment (E&S) controls is provided below.

7.2 Erosion and Sediment Controls

Erosion and sediment (E&S) controls will be emplaced before construction activities begin to control surface runoff within any disturbed areas to minimize the potential for sediment-laden run-off to discharge from the Site. Specific areas targeted for E&S controls include:

- The south side of the southern access road including any areas where trenching will be completed.
- The west side of the western access road including any areas where trenching will be completed.
- All existing drainage structures; and,
- All temporary stockpile locations.

In general, E&S controls will consist of the installation and maintenance of perimeter silt fence at these locations. However, straw bales may be used in conjunction with silt fence if additional protection is deemed necessary. In addition to silt fence, all surge (temporary stockpiled) material will be covered with polyethylene sheeting when not actively in-use and during all storm events. Finally, all stormwater inlets will be protected with temporary berms or other means, as necessary. The construction contractor will be responsible for maintaining these measures throughout the project. An E&S control plan and accompanying details have been provided on Drawing 2.

7.3 Traffic Control

The traffic route for construction equipment and vehicles is shown on Drawing 2. The primary site access will be through the Cherry Avenue Extension/Aerospace Boulevard (Blvd.) entrance. During site activities, waste hauler access will be limited to the access road from the proposed offsite disposal stockpile area to the Cherry Avenue Extension/Aerospace Blvd. Waste haulers will then receive the appropriate waste from the hazardous or non-hazardous stockpile areas and will be directed to the washdown pad prior to reentry onto public roads. Authorized personnel may access the site from either the Cherry Avenue Extension or the southern access road. As referenced previously, the southern access road will be closed for the duration of the work. Accordingly, access along the southern access road will be limited to authorized personnel vehicles only. As shown on Drawings 1 and 2, the primary recovery trench will be installed immediately north of the current southern access road. Construction equipment traffic will be limited to the north side of the proposed trench (e.g., along the "former" access road) except during connection of individual well headers to the common trench.

All equipment will be stored within the 6-foot fence around McKay Field with locking gates.

7.4 Soil Management

Based on previous site operations and soils investigation data the handling and management of soils during intrusive work will be an important part of construction activities. In accordance with data obtained during previous investigations, polychlorinated biphenyl's (PCBs), chromium, VOCs, and semi volatile organic compounds (SVOCs) are the primary constituents of concern along the southern and western access roads where intrusive activities are planned. The primary intrusive activities that will result in the generation of soils requiring management include well installation and trenching. Soils management will be accomplished through a variety of site controls, engineering controls, and construction methodologies. Accordingly, the following activities have been identified for soils management:

- Immediately containing all drill cuttings within 55-gallon drums. Subsequent characterization of wastes and disposal in accordance with all applicable regulations.
- Implementation of a pre-characterization sampling program along all areas where trenching activities are planned and soils investigation has not been completed and/or insufficient data exists.
- Implementation of soil management controls including:
  - Implementation of the traffic controls referenced in Section 7.3.
  - Engineering controls on all site soils which are managed through the installation of temporary stockpile areas; and,
  - Engineering controls around all active trenching areas.
- Implementation of the E&S control plan referenced in Section 7.2 above; and,
- Implementation of dust suppression and air monitoring activities as listed in Section 7.5 below.

As referenced above, prior to trenching activities, soil cores will be collected in areas where a soil investigation has not been completed and/or insufficient data exists using a Geoprobe® rig. The samples will be collected and selectively analyzed for PCBs, total chromium, VOCs, and SVOCs using United States Environmental Protection Agency (USEPA) Methods 8082, 6010, 8260, and 8270, respectively. The depth of sample collection will be dependant on the anticipated depth of trenching in that particular location. It is anticipated that a minimum of two (2) sample depths will be collected for each sampling location. The pre-characterization data will be used to estimate the quantity of soil materials requiring offsite disposal (as either hazardous or non-hazardous material) and accordingly the amount of imported backfill required. Delineation of these materials prior to construction will minimize the amount of time materials will require staging, will expedite the backfilling process, and will identify which areas require additional E&S controls, if necessary.

Pre-characterization soil data will be compared to the soil cleanup objectives (SCOs) in 6 NYCRR Part 375 for Industrial Classified areas. Soils which are characterized as having a constituent greater than its' respective SCO will be excavated and staged in the designated area near McKay field for offsite disposal. Soils which are characterized as having all constituents below their respective SCOs will be reused as backfill material. The staged soils will be further characterized for TCLP metals, TCLP VOCs, and TCLP SVOCs to classify them as either hazardous or non-hazardous waste, prior to transport and disposal at the receiving facility. For example, soils characterized as less than 25 parts per million (ppm) total PCBs will be stockpiled on-site for reuse as trench backfill material. Soils characterized as greater than or equal to 25 ppm total PCBs will be stockpiled in the designated area near McKay field for offsite disposal as non-hazardous waste. Soils characterized as greater than or equal to 50 ppm total PCBs will be stockpiled in the designated area near McKay field for offsite disposal as hazardous waste. This same methodology would apply to each of the COCs characterized as part of the pre-characterization program. Every effort will be made to reuse soils in the same location where it was excavated as a best management practice. In addition, appropriate institutional controls will be considered and implemented as needed as part of the overall remedy for the parcel.

The proposed temporary stockpile locations for non-hazardous reuse fill, imported fill, and materials requiring offsite disposal are provided on Drawing 2. Temporary stockpiles will be covered with plastic sheeting to prevent exposure to rainwater and reduce airborne particulates. In addition, stockpiles will also be covered at the end of each day. The plastic sheeting used to cover stockpiles will have a thickness of 6 millimeters and will be anchored so the sheeting does not slide or blow off the stockpiles. If necessary, damaged sheets will be disposed with each pile of non-hazardous material and fresh plastic sheeting will be used to cover new piles. Finally, a HDPE or PVC liner will be installed below each stockpile area. All sheeting and/or liners will be disposed at the end of the project as non-hazardous material.

7.5 Dust Suppression and Air Monitoring

Dust suppression and air monitoring will be an integral part of the project for the protection of site workers and the public. The dust suppression and air monitoring program will be implemented to eliminate the potential for impacted dust or any other potentially hazardous respirable materials to migrate during construction activities and to protect on-site workers. Dust emissions will be controlled by misting work areas with water. During application of the water, attempts will be made to keep the work areas damp while limiting runoff resulting from the misting.

In addition to the dust suppression activities listed above, the existing Community Air Monitoring Plan (CAMP) will be implemented during all intrusive site activities. The CAMP requires real-time monitoring of VOCs and dust (PM-10) during all intrusive activities and periodic monitoring of VOCs during non-intrusive activities. Real-time monitoring will be provided to establish baseline values each day prior to initiating construction activities each day and an appropriate number of monitoring stations will be emplaced down wind of all intrusive construction activities each day. The wind direction will be periodically monitored throughout the day and adjustments will be made to monitoring locations, as necessary. A copy of the existing CAMP, which includes detailed procedures for the air monitoring program, has been provided as Attachment A-2 of Appendix A of the existing Quality Assurance Project Plan (QAPP [ARCADIS 2006]) for the Site.

8. Operation, Maintenance, and Monitoring

The system OM&M phase will begin immediately following system construction and the system startup/shakedown period. The goals of system OM&M will be to (NYSDEC 2002):

- Operate and maintain the soil gas IRM in accordance with equipment manufacturer recommendations and the site-specific OM&M Manual.
- Inspect and evaluate system data periodically to confirm that the system continues to be effective for protection of human health and the environment.
- Monitor and report performance of the soil gas IRM by:

   - Assessing compliance with the air permit equivalent limits.
   - Assessing achievement of the soil gas IRM design criteria referenced herein; and,
   - Sampling and analysis of appropriate media.

- Inspect and evaluate site-wide data periodically to determine when operation of the soil gas IRM is no longer required for protection of human health and the environment.

A formal OM&M Manual will be provided to the NYSDEC within 60 days of beginning full-time system operation. This will allow sufficient system operational time to develop site-specific OM&M requirements and protocols based on the results of the system startup/shakedown period. Furthermore, this will allow sufficient time to receive and organize equipment cut sheets from the individual manufacturers.

A preliminary Sampling and Analysis Plan (SAP) has been provided herein as Appendix C to describe the system startup/shakedown methodology and present a preliminary long-term SAP. The final long-term SAP, which will incorporate the long-term sampling methodology, will be updated following the system startup/shakedown period and will be included as an appendix to the OM&M Manual.

9. Permitting

The proposed facility is exempt from air registration requirements pursuant to 6 NYCRR Part 201-3.3(c)(29). Nonetheless, a completed NYSDEC Minor Facility Air Registration form is included as Appendix D. Relevant air discharge calculations are provided in Tables B-11 through B-13. A copy of the formal request for the discharge of condensate to the Town of Oyster Bay POTW is also included in Appendix D. The Town of Oyster Bay approval letter will be provided to the NYSDEC for their records upon receipt.

Additionally, all required building and construction permits will be obtained through the Town of Oyster Bay building division and other applicable town divisions.

10. Security

To reduce the risk of vandalism following construction the following permanent security measures are specified in the building/site design:

- All depressurization and monitoring wells will be encased in lockable below grade well vaults.
- The treatment building site perimeter is surrounded by an existing 6-foot high chain link fence with locking gates.
- Each treatment building will be secured with lockable double doors; and,
- Exterior security lights will be installed on each treatment building. Each light will be equipped with a photocell.

If vandalism were to occur which affected operation of the system, the proposed alarm and interlock system would most likely be triggered and result in callout of the autodialer. In addition, periodic inspections will be completed as part of system OM&M. The periodic inspections will include a visual examination for signs of vandalism on all above grade structures.

11. References

ARCADIS G&M, Inc. 2006. Remedial Investigation/Feasibility Work Plan, Former Grumman Settling Ponds (Operable Unit 3), Bethpage Community Park, Bethpage, New York. March 8, 2006.

ARCADIS of New York, Inc. 2007. Operable Unit 3 – Soil Gas Interim Remedial Measure Work Plan, Former Grumman Settling Ponds, Bethpage, New York, Site #1-30-003A February 16, 2007.

ARCADIS of New York, Inc. 2007. 50 to 75% Design Report, Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York, Site #1-30-003A August 2, 2007.

Dvirka & Bartilucci Consulting Engineers (D&B) 2003. Field Report - Town of Oyster Bay, Bethpage Community Park, Investigation Sampling Report, December 2003

New York State Department of Environmental Conservation (NYSDEC), 2002, Draft DER-10 Technical Guidance for Site Investigation and Remediation, December 2002.

New York State Department of Environmental Conservation (NYSDEC) Letter to Northrop Grumman, RE: Former Settling Ponds, NYSDEC Nassau County Site No. 1-30-003A (Bethpage Community Park) dated, December 22, 2006.

New York State Department of Environmental Conservation (NYSDEC), 2005a, Order on Consent Index #WI-0018-04-01, Site # 1-30-003A, July 4, 2005.

New York State Department of Environmental Conservation, Division of Air Resources-1 (DAR-1) Guidelines for the Control of Toxic Ambient Air Contaminants dated 1991 and the AGC/SGC Tables dated December 22, 2003.

U.S. Environmental Protection Agency (USEPA), *Soil Vapor Extraction SVE Chapter II*, http://www.epa.gov, October 1994.

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Table 1. Summary of Existing and Proposed Depressurization and Vapor Monitoring Well Cluster Construction Details, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Well Designation	Well Purpose	Nominal Well Diameter (inches)	Screened Interval (feet bls)		
Western Access Road					
Depressurization Wells					
DW-3S	Depressurization	4	10	to	30
DW-3D	Depressurization	4	26	to	46
DW-7S[(1)]	**Depressurization**	**4**	**10**	**to**	**30**
DW-7D[(1)]	**Depressurization**	**4**	**30**	**to**	**40**
Vacuum Monitoring Wells					
VMWC-9A	Vacuum Monitoring	0.75	6.3	to	7.3
VMWC-9B	Vacuum Monitoring	0.75	19.3	to	20.3
VMWC-10B	Vacuum Monitoring	0.75	18.8	to	19.8
VMWC-10D	Vacuum Monitoring	0.75	39	to	40
VMWC-11B	Vacuum Monitoring	0.75	19.2	to	20.2
VMWC-11D	Vacuum Monitoring	0.75	39.3	to	40.3
VMWC-12D	Vacuum Monitoring	0.75	39.2	to	40.2
VMWC-14A[(1)]	**Vacuum Monitoring**	**0.75**	**6**	**to**	**7**
VMWC-14B[(1)]	**Vacuum Monitoring**	**0.75**	**18**	**to**	**19**
VMWC-14D[(1)]	**Vacuum Monitoring**	**0.75**	**38**	**to**	**39**
Southern Access Road					
Depressurization Wells					
DW-1S	Depressurization	4	15	to	30
DW-1D	Depressurization	4	42	to	47
DW-2S	Depressurization	4	10	to	17
DW-2D	Depressurization	4	27	to	47
DW-4S[(1)]	**Depressurization**	**4**	**15**	**to**	**30**
DW-4D	Depressurization	4	27	to	47
DW-5S[(1)]	**Depressurization**	**4**	**15**	**to**	**30**
DW-5D[(1)]	**Depressurization**	**4**	**42**	**to**	**47**
DW-6S[(1)]	**Depressurization**	**4**	**15**	**to**	**30**
DW-6D[(1)]	**Depressurization**	**4**	**42**	**to**	**47**
DW-8S[(1)]	**Depressurization**	**4**	**10**	**to**	**17**
DW-9S[(1)]	**Depressurization**	**4**	**10**	**to**	**17**
DW-10S[(1)]	**Depressurization**	**4**	**10**	**to**	**17**
DW-11S[(1)]	**Depressurization**	**4**	**10**	**to**	**17**

Note and abbreviations on last page.

Table 1. Summary of Existing and Proposed Depressurization and Vapor Monitoring Well Cluster Construction Details, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Well Designation	Well Purpose	Nominal Well Diameter (inches)	Screened Interval (feet bls)		
Southern Access Road					
Vacuum Monitoring Wells					
VMWC-1A	Vacuum Monitoring	0.75	7.5	to	8.5
VMWC-1B	Vacuum Monitoring	0.75	12	to	13
VMWC-1C	Vacuum Monitoring	0.75	24.7	to	39.7
VMWC-1D	Vacuum Monitoring	0.75	44	to	54
VMWC-2A	Vacuum Monitoring	0.75	9	to	10
VMWC-2C	Vacuum Monitoring	0.75	21	to	22
VMWC-2D	Vacuum Monitoring	0.75	44	to	45
VMWC-3A	Vacuum Monitoring	0.75	7.5	to	8.5
VMWC-3B	Vacuum Monitoring	0.75	13	to	14
VMWC-3C	Vacuum Monitoring	0.75	22	to	23
VMWC-3D	Vacuum Monitoring	0.75	45	to	46
VMWC-4A	Vacuum Monitoring	0.75	6	to	7
VMWC-4B	Vacuum Monitoring	0.75	12	to	13
VMWC-4C	Vacuum Monitoring	0.75	21	to	22
VMWC-4D	Vacuum Monitoring	0.75	44	to	45
VMWC-5A	Vacuum Monitoring	0.75	7	to	8
VMWC-5B	Vacuum Monitoring	0.75	15.2	to	19.2
VMWC-5D	Vacuum Monitoring	0.75	40	to	50
VMWC-6A	Vacuum Monitoring	0.75	8	to	9
VMWC-6B	Vacuum Monitoring	0.75	15	to	16
VMWC-6D	Vacuum Monitoring	0.75	39	to	40
VMWC-7A	Vacuum Monitoring	0.75	7	to	8
VMWC-7B	Vacuum Monitoring	0.75	14	to	15
VMWC-7D	Vacuum Monitoring	0.75	36	to	37
VMWC-8A	Vacuum Monitoring	0.75	7	to	8
VMWC-8B	Vacuum Monitoring	0.75	13	to	14
VMWC-8D	Vacuum Monitoring	0.75	35	to	36
VMWC-13D	Vacuum Monitoring	4	27	to	47
VMWC-15A(1)	**Vacuum Monitoring**	**0.75**	**7**	**to**	**8**
VMWC-15B(1)	**Vacuum Monitoring**	**0.75**	**13**	**to**	**14**
VMWC-15D(1)	**Vacuum Monitoring**	**0.75**	**45**	**to**	**46**
VMWC-16A(1)	**Vacuum Monitoring**	**0.75**	**7**	**to**	**8**
VMWC-16B(1)	**Vacuum Monitoring**	**0.75**	**13**	**to**	**14**
VMWC-16D(1)	**Vacuum Monitoring**	**0.75**	**45**	**to**	**46**
VMWC-17D(1)	**Vacuum Monitoring**	**4**	**32**	**to**	**47**
VMWC-18A(1)	**Vacuum Monitoring**	**0.75**	**7**	**to**	**8**
VMWC-18B(1)	**Vacuum Monitoring**	**0.75**	**13**	**to**	**14**

Note and abbreviations on last page.

Table 1. Summary of Existing and Proposed Depressurization and Vapor Monitoring Well Cluster Construction Details, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Note & Abbreviations:

1. Proposed location and depth, actual location and depth may vary based on field conditions.

bls	below land surface
DW	**proposed depressurization well**
DW	existing depressurization well
VMWC	**proposed vapor monitoring well cluster**
VMWC	existing Vapor monitoring well cluster

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Appendix A

Pneumatic Conductivity Test Results

Table A-1. Pneumatic Conductivity Test, Depressurization Well 1-Shallow Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	DW-1S Wellhead Vacuum	VCS Air Flow (6)	Wellhead Effluent PID	Knockout Tank Vacuum	Post Knockout Vacuum	Blower Influent Vacuum	Blower Influent Temperature	Blower Effluent Pressure	Blower Effluent Temperature	Carbon Influent Pressure	Carbon Effluent PID
		VI-1 (iwc)	Hand Held/FM-1 (fpm)/(scfm)	ASP-1 (ppm)	VI-2 (iwc)	(iwc)	VI-3 (iwc)	TI-1 (F)	PI-1 (iwc)	TI-2 (F)	(iwc)	ASP-2 (ppm)
Baseline[5]	8:30-12 PM	-0.0036										
Steady State[9]	12:37 PM	-4.040	2134/NM	NM		-22	-36	50	32	122	18	NM
1 hr	1:30 PM	-4.046	2733/~190	NM	-6	-22	-36	58	31	132	18	NM
2 hr	2:45 PM	-3.957	(7,8) /230	NM	-6	-22	-36	62	31	134	18	NM
3 hr	3:50 PM	-4.015	3025/230	NM	-6	-22	-36	60	30	130	17	NM
4 hr [3]	4:30 PM	-4.040	3153/230	0.0	-6	-22	-36	58	30	132	18	42.5
Special 4 Hr. - 100% Manifold -94 SCFM	*~5:10 PM*	*-2.415*	*2530/285*	*NM*	*-46*	*-54*	*-62*	*58*	*14*	*150*	*8*	*NM*
~5 hr / 75% Changed at 5:20 pm	5:50 PM	-2.750	2200-3100/171	NM	-2	-14	-20	58	38	120	20	NM
~6 hr / 50% Changed at 6:00 pm	6:30 PM	-2.482	2200-3000/171	NM	-1	-12	-16	54	40	120	20	NM
Special 7Hr. - 100% Manifold -94 SCFM	*7:10 PM*	*-2.464*	*1534/94*	*NM*	*-46*	*-54*	*-62*	*52*	*15*	*NM*	*8*	*NM*

Initials:	PAR	Date: 3/22/07	(+/-)[2]
Barometric Pressure (inHg)	2:12 PM	30.21	Steady / 76% RH
Ambient Temperature	12:05 PM	56.5 F	86% RH
Ambient Conditions	12:05 PM	Overcast, Cool	
Ambient Conditions	2:15 PM	Sunny, Breezy	
Ambient Conditions	6:30 PM	Overcast, Cool, Breezy Front rolling in	
Ambient Conditions	7:17 PM	Rain Start	

% Dilution Valve opened at start of test	**None**
Total Volume of water collected from knockout tank	**0 Gallons**

Notes on last page

Table A-1. Pneumatic Conductivity Test, Depressurization Well 1-Shallow Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (iwc) Vacuum Points											
		VMWC-1			VMWC-2			VMWC-3			VMWC-4		
		Radial Distance[1] 10 ft			Radial Distance[1] 25 ft			Radial Distance[1] 55 ft			Radial Distance[1] 35 ft		
		Depth A (7.5-8.5 ft bls)	Depth B (12.4-13.4 ft bls)	Depth C (24.7-39.7 ft bls)	Depth A (9-10 ft bls)		Depth C (21-22 ft bls)	Depth A (7.5-8.5 ft bls)	Depth B (13-14 ft bls)	Depth C (22-23 ft bls)	Depth A (6-7 ft bls)	Depth B (12-13 ft bls)	Depth C (21-22 ft bls)
Baseline[5]		+0.0321	+0.0200	+0.0319	+0.0366		+0.0382	+0.0187	+0.0194	+0.0233	+0.0071	+0.0261	+0.0264
Steady State	12:56 PM	-0.4633	-0.5270	-0.3935	-0.3193		-0.3288	-0.1722	-0.1749	-0.1692	-0.2570	-0.2803	-0.2891
1 hr	1:33 PM	-0.4782	-0.5108	-0.3988	-0.3206		-0.3245	-0.1622	-0.1762	-0.1807	-0.2486	-0.2773	-0.2589
2 hr	2:50 PM	-0.4824	-0.5084	-0.4238	-0.3197		-0.3242	-0.1735	-0.1881	-0.1889	-0.2590	-0.2950	-0.2887
3 hr	3:50 PM	-0.4730	-0.5209	-0.4108	-0.3119		-0.3220	-0.1749	-0.1868	-0.1763	-0.2511	-0.2818	-0.2726
4 hr [3]	4:35 PM	-0.4857	-0.5316	-0.4187	-0.3173		-0.3312	-0.1799	-0.1874	-0.1738	-0.2583	-0.2829	-0.2718
Special 4 Hr. - Manifold - 94 SCFM	*~5:10 PM*	*NM*	*NM*	*NM*	*NM*		*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
~5 hr / 75% Changed at 5:20 pm	5:50 PM	-0.3503	-0.3936	-0.3069	-0.2439		-0.2448	-0.1449	-0.1494	-0.1456	-0.1933	-0.2358	-0.2198
~6 hr / 50% Changed at 6:00 pm	6:30 PM	-0.3374	-0.3672	-0.2966	-0.2442		-0.2414	-0.1270	-0.1322	-0.1215	-0.1778	-0.2103	-0.2041
Special 7Hr. - 100% Manifold -94 SCFM	*7:10 PM*	*-0.3280*	*-0.3855*	*-0.2942*	*-0.2270*		*-0.2400*	*-0.1334*	*-0.1174*	*-0.1239*	*-0.1621*	*-0.1760*	*-0.1682*

Notes on last page

Table A-1. Pneumatic Conductivity Test, Depressurization Well 1-Shallow Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (iwc) Vacuum Points – Monitoring Wells (if applicable)			Water Level Measurements – Monitoring Wells (if applicable)			Comments
		I-97-PZ Stick-up Screened (35-45)	MW - __	MW - __	DW-1S Screened (15-30) DTW	VMWC-3C DTW	MW - __ DTW	
		(ft bmp)	(ft bmp)	(ft bmp)	(ft bls)	(ft bls)	(ft bmp)	
Baseline[5]		+0.0308			DRY	53.7		
Steady State	1:09 PM	-0.0615				NM		
1 hr	1:50 PM	-0.0341				NM		2:15PM weather changed, sunny, breezy
2 hr	3:15 PM	-0.0622				NM		Sun shining bright now with light breeze
3 hr	4:00 PM	-0.0625				NM		
4 hr [3]	5:06 PM	-0.0883				NM		
Special 4 Hr. - Manifold -94 SCFM	*~5:10 PM*	*NM*				*NM*		
~5 hr / 75% Changed at 5:20 pm	5:59 PM	-0.0583				NM		Flow changed at 5:20PM readings taken at 5:50PM.
~6 hr / 50% Changed at 6:00 pm	6:49 PM	-0.0651				NM		Weather changed Overcast, Cold, Breezy ,Front rolling in Flow changed at 6:00PM readings taken at 6:30PM.
Special 7Hr. - 100% Manifold -94 SCFM	*7:29 PM*	*-0.0382*				*NM*		6:55PM add manifold and increased flow back to 100%, readings taken at 7:10PM rain starts at 7:17PM

Table A-1. Pneumatic Conductivity Test, Depressurization Well 1-Shallow Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Notes & Abbreviations:

1. Radial Distances for VMWCs 1-4 are measured from DW-1S.
2. + indicates increasing, - indicates decreasing
3. Air sample was collected in 6-liter suma canister and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis; 24 Hr. TAT requested. Pre-carbon sample was collected at test hour 4.
4. Water was not generated during this event therefore, water sample was not collected or submitted for analysis.
5. Initial measurement after start-up for wellhead vacuum.
6. Velocity measured at 4"D PVC pipe with thermal anemometer. Rotron Flowmeter supplied by system vendor did not function properly.
7. Anemometer readings at 2:45pm: 2440, 3059, 2285, 2939, 2949, 2968, 2984.
8. Anemometer readings at 3:18pm: 3075 &3018
9. Test started at 12:31PM readings stabilized 6 mins later.

DTW	depth to water
DW	Depressurization Well
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
SCFM	standard cubic feet per minute
TOC	top of casing
VCS	vapor control system
VMWC	vacuum monitoring well cluster

Table A-2. Pneumatic Conductivity Test, Depressurization Well 1-Deep Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	DW-1D Wellhead Vacuum	VCS Air Flow	Wellhead Effluent PID	Knockout Tank Vacuum	Post Knockout Vacuum	Blower Influent Vacuum	Blower Influent Temperature	Blower Effluent Pressure	Blower Effluent Temperature	Carbon Influent Pressure	Carbon Effluent PID
		VI-1 (iwc)	Hand Held/FM-1 (fpm)/(scfm)	ASP-1 (ppm)	VI-2 (iwc)	(iwc)	VI-3 (iwc)	TI-1 (F)	PI-1 (iwc)	TI-2 (F)	(iwc)	ASP-2 (ppm)
Baseline[5]		0.0013										
Steady State[8]	1:50 PM	-40.86	1441/NM	NM		-50	-60	50	20	144	8	NM
1 hr[6]	2:50 PM	-41.89	1431/NM	NM	-42	-52	-61	52	18	146	8	NM
2 hr	3:50 PM	-42.75	NM	NM	-42	-52	-61	54	18	154	8	NM
2 Hr Additional Points	3:50 PM	Same as above	Same as above	Same as above	Same as above	-52	Same as above	Same as above	Same as above	Same as above	8	Same as above
3 hr[3]	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
4 hr	5:55 PM	-42.74	NM	NM	-42	-52	-60	52	18	154	8	NM
Special - 100% with Manifold - 80 scfm [7]	*6:29 PM*	*-33.57*	*NM/80*	*NM*	*-61*	*-68*	*-72*	52	*10*	172	*4*	*NM*
5 hr / 75% Changed at 6:40 PM with Manifold - 54 scfm [7]	6:50 PM	-24.01	NM/54	NM	-39	-44	-48	52	24	140	12	NM
~6 hr / 50% Changed at 7:05 PM with Manifold - 49 scfm [7]	7:15 PM	-21.35	NM/49	NM	*-30*	-39	-40	52	28	132	*16*	NM

Initials:	PAR	Date: 3/23/07	(+/-)[2]
Barometric Pressure (inHg)	3:30 PM	30.17	-
Ambient Temperature (F)	1:53 PM	52.00	69% RH
Ambient Conditions	AM	Overcast, Still , Humid and Wet	
Ambient Conditions	1:45 PM	Raining	
Ambient Conditions	5:55 PM	Rain Ends	

% Dilution Valve opened at start of test	**None**
Total Volume of water collected from knockout tank	**0 Gallons**

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Table A-2. Pneumatic Conductivity Test, Depressurization Well 1-Deep Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (iwc)			
		Vacuum Points			
		VMWC-1	VMWC-2	VMWC-3	VMWC-4
		Radial Distance[1] 13 ft	Radial Distance[1] 28 ft	Radial Distance[1] 58 ft	Radial Distance[1] ~35 ft
		Depth D	Depth D	Depth D	Depth D
		(44-54 ft bls)	(44-45 ft bls)	(45-46 ft bls)	(44-45 ft bls)
Baseline[5]		-0.0115	+0.0135	-0.0288	-0.0628
Steady State[6]	1:50 PM	-4.678	-2.955	-1.593	-2.006
1 hr	2:50 PM	NM	NM	NM	NM
2 hr	3:50 PM	-4.386	-2.771	-1.475	-1.819
2 Hr Additional Points	3:50 PM	A / B / C -0.1244 / -0.1292 / -0.2029	A / X / C -0.1110 / X / -0.1209	A / B / C -0.0830 / -0.0839 / -0.0917	A / B / C -0.0956 / -1.096 / -0.1219
3 hr[3]	NM	NM	NM	NM	NM
4 hr	5:55 PM	-4.340	-2.694	-1.453	-1.754
Special - 100% with Manifold - 80 scfm	6:29 PM	-3.231	-2.096	-1.222	-1.428
5 hr / 75% Changed at 6:40 PM with Manifold - 54 scfm	7:02 PM	-2.327	-1.522	-0.8575	-1.031
~6 hr / 50% Changed at 7:05 PM with Manifold - 49 scfm	7:15 PM	-2.104	-1.368	-0.7999	-0.9273

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Table A-2. Pneumatic Conductivity Test, Depressurization Well 1-Deep Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (iwc) VAC Points			Water Level Measurements			Comments
		Monitoring Wells (if applicable)			Monitoring Wells (if applicable)			
		BCP-MW-4-1 Screened (45-65)	MW - ___	MW - ___	DW-1D Screened (42-47)	VMWC-1D Screened (44-54)	BCP-MW-4-1 Stick-up Screened (45-65)	
					DTW	DTW	DTW	
		(iwc)	(ft bmp)	(ft bmp)	(ft bmp)	(ft bls)	(ft bmp)	
Baseline[5]		-0.0695			Dry	53.6	56.6	Pull dedicated tubing from Well BCP-MW-4-1, and get shim to align well casing to get cap on for induced vacuum readings.
Steady State[6]	2:09 PM	-1.196				53.16	56.63	Weather Changed -1:45 PM Rain Start--
1 hr	2:50 PM	NM				NM	NM	Anemometer malfunction due to rain conditions -
2 hr	3:50 PM	-1.086				53.31	53.51	Data adjusted from 53.36 and 53.56 (JCs water level measurements are +0.05 from actual)
2 Hr Additional Points	3:50 PM	Same as above				Same as above	Same as above	
3 hr[3]	4:50 PM	NM				NM	NM	DW-1D and Carbon Effluent Air Samples taken.
4 hr	5:50 PM	-0.9032				NM	NM	Weather changed - Stopped Raining
Special - 100% with Manifold - 80 scfm	6:29 PM	*-0.7894*				53.33	56.62	
5 hr / 75% Changed at 6:40 PM with Manifold - 54 scfm	6:50 PM	-0.6211				53.42	56.61	Changed Flow at 6:40 PM readings taken at 6:50 PM.
~6 hr / 50% Changed at 7:05 PM with Manifold - 49 scfm	7:15 PM	-0.5486				53.42	56.65	Changed Flow at 7:05 PM readings taken at 7:15 PM.

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Table A-2. Pneumatic Conductivity Test, Depressurization Well 1-Deep Field Monitoring Parameters,
Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Notes & Abbreviations:

1. Radial Distances for VMWCs 1-4 are measured from DW-1D.
2. + indicates increasing, - indicates decreasing
3. Air samples were collected in 6-liter suma canister and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis; 24 Hr. TAT requested.
   Pre-carbon sample was collected at 5:15 pm and post carbon effluent sample, for the entire PCT Test, was collected at 5:55 pm.
4. Water was not generated during this event therefore, water sample was not collected or submitted for analysis.
5. Initial measurement after start-up for wellhead vacuum.
6. Velocity measured at 4"D well pipe with thermal anemometer, skid mounted Rotron flow meter malfunctioned.
7. Hand held anemometer malfunctioned due to rain conditions after 1 Hr readings taken. Installed manifold with Dwyer flow meter and used in-line for 6:29pm - 7:15pm parameter readings.
8. Test started at 1:45 PM readings stabilized 6 mins later.

DTW	depth to water
DW	Depressurization Well
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
SCFM	standard cubic feet per minute
TOC	top of casing
VCS	vapor control system
VMWC	vacuum monitoring well cluster

Table A-3. Pneumatic Conductivity Test, Depressurization Well 2-Shallow Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	DW-2S Wellhead Vacuum (8)	VCS Air Flow (9)	Wellhead Effluent PID	Knockout Tank Vacuum	Post Knockout Vacuum	Blower Influent Vacuum	Blower Influent Temperature	Blower Effluent Pressure	Blower Effluent Temperature	Carbon Influent Pressure	Carbon Effluent PID
		VI-1 (iwc)	Hand Held/FM-1 (fpm)/(scfm)	ASP-1 (ppm)	VI-2 (iwc)	(iwc)	VI-3 (iwc)	TI-1 (F)	PI-1 (iwc)	TI-2 (F)	(iwc)	ASP-2 (ppm)
Baseline(5)	~2:00 PM	-0.0058										
Steady State(10)	2:26 PM	-8.832	2461/304	7.8 & 0.0 (6)		NM	-39	62	31	120	NM	9-11 (6)
1 hr	3:41 PM	-8.79	2172/305	0.00-1.1	-10	NM	-39	49	30	124	NM	(7)
2 hr	4:35 PM	-8.86	2117/NM	0.1	-10	NM	-39	49	30	124	18	19.2
3 hr	5:35 PM	-8.854	2110/305	NM	-10	NM	-39	48	30	121	19.2	NM
4 hr (3)	6:25 PM	-8.867	1703/NM	NM	-10	NM	-39	42	30	120	18	NM
5 hr / 75% Changed at 7:00 PM	7:30 PM	-6.071	1232/NM	NM	-5	NM	-22	40	39	108	NM	NM
6 hr / 50% Changed at 7:40PM	8:11 PM	-5.504	1144/NM	NM	-4	NM	-19	40	40	107	NM	NM

Initials:	PAR	Date: 3/20/07	(+/-)(2)
Barometric Pressure (inHg)		30.39	(+) @ ~4PM
Ambient Temperature		48 F	--
Ambient Conditions		Dry & Cold	--

% Dilution Valve opened at start of test	**None**
Total Volume of water collected from knockout tank	**0 Gallons**

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Table A-3. Pneumatic Conductivity Test, Depressurization Well 2-Shallow Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (iwc) Vacuum Points											
		VMWC-5 Radial Distance[1] 10 ft			VMWC-6 Radial Distance[1] 25 ft			VMWC-7 Radial Distance[1] 50 ft			VMWC-8 Radial Distance[1] 35 ft		
		Depth A (7-8 ft bls)	Depth B (15.2-19.2 ft bls)	Depth D (40-50 ft bls)	Depth A (8-9 ft bls)	Depth B (15-16 ft bls)	Depth D (39-40 ft bls)	Depth A (7-8 ft bls)	Depth B (14-15 ft bls)	Depth D (36-37 ft bls)	Depth A (7-8 ft bls)	Depth B (13-14 ft bls)	Depth D (35-36 ft bls)
Baseline[5]	~2:00 PM	-0.014	-0.0200	-0.143	-0.0167	-0.0181	-0.1460	-0.8898	-0.0102	-0.2009	-0.0223	-0.0207	-0.1572
Steady State[11]	2:26 PM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
1 hr	3:41 PM	-1.795	-1.912	-0.1207	-0.9466	-1.016	-0.1880	-0.3974	-0.4273	-0.1657	-0.8067	-0.8522	-0.1472
2 hr	4:35 AM	-1.807	-1.927	-0.1118	-0.9658	-1.018	-0.1702	-0.4177	-0.4319	-0.1953	-0.8130	-0.8467	-0.1532
3 hr	5:35 AM	-1.808	-1.938	-0.129	-0.9799	-1.025	-0.1660	-0.3936	-0.4367	-0.1637	-0.8077	-0.8540	-0.1312
4 hr [3]	6:25 PM	-1.821	-1.937	-0.1151	-0.9747	-1.028	-0.1374	-0.4040	-0.4441	-0.1496	-0.8194	-0.8684	-0.2099
5 hr / 75% Changed at 7:00 PM	7:30 PM	-1.297	-1.388	0.1991	-0.7075	-0.7345	-0.2160	-0.3039	-0.3061	-0.2370	-0.5784	-0.627	-0.1851
6 hr / 50% Changed at 7:40PM	8:11 PM	-1.197	-1.282	-0.2795	-0.6465	-0.6684	-0.2796	-0.2643	-0.2882	-0.2567	-0.5357	-0.5634	-0.2075

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Table A-3. Pneumatic Conductivity Test, Depressurization Well 2-Shallow Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (iwc) Vacuum Points			Water Level Measurements			Comments
		Monitoring Wells (if applicable)			Monitoring Wells (if applicable)			
		MW - __	MW - __	MW - __	DW-2S Screen (10-17)	VMWC-5B Screened (15.2-19.2)	MW -__	
					DTW	DTW	DTW	
		(ft bmp)	(ft bmp)	(ft bmp)	(ft bmp)	(ft bmp)	(ft bmp)	
Baseline[5]	2:15 PM				Dry	Dry		Wells Dry yesterday also, DTW on 5D yesterday was 49.24 ft bls.
Steady State[11]	2:26 PM					NM		Stack reading 68% RH and 71F 3:08 PM Carbon Effluent 64% RH 81.8F
1 hr	3:41 PM					NM		EFF PID Readings 17, 18, 25, 35, 39, 28; EFF PID Readings 6, 1.9, 0.1, 0.7, 0.1, 0.2, 0.0 EFF PID Readings 19, 32, 79, 119, 131, 153--
2 hr	4:35 AM					NM		
3 hr	5:35 AM					NM		5:48 PM Carbon Eff RH 22.8% and 96.2 F
4 hr [3]	6:25 PM					NM		
5 hr / 75% Changed at 7:00 PM	7:30 PM					NM		7 PM changed flow to 75% of Original
6 hr / 50% Changed at 7:40PM	8:11 PM					NM		7:40 PM changed flow to 50% of Original

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Table A-3. Pneumatic Conductivity Test, Depressurization Well 2-Shallow Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Notes & Abbreviations:

1. Radial Distances for VMWCs 5-8 are measured from DW-2S.
2. + indicates increasing, - indicates decreasing
3. Air sample was collected in 6-liter suma canister and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis; 24 Hr. TAT requested. Pre-carbon sample was collected at test hour 4.
4. Water was not generated during this event therefore, water sample was not collected or submitted for analysis.
5. Initial measurement after start-up for wellhead vacuum.
6. PID readings taken with 2 separate Minirae 2000 units and no correlation was observed. Unit # 3881 INF 7.8 Eff 83-85 Calibration gas check 116-118 ppm. Unit # 8708 INF 0.0ppm; EFF 7.1ppm; calibration gas check 91ppm. One PID unit was recalibrated, sample bags were left in field vehicle with the PID to normalize to stable temperature. Screened samples 30 mins later- results not stable (see note 7). Samples collected again and results varied largely, moisture determined to be one of the problems and meters not holding calibration, new minirae meters (11.7) ordered from another vendor.
7. Measurement varied from 0-153 moisture problem from effluent of carbon RH >60%
8. Wellhead temperature 46.2-46.4F with thermal anemometer; RH approx. 87% at 1 time during sampling. When probe from anemometer removed at end of day there was moisture beading on the probe.
9. Velocity measured at 4"D well pipe with thermal anemometer (see note 8), skid mounted Rotron flow meter malfunctioned.
10. Test started at 2:24 PM readings stabilized 2 mins later.

DTW	depth to water
DW	Depressurization Well
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
SCFM	standard cubic feet per minute
TOC	top of casing
VCS	vapor control system
VMWC	vacuum monitoring well cluster

Table A-4. Pneumatic Conductivity Test, Depressurization Well 2-Deep Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	DW-2D Wellhead Vacuum	VCS Air Flow	DW-2D Wellhead Temperature	Wellhead Effluent PID	Knockout Tank Vacuum	Post Knockout Vacuum	Blower Influent Vacuum	Blower Influent Temperature	Blower Effluent Pressure	Blower Effluent Temperature	Carbon Influent Pressure Approximate	Carbon Effluent PID
		VI-1 (iwc)	Hand Held/FM-1 (fpm)/(scfm)	(F)	ASP-1 (ppm)	VI-2 (iwc)	(iwc)	VI-3 (iwc)	TI-1 (F)	PI-1 (iwc)	TI-2 (F)	(iwc)	ASP-2 (ppm)
Baseline(5)	10:10 AM	-8.090		38.1									
Steady State (12)	10:55 AM	-11.13	2390/314	NM	NM	-12	-28	-40	52	30	138	18	NM
1 hr	12:18 PM	-11.06	2390/NM	NM	NM	-12	-30	-41	52	30	134	18	NM
2 hr	1:23 PM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
3 hr	1:57 PM	-11.12	2527/NM	56.3	NM	-12	-28	-41	50	30	132	18	NM
4 hr (3)	~3:00 PM	-11.08	2437/NM	55.4	0.0	-12	-29	-40	46	30	130	18	16.4
5 hr / 75% Changed at 4:12 PM	4:55 PM	-7.846	1754/285	54.8	NM	-7	-19	-24	44	38	NM	18-30	NM
6 hr / 50% Changed at 5:24 PM	~5:50 PM	-7.191	1564/265	55.7	NM	-6	-16	-22	42	40	110	20-32	NM

Initials:	PAR	Date: 03/21/07	(+/-)(2)
Barometric Pressure (inHg)		30.79 & 33% RH	(-) @ 9:22 am
Ambient Temperature		41.4 F	25.4% RH @ 11:58 am
Ambient Conditions		Cold, Sunny, Slight Breeze	

% Dilution Valve opened at start of test	**None**
Total Volume of water collected from knockout tank	**1 Quart**

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Table A-4. Pneumatic Conductivity Test, Depressurization Well 2-Deep Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (iwc)					
		Vacuum Points					
		VMWC-5	VMWC-5	VMWC-5	VMWC-6	VMWC-6	VMWC-6
		Radial Distance[1] 13 ft	Radial Distance[1] 13 ft	Radial Distance[1] 13 ft	Radial Distance[1] 28 ft	Radial Distance[1] 28 ft	Radial Distance[1] 28 ft
		Depth A	Depth B	Depth D	Depth A	Depth B	Depth D
		(7-8 ft bls)	(15.2-19.2 ft bls)	(40-50 ft bls)	(8-9 ft bls)	(15-16 ft bls)	(39-40 ft bls)
Baseline[5]	8:50 AM	+0.0681	+0.0263	0.0061	-0.0188	-0.002	+0.0501
Steady State [12]	10:55 AM	-0.0065	0.0041	-3.498	-0.0079	-0.0074	-2.864
1 hr	12:18 PM	-0.0151 [9]	-0.0257	-3.477	-0.0095	-0.0105	-2.855
2 hr	1:23 PM	NM	NM	NM	NM	NM	NM
3 hr	1:57 PM	-0.0155	-0.0115 [6]	-3.406	-0.0147	+0.0023	-2.755
4 hr [3]	~3:20 PM	-0.0199	-0.0145	-3.392	-0.0105	+0.0015	-2.788
5 hr / 75% Changed at 4:12 PM	4:55 PM	-0.0162	-0.0008	-2.469	+0.0012	-0.0027	-2.009
6 hr / 50% Changed at 5:24 PM	~5:50 PM	-0.0084	-0.0112	-2.347	-0.0204	-0.0124	-1.928

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Table A-4. Pneumatic Conductivity Test, Depressurization Well 2-Deep Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (Iwc)					
		Vacuum Points					
		VMWC-7	VMWC-7	VMWC-7	VMWC-8	VMWC-8	VMWC-8
		Radial Distance(1) 53 ft	Radial Distance(1) 53 ft	Radial Distance(1) 53 ft	Radial Distance(1) ~35 ft	Radial Distance(1) ~35 ft	Radial Distance(1) ~35 ft
		Depth A	Depth B	Depth D	Depth A	Depth B	Depth D
		(7-8 ft bls)	(14-15 ft bls)	(36-37 ft bls)	(7-8 ft bls)	(13-14 ft bls)	(35-36 ft bls)
Baseline(5)	9:26 AM	-0.0124	+0.0002 (8)	-0.0319	+0.0089	+0.0117	+0.0071
Steady State (12)	10:55 AM	-0.0164	-0.0187	-2.193	-0.0273	-0.0148	-2.613
1 hr	12:18 PM	-0.006	-0.0006 (7)	-2.163	-0.020	-0.0181	-2.600
2 hr	1:23 PM	NM	NM	NM	NM	NM	NM
3 hr	1:57 PM	-0.0013	-0.0019	-2.063	-0.0116	-0.0119	-2.475
4 hr (3)	~3:35 PM	-0.0120	-0.0184	-2.08	-0.0004	-0.0019	-2.556
5 hr / 75% Changed at 4:12 PM	4:55 PM	-0.0039	-0.0238	-1.498	-0.0099	-0.0101	-1.845
6 hr / 50% Changed at 5:24 PM	~5:50 PM	-0.0016	-0.012	-1.432	-0.0143	-0.0072	-1.783

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Table A-4. Pneumatic Conductivity Test, Depressurization Well 2-Deep Field Monitoring Parameters,
Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (iwc) Vacuum Points Monitoring Wells (if applicable)			Water Level Measurements Monitoring Wells (if applicable)			Comments
		MW -__	MW -__	MW -__	DW-2D Screen (27-47) DTW	VMWC5-D Screen (40-50) DTW	MW -__ DTW	
		(ft bmp)	(ft bmp)	(ft bmp)	(ft bls)	(ft bls)	(ft bls)	
Baseline	8:50 AM				Dry	NM		9:15 am calls from GWTT to troubleshoot skid system FM - run system start close influent valve Note: FM SCFM actually increased. 10:02 AM reading at DW-2D +0.0239 prior to start-up.
Steady State (12)	12:11 PM				Dry	49.9		
1 hr	12:18 PM					NM		
2 hr	1:23 PM					NM		Unable to take readings phone calls to office discussion of readings/vendor calls regarding FM. Jen Gasho 610-692-5650.
3 hr	1:57 PM					NM		Moisture Build-up on well head anemometer
4 hr (3)	~3:56 PM					NM		Vacuum Gauge for air sample was borrowed from IRM work - location SGP 11A 7.5-8 ft @ 1450.
5 hr / 75% Changed at 4:12 PM	4:55 PM					Dry		Carbon influent pressure indicator needle bouncing vigorously during reading.
6 hr / 50% Changed at 5:24 PM	~5:50 PM					NM		Carbon influent pressure indicator needle bouncing vigorously during reading. Barb on Effluent of well left open from 5 Hr reading until before VMWC-8 (last) readings.

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Table A-4. Pneumatic Conductivity Test, Depressurization Well 2-Deep Field Monitoring Parameters,
Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Notes & Abbreviations:

1. Radial Distances for VMWCs 5-8 are measured from DW-2D.
2. + indicates increasing, - indicates decreasing
3. Air sample was collected in 6-liter suma canister and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis; 24 Hr. TAT requested. Pre-carbon sample was collected at test hour 4.
4. One water sample was collected from the moisture separator at the end of the test and was submitted (on 3/26) to Columbia Analytical Labs, Rochester, New York for VOC Analysis (ASP 2000) TO-15 analysis; 2 week TAT requested.
5. Initial measurement after start-up for wellhead vacuum.
6. Barb found loose on 5B during this reading
7. Readings varied +0.0010, -0.0153, +0.0034, -0.0081, 0.0146
8. Reading varying from - to +.
9. Readings varied -0.0152, -0.0174, -0.0147, -0.0203, -0.0230
10. Vacuum Gauge for air sample was borrowed from IRM work - location SGP 11A 7.5-8 ft @ 1450.
11. Carbon effluent end of day (5:38 PM) 91.8F and 21.0% RH.
12. Test started at 10:10 AM readings stabilized approximately 42 mins later.

DTW	depth to water
DW	Depressurization Well
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
SCFM	standard cubic feet per minute
TOC	top of casing
VCS	vapor control system
VMWC	vacuum monitoring well cluster

Table A-5. Pneumatic Conductivity Test, Depressurization Well 3-Shallow Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	DW-3S Wellhead Vacuum	DW-3S Wellhead Temperature	Wellhead Effluent PID	VCS Air Flow (10)	Post Knockout Vacuum	Blower Influent Vacuum	Blower Influent Temperature	Blower Effluent Pressure	Blower Effluent Temperature	Carbon Influent Pressure	Carbon Effluent Temperature	Carbon Effluent PID
		VI-1 (iwc)	Hand Held (F)	ASP-1 (ppm)	Manifold (scfm)	(iwc)	VI-3 (iwc)	TI-1 (F)	PI-1 (iwc)	TI-2 (F)	(iwc)	(F)	ASP-2 (ppm)
Baseline(5)	12:15 PM	-0.0109	72.5										
Steady State(11)	2:20 PM	-2.003	64.4	NM(6)	105	--	-61	NM	10	130	10	70	NM(6)
30 min	3:05 PM	-1.989	64.1	0.0	104	--	-60	70	10	146	10	90	3.1
1 hr	3:42 PM	-1.982	64.3	NM	104	--	-60	NM	10	NM	10	100	NM
2 hr	4:20 PM	-1.962	64.1	7.2	104	--	-60	70	10	148	10	100	0.7
3 hr(3)	5:35 PM	-2.012	63.9	9.2	104	--	-60	70	10	142	10	96	0.0
4 hr	6:54 PM	-2.065	63.7	11.1	104	--	-60.5	NM	10	140	10	90	4.2
5 hr / 75% Changed at 7:30 PM	8:00 PM	-1.490	63.5	NM(7)	77	--	-40	60	18	~ 120(8)	18	~ 88	3.0
6 hr / 50% Changed at 8:24PM	9:00 PM	-1.405	63.5	NM(7)	73	--	-36	55	20	NM(8)	20	80	NM

Initials:	PAR	Date: 6/13/07	(+/-)(2)
Barometric Pressure (inHg)			
Ambient Temperature (F)		71.6°F	RH = 90.5% @ 12:50 PM
Ambient Conditions		Overcast, cloudy; rain in AM	

% Dilution Valve opened at start of test	None
Total Volume of water collected from knockout tank(4)	0 Gallons

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Table A-5. Pneumatic Conductivity Test, Depressurization Well 3-Shallow Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (iwc)											
		Vacuum Points											
		VMWC-9			VMWC-10			VMWC-11			VMWC-12		
		Radial Distance[1]			Radial Distance[1]			Radial Distance[1]			Radial Distance[1]		
		(30.2 ft)	(34 ft)	N/A	N/A	(55.3 ft)	(58 ft)	N/A	(80.8 ft)	(83.9 ft)	N/A	N/A	(107.3 ft)
		Depth A	Depth B	Depth D	Depth A	Depth B	Depth D	Depth A	Depth B	Depth D	Depth A	Depth B	Depth D
		(6.3-7.3 ft bls)	(19.3-20.3 ft bls)	N/A	N/A	(18.8-19.8 ft bls)	(39-40 ft bls)	N/A	(19.2-20.2 ft bls)	(39.3-40.3 ft bls)	N/A	N/A	(39.2-40.2 ft bls)
Baseline[5]	12:15 PM	-0.0018	0.0062			0.0032	0.0089		0.0047	NM			NM
Steady State[11]	2:20 PM	-0.3706	-0.3651			-0.2893	-0.2136		-0.1704	-0.1464			-0.0933
30 min	3:05 PM	-0.3499	-0.3688			-0.2330	-0.2021		-0.1470	-0.1269			-0.1062
1 hr	3:50 PM	-0.3581	-0.3660			-0.2506	-0.2209		-0.1725	-0.1614			-0.1076
2 hr	4:23 PM	-0.3491	-0.3424			-0.2374	-0.2158		-0.1726	-0.1599			-0.1162
3 hr [3]	5:35 PM	-0.3839	-0.3754			-0.2606	-0.2315		-0.1936	-0.1705			-0.1091
4 hr	7:04 PM	-0.3652	-0.3644			-0.2586	-0.2217		-0.1944	-0.1787			-0.1111
5 hr / 75% Changed at 7:30 PM	8:00 PM	-0.2664	-0.2649			-0.1951	-0.1745		-0.1818	-0.1389			-0.1268
6 hr / 50% Changed at 8:24PM	9:00 PM	-0.2873	-0.2862			-0.1893	-0.1891		-0.1588	-0.1567			-0.1002

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Table A-5. Pneumatic Conductivity Test, Depressurization Well 3-Shallow Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings	Water Level Measurements	Comments
		Monitoring Well	Monitoring Well	
		B24MW-3[5]	B24MW-3	
		Radial Distance[1] 182.4 ft	Radial Distance[1] 182.4 ft	
		Screened (55-70 ft bls)	Screened (55-70 ft bls)	
		(iwc)	DTW (ft bmp)	
Baseline[5]	12:15 PM	NM	53.36	Depth to water 53.92 ' below land surface.
Steady State[11]	2:20 PM	NM	NM	
30 min	3:05 PM	NM	NM	w/o Filter: 7.8
1 hr	3:50 PM	NM	NM	
2 hr	4:23 PM	NM	NM	Finished this round measurements 4:52pm.
3 hr[3]	5:35 PM	NM	NM	DW-3S air sample at 6:15pm.
4 hr	7:04 PM	0.0000[9]	NM	
5 hr / 75% Changed at 7:30 PM	8:00 PM	0.0000[9]	NM	Influent PID reading to dilution valve 1.3 ppm; Top of casing for well B24MW-3 cracked, seal may not be good.
6 hr / 50% Changed at 8:24PM	9:00 PM	NM	NM	

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Table A-5. Pneumatic Conductivity Test, Depressurization Well 3-Shallow Field Monitoring Parameters,
Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Notes & Abbreviations:

1. Radial Distances for VMWCs 9-11 and B24MW-3 are measured from DW-3S and taken from survey done by Nelson & Pope on July 25, 2007.
2. + indicates increasing, - indicates decreasing
3. Air sample was collected in 6-liter suma canister and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis; 24 Hr. TAT requested.
   Pre-carbon sample was collected at 6:15pm.
4. Water was not generated during this event therefore, water sample was not collected or submitted for analysis.
5. Initial measurement after start-up for wellhead vacuum.
6. Generator not working so vacuum pump could not be started. No PID measurements for steady state.
7. Vacuum pump not available, no further influent PID measurements taken.
8. Could not read gauge clearly due to moisture accumulation on glass.
9. Induced vacuum at well B24MW-3 not applicable to test - entire well screen submerged.
10. VCS Flow readings taken from manifold have been reduced by 9 SCFM due to technical error in field.
11. Test started at 2:15 PM readings stabilized 5 minutes later.

DTW	depth to water
DW	Depressurization Well
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
SCFM	standard cubic feet per minute
TOC	top of casing
VCS	vapor control system
VMWC	vacuum monitoring well cluster

Table A-6. Pneumatic Conductivity Test, Depressurization Well 3-Deep Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	DW-3D Wellhead Vacuum	DW-3D Wellhead Temperature	Wellhead Effluent PID	VCS Air Flow (8)	Post Knockout Tank Vacuum	Blower Influent Vacuum	Blower Influent Temperature	Blower Effluent Pressure	Blower Effluent Temperature	Carbon Influent Pressure	Carbon Effluent Pressure	Carbon Effluent Temperature	Carbon Effluent PID
		VI-1 (iwc)	Hand Held (F)	ASP-1 (ppm)	Manifold (scfm)	(iwc)	VI-3 (iwc)	TI-1 (F)	PI-1 (iwc)	TI-2 (F)	PI-1 (iwc)	(iwc)	(F)	ASP-2 (ppm)
Baseline(5)	11:48 AM	-0.0063	71.5											
Steady State	11:56 AM	-2.582	65.2	5.8	105		-62	60	10	142	10	5	90	0.0
30 min	12:30 PM	-2.619	63.5	6.8	103		-61	68	10	142	10	5	90	0.0
1 hr (6)	1:00 PM	-2.436	63.5	7.0	104	--	-61	68	10	144	10	5	94	0.0
2 hr	2:00 PM	-2.613	63.4	NM	104	--	-61	70	10	146	10	5	96	0.0
3 hr	3:00 PM	-2.569	63.4	17.4	102	--	-61	70	10	146	10	5	96	0.3
4 hr (3)	4:40 PM	-2.635	63.4	14.3	102	--	-61	73	10	~146	10	5	98	0.0
5 hr / 75% Changed at 5:30 pm (7)	6:00 PM	-1.897	63.5	14.4	75	--	-39	NM	18	130	16	8	98	0.0
6 hr / 50% Changed at 6:17 pm	6:47 PM	-1.753	63.5	14.6	71	--	-34	NM	19	128	19	NM	NM	NM

Initials:	PAR	Date: 6/14/07	(+/-)(2)
Barometric Pressure (inHg)			
Ambient Temperature (F) -- 11:59 AM		68°F	RH = 59.7%
Ambient Conditions			Overcast, Breezy, Dark

% Dilution Valve opened at start of test	None
Total Volume of water collected from knockout tank(4)	0 Gallons

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Table A-6. Pneumatic Conductivity Test, Depressurization Well 3-Deep Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (iwc)											
		Vacuum Points											
		VMWC-9			VMWC-10			VMWC-11			VMWC-12		
		Radial Distance[1]			Radial Distance[1]			Radial Distance[1]			Radial Distance[1]		
		25.2	29	N/A	N/A	50.3	53	N/A	75.8	79	N/A	N/A	102.3
		Depth A	Depth B	Depth D	Depth A	Depth B	Depth D	Depth A	Depth B	Depth D	Depth A	Depth B	Depth D
		(6.3-7.3 ft bls)	(19.3-20.3 ft bls)	N/A	N/A	(18.8-19.8 ft bls)	(39-40 ft bls)	N/A	(19.2-20.2 ft bls)	(39.3-40.3 ft bls)	N/A	N/A	(39.2-40.2 ft bls)
Baseline[9]	Early AM	-0.0193	0.0013			0.0215	0.0206		-0.004	0.0013			-0.0092
Steady State	--	-0.2903	-0.3230			-0.2414	-0.2308		-0.1799	-0.1813			-0.1245
30 min	--	-0.2728	-0.3094			-0.2308	-0.2298		-0.1651	-0.1082			-0.1084
1 hr [6]	1:20 PM	-0.2611	-0.2888			-0.2103	-0.1878		-0.1471	-0.1498			-0.1309
2 hr	2:25 PM	-0.2769	-0.3155			-0.2333	-0.2315		-0.1605	-0.1560			-0.1151
3 hr	--	-0.2755	-0.3134			-0.2322	-0.2265		-0.1696	-0.1634			-0.1198
4 hr [3]	--	-0.3085	-0.3418			-0.2541	-0.2545		-0.1765	-0.1669			-0.1140
5 hr / 75% Changed at 5:30 pm [7]	--	-0.2064	-0.2333			-0.1770	-0.1390		-0.1238	-0.1117			-0.0855
6 hr / 50% Changed at 6:17 pm	--	-0.2102	-0.2384			-0.1924	-0.1982		-0.1414	-0.1193			-0.0940

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Table A-6. Pneumatic Conductivity Test, Depressurization Well 3-Deep Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings		Water Level Measurements		Comments
		Monitoring Well	Depressurization Well	Monitoring Wells	Depressurization Well	
		B24MW-3 (10)	DW-3S	B24MW-3	DW-3D	
		Radial Distance 177.6 ft	Radial Distance 5 ft	Radial Distance 177.6 ft	Radial Distance 0 ft	
		Screened (55-70 bls)	Screened (10-30)	Screened (55-70 bls)	Screened (26-46)	
		(Iwc)	(Iwc)	DTW (ft bmp)	DTW (ft bmp)	
Baseline(9)	Early AM	0.0001(10)	NM	53.52	Dry	
Steady State	--	0.0001(10)	NM	53.50	NM	
30 min	1:00 PM	0.0002(10)	NM	53.51	Dry	
1 hr (6)	1:40 PM	0.0001(10)	-0.4588	53.51	NM	
2 hr	--	0. 0000(10)	-0.4792	53.51	NM	
3 hr	--	-0.0001(10)	-0.4630	NM	Dry	
4 hr (3)	4:30 PM	NM	-0.5016	NM	NM	
5 hr / 75% Changed at 5:30 pm (7)	--	NM	-0.3538	NM	NM	
6 hr / 50% Changed at 6:17 pm	--	NM	-0.3452	NM	NM	

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Table A-6. Pneumatic Conductivity Test, Depressurization Well 3-Deep Field Monitoring Parameters, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Notes & Abbreviations:

1. Radial Distances for VMWCs 9-12 and B24MW-3 are measured from DW-3D and taken from survey done by Nelson & Pope on July 25, 2007.
2. + indicates increasing, - indicates decreasing
3. Air sample was collected in 6-liter suma canister and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis; 24 Hr. TAT requested. Pre-carbon sample was collected at 5:20pm.
4. Water was not generated during this event therefore, water sample was not collected or submitted for analysis.
5. Initial measurement after start-up for wellhead vacuum.
6. Vacuum measurements taken with water level indicator access port open.
7. Post-carbon air sample was taken at 6:15pm, collected in 6-liter suma canister and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis; 24 Hr. TAT requested.
8. VCS Flow readings taken from manifold have been reduced by 9 SCFM due to technical error in field.
9. Vacuum readings for all but well head were taken early am prior to start of test.
10. Induced vacuum at well B24MW-3 not applicable to test - entire well screen submerged. TOC was damaged and almost level with cement seal so fitting PVC cap over casing may not provide adequate seal in the future.

DTW	depth to water
DW	Depressurization Well
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
SCFM	standard cubic feet per minute
TOC	top of casing
VCS	vapor control system
VMWC	vacuum monitoring well cluster

Table A-7. Pneumatic Conductivity Calculation Summary Table, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds Bethpage, New York.

Pneumatic Conductivity [1,2]

Depressurization Well		Depressurization Well	
DW-1S [3]		**DW-2S [4]**	
Between VMWC-1C and VMWC-2C	1.35×10^{4}	Between VMWC-5B and VMWC-6B	3.15×10^{5}
Between VMWC-1C and VMWC-3C	8.00×10^{5}	Between VMWC-5B and VMWC-7B	3.36×10^{5}
Between VMWC-2C and VMWC-3C	5.43×10^{5}	Between VMWC-6B and VMWC-7B	3.70×10^{5}
Average:	8.98×10^{5}	Average:	3.41×10^{5}
DW-1S [3]		**DW-2S [4]**	
Between VMWC-1C and VMWC-4C	7.95×10^{5}	Between VMWC-5B and VMWC-8B	3.66×10^{5}
Between VMWC-2C and VMWC-4C	3.75×10^{5}	Between VMWC-6B and VMWC-8B	6.58×10^{5}
Between VMWC-4C and VMWC-3C	8.16×10^{5}	Between VMWC-8B and VMWC-7B	2.62×10^{5}
Average:	6.62×10^{5}	Average:	4.29×10^{5}
DW-1D [3]		**DW-2D [4]**	
Between VMWC-1D and VMWC-2D	1.38×10^{5}	Between VMWC-5D and VMWC-6D	1.68×10^{5}
Between VMWC-1D and VMWC-3D	1.52×10^{5}	Between VMWC-5D and VMWC-7D	1.42×10^{5}
Between VMWC-2D and VMWC-3D	1.70×10^{5}	Between VMWC-6D and VMWC-7D	1.19×10^{5}
Average:	1.53×10^{5}	Average:	1.43×10^{5}
DW-1D [3]		**DW-2D [4]**	
Between VMWC-1D and VMWC-4D	1.12×10^{5}	Between VMWC-5D and VMWC-8D	1.57×10^{5}
Between VMWC-2D and VMWC-4D	6.82×10^{6}	Between VMWC-6D and VMWC-8D	1.27×10^{5}
Between VMWC-4D and VMWC-3D	5.00×10^{5}	Between VMWC-8D and VMWC-7D	1.15×10^{5}
Average:	2.27×10^{5}	Average:	1.33×10^{5}
DW-3S [3]		**DW-3D [3]**	
Between VMWC-9B and VMWC-10B	2.95×10^{5}	Between VMWC-10D and VMWC-11D	3.98×10^{5}
Between VMWC-9B and VMWC-11B	3.26×10^{5}	Between VMWC-10D and VMWC-12D	3.87×10^{5}
Between VMWC-10B and VMWC-11B	3.78×10^{5}	Between VMWC-11D and VMWC-12D	3.73×10^{5}
Average:	3.33×10^{5}	Average:	3.86×10^{5}

Notes & Abbreviations:

1. Pneumatic conductivity values shown based on data collected during tests conducted the week of March 19 and June 11, 2007. Data interpreted using "Soil Vapor Extraction System Design Calculation Method" by ARCADIS.
2. Units of values shown are in seconds.
3. Pneumatic conductivity calculated using air flow measurements collected with a variable area flow meter.
4. Pneumatic conductivity calculated using air flow measurements collected with a hand-held anemometer.

DW depressurization well
VMWC vapor monitoring well cluster

Table A-7. Pneumatic Conductivity Calculation Summary Table, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Evaluation of Pneumatic Conductivity Test Data Depressurization Well 1S with Manifold (Variable Area Flowmeters),

Factor of Safety on Flow =	1	Based on pilot test data.
Acceleration due to Gravity	980	cm/sec^2

Parameter	Value	Units	Basis
	Input Parameters		
Air Flow	-94	scfm	Flow is Negative for Vacuum; Air flow reading from VA meters during 100% flow with manifold in line.
Distance From Vacuum Well to Inner Point	10.00	feet	Inner Point = VMWC-1C
Distance From Vacuum Well to Outer Point	25.00	feet	Outer Point = VMWC-2C
Vadose Zone Thickness	15.00	feet	Screened Interval
Vacuum at Inner Point(1C)	0.29420	in. H2O	Vacuum reading at 7 hrs.
Vacuum at Outer Point(2C)	0.24000	in. H2O	Vacuum reading at 7 hrs.
	Output Parameters		
Air Flow	-96.94	ft^3/min	Assumes temp 52F blower inlet temp; P=P
Air Mass Flow (Q)	-57.15	grams/sec	Assumes air density = 1.25 g/L
Distance From Vacuum Well to Inner Point	304.80	cm	
Distance From Vacuum Well to Outer Point	762.00	cm	
Vadose Zone Thickness	457.20	cm	
Vacuum at Inner Point	732.26	grams/cm-sec^2	
Vacuum at Outer Point	597.36	grams/cm-sec^2	
Pressure Drop Over Interval	134.90	grams/cm-sec^2	
Pneumatic Conductivity (Kair)	**1.35E-04**	**sec**	
	1.32E-01	**cm/s**	Kair * g
Effective Air Permeability (kair)	**1.88E-05**	**cm^2**	
Intrinsic Permeability (kint)	**2.58E-05**	**cm^2**	Assumes fraction of soil volume occupied by water is equal to 10% of the porosity
Hydraulic Conductivity (Kwater)	**1.81E+00**	**cm/s**	

$$Q(b, ER) = \frac{ER \cdot \pi \cdot (b^2 - a^2) \cdot h \cdot \eta \cdot \rho_{air}}{1440 \cdot 60}$$

$ER = Pore\_Volume\_Exchange\_Rate\_(g/\sec)$

$b = Radial\_Dis\tan ce\_to\_Outter\_Monitoring\_Po\text{int}\_(cm)$

$a = Radia\_Dis\tan ce\_to\_Inner\_Monitoring\_Po\text{int}\_(cm)$

$h = Vadose\_Zone\bar{e}Thickness$

$b = Dis\tan ce\_From\_Vacuum\_to\_Outter\_Monitoring\_Po\text{int}\ (ft)$

$$k_{air} = \frac{K_{air} \cdot \mu_{air}}{\rho_{air} \cdot g}$$

$\mu_{air} = Vis\cos ity\_Air\_10^o C$

$\rho_{air} = Density\_Air\_10^o C$

$g = Acceleration\_due\_to\_gravity$

$$k_{int} = \frac{k_{air}}{\left(n - S_w/n\right)^3}$$

$n = Porosity$

$S_w = Fraction\_of\_soil\_volume\_occupied\_by\_water$

$$K_{water} = \frac{k_{int} \cdot \rho_{water} \cdot g}{\mu_{water}}$$

$\rho_{water} = Density\_Water\_10^o C$

$g = Acceleration\_due\_to\_gravity$

$\mu_{water} = Vis\cos ity\_Water\_10^o C$

Table A-8. Summary of Vapor Analytical Results, Pneumatic Conductivity Tests, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

CONSTITUENT (ug/m^3)	Site ID: / Sample ID: / Sample Date:	DW-2S / PCT ASP-1 / 3/20/2007	DW-2D / DW-2D INF / 3/21/2007	DW-1S / DW1S / 3/22/2007	DW-1D / DWID / 3/23/2007
Volatile Organic Compounds	**CAS Number**				
1,1,1-Trichloroethane	71-55-6	**1.4**	**59**	**54**	**88**
1,1,2,2-Tetrachloroethane	79-34-5	< 0.15	< 1.3	< 4.1	< 4.2
1,1,2-Trichloroethane	79-00-5	< 0.6	< 5.3	< 16	< 17
1,1-Dichloroethane	75-34-3	< 0.45	< 3.9	< 12	< 12
1,1-Dichloroethylene	75-35-4	**1.5**	< 3.9	< 12	**18**
1,2-Dichloroethane	107-06-2	< 0.45	< 3.9	< 12	< 12
1,2-Dichloropropane	78-87-5	< 0.51	< 4.5	< 14	< 14
1,3-Butadiene	106-99-0	< 0.49	< 4.3	< 13	< 14
2-Butanone	78-93-3	**35 D**	**49**	**47**	**42**
4-Methyl-2-Pentanone	108-10-1	< 0.9	< 8	< 24	< 25
Acetone	67-64-1	**8.4**	< 11	< 32	< 33
Benzene	71-43-2	< 0.35	< 3.1	< 9.5	< 9.8
Bromodichloromethane	75-27-4	< 0.15	< 1.3	< 4	< 4.1
Bromomethane	74-83-9	< 0.43	< 3.8	< 12	< 12
Carbon Disulfide	75-15-0	< 0.34	< 3	< 9.2	< 9.5
Carbon Tetrachloride	56-23-5	< 0.14	< 1.2	**31**	**40**
Trichlorofluoromethane (CFC-11)	75-69-4	**1.1**	**32**	< 17	< 17
1,1,2-Trichlorotrifluoroethane (Freon 113)	76-13-1	**0.46**	**4.8**	**17**	**45**
Chlorobenzene	108-90-7	< 0.51	< 4.5	< 14	< 14
Chlorodibromomethane	124-48-1	< 0.19	< 1.7	< 5.1	< 5.2
Chloroethane	75-00-3	< 0.58	< 5.1	< 16	< 16
Chloroform	67-66-3	**0.68**	< 4.8	< 14	**22**
Chloromethane	74-87-3	< 0.45	< 4	< 12	< 13
cis-1,2-Dichloroethene	156-59-2	**630 D**	**83**	**130**	**36**
cis-1,3-Dichloropropene	10061-01-5	< 1	< 8.9	< 27	< 28
Dichloromethane	75-09-2	< 0.38	< 3.4	< 10	< 11
Ethylbenzene	100-41-4	< 0.95	< 8.5	< 26	< 27
m,p-Xylenes	NA	**2.3**	< 17	**68**	< 53
Methyl n-Butyl Ketone	591-78-6	< 0.45	< 4	< 12	< 13
Methyl tert-Butyl Ether	1634-04-4	< 0.79	< 7	< 21	< 22
Methylbenzene	108-88-3	**1.5**	< 3.7	**59**	< 12
o-Xylene	95-47-6	**1.1**	< 8.5	**28**	< 27
Styrene	100-42-5	< 0.94	< 8.3	< 25	< 26
Tetrachloroethene	127-18-4	**9.5**	**25**	**44**	**83**
trans-1,2-Dichloroethene	156-60-5	< 0.44	< 3.9	< 12	< 12
trans-1,3-Dichloropropene	10061-02-6	< 0.5	< 4.4	< 13	< 14
Tribromomethane	75-25-2	< 1.1	< 10	< 31	< 32
Trichloroethylene	79-01-6	**140 D**	**390**	**840**	**1,600 D**
Vinyl Chloride	75-01-4	**3.1**	< 5	**28**	**33**
Total VOCs (2)		**836.0**	**642.8**	**1,346**	**2,007**

Notes & Abbreviations:

1. Analytical results for system carbon effluent, for March 2007 are not consistent with system influents and are attributable to regenerated carbon supplied by vendor.
2. "Total VOCs" represents the sum of individual concentrations of constituents listed in this table.

Bold	detected compound
<	less than MDL
ASP	air sample port
C EFF	effluent from vapor extraction pilot system carbon
CAS	Chemical Abstracts Service Registry Number
D	concentrations identified from analysis of the sample at a secondary dilution
DW	depressurization well
INF	influent to vapor extraction pilot system
J	estimated value
PCT	pneumatic conductivity test
ug/m^3	microgram per meter cubed
VOCs	volatile organic compounds

Table A-8. Summary of Vapor Analytical Results, Pneumatic Conductivity Tests, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

CONSTITUENT (ug/m³)	Site ID: / Sample ID: / Sample Date:	Carbon Effluent Day 4 [(1)] / DWID-C EFF / 3/23/2007	DW-3S / DW-3S-20070613 / 6/13/2007	DW-3D / DW-3D-20070614 / 6/14/2007	Carbon Effluent / CARBON EFF-20070614 / 6/14/2007
Volatile Organic Compounds	**CAS Number**				
1,1,1-Trichloroethane	71-55-6	< 800	**660**	**720**	< 17
1,1,2,2-Tetrachloroethane	79-34-5	< 200	< 3.7	< 4.4	< 4.2
1,1,2-Trichloroethane	79-00-5	< 800	< 15	< 18	< 17
1,1-Dichloroethane	75-34-3	< 590	**170**	**220**	< 12
1,1-Dichloroethylene	75-35-4	< 580	< 11	< 13	< 12
1,2-Dichloroethane	107-06-2	< 590	< 11	< 13	< 12
1,2-Dichloropropane	78-87-5	< 680	< 13	< 15	< 14
1,3-Butadiene	106-99-0	< 650	< 12	< 14	< 14
2-Butanone	78-93-3	< 860	**49**	< 19	< 18
4-Methyl-2-Pentanone	108-10-1	< 1200	< 22	< 26	< 25
Acetone	67-64-1	**11,000 J**	**130 J**	**53**	< 33
Benzene	71-43-2	< 470	< 8.6	< 10	< 9.8
Bromodichloromethane	75-27-4	< 200	< 3.6	< 4.3	< 4.1
Bromomethane	74-83-9	< 570	< 11	< 13	< 12
Carbon Disulfide	75-15-0	< 460	< 8.4	< 10	< 9.5
Carbon Tetrachloride	56-23-5	< 180	< 3.4	< 4.1	< 3.8
Trichlorofluoromethane (CFC-11)	75-69-4	< 820	**21**	**21**	< 17
1,1,2-Trichlorotrifluoroethane (Freon 113)	76-13-1	< 220	**21**	**27**	< 4.7
Chlorobenzene	108-90-7	< 670	< 12	< 15	< 14
Chlorodibromomethane	124-48-1	< 250	< 4.6	< 5.5	< 5.2
Chloroethane	75-00-3	< 770	< 14	< 17	< 16
Chloroform	67-66-3	< 710	**71**	**75**	< 15
Chloromethane	74-87-3	< 600	< 11	< 13	< 13
cis-1,2-Dichloroethene	156-59-2	< 580	**8,800 D**	**17,000 D**	< 12
cis-1,3-Dichloropropene	10061-01-5	< 1300	< 25	< 29	< 28
Dichloromethane	75-09-2	< 510	< 9.4	< 11	< 11
Ethylbenzene	100-41-4	< 1300	< 23	< 28	< 27
m,p-Xylenes	NA	< 2500	< 47	< 56	< 53
Methyl n-Butyl Ketone	591-78-6	< 600	< 11	< 13	< 13
Methyl tert-Butyl Ether	1634-04-4	**85,000 D**	< 20	< 23	< 22
Methylbenzene	108-88-3	< 550	**270**	**40**	< 12
o-Xylene	95-47-6	< 1300	< 23	< 28	< 27
Styrene	100-42-5	< 1200	< 23	< 28	< 26
Tetrachloroethene	127-18-4	< 200	**570**	**800**	< 4.1
trans-1,2-Dichloroethene	156-60-5	< 580	**330**	**430**	< 12
trans-1,3-Dichloropropene	10061-02-6	< 660	< 12	< 15	< 14
Tribromomethane	75-25-2	< 1500	< 28	< 33	< 32
Trichloroethylene	79-01-6	< 160	**39,000 D**	**65,000 D**	< 3.3
Vinyl Chloride	75-01-4	< 750	< 14	< 17	< 16
Total VOCs [(2)]		**96,000**	**50,092**	**84,386**	**0**

Notes & Abbreviations:

1. Analytical results for system carbon effluent, for March 2007 are not consistent with system influents and are attributable to regenerated carbon supplied by vendor.
2. "Total VOCs" represents the sum of individual concentrations of constituents listed in this table.

Bold	detected compound
<	less than MDL
ASP	air sample port
C EFF	effluent from vapor extraction pilot system carbon
CAS	Chemical Abstracts Service Registry Number
D	concentrations identified from analysis of the sample at a secondary dilution
DW	depressurization well
INF	influent to vapor extraction pilot system
J	estimated value
PCT	pneumatic conductivity test
ug/m³	microgram per meter cubed
VOCs	volatile organic compounds

Table A-9. Summary of Analytical Results for Collected Condensate[1], Pneumatic Conductivity Test, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

CONSTITUENT (ug/m^3)	Site ID: / Sample ID: / Sample Date:	DW2D-Condensate / DW2D-KO-20070321 / 3/21/2007
Volatile Organic Compounds	**CAS Number**	
1,1,1-Trichloroethane	71-55-6	< 5
1,1,2,2-Tetrachloroethane	79-34-5	< 5
1,1,2-Trichloroethane	79-00-5	< 5
1,1-Dichloroethane	75-34-3	< 5
1,1-Dichloroethlene	75-35-4	< 5
1,2-Dichloroethane	107-06-2	< 5
1,2-Dichloropropane	78-87-5	< 5
2-Butanone	78-93-3	< 50
4-Methyl-2-Pentanone	108-10-1	< 50
Acetone	67-64-1	< 50
Benzene	71-43-2	< 0.7
Bromodichloromethane	75-27-4	< 5
Bromomethane	74-83-9	< 5
Carbon Disulfide	75-15-0	< 50
Carbon Tetrachloride	56-23-5	< 5
Freon 12	75-71-8	< 5
Freon 22	75-45-6	< 5
Freon 113	76-13-1	< 5
Chlorobenzene	108-90-7	< 5
Chlorodibromomethane	124-48-1	< 5
Chloroethane	75-00-3	< 5
Chloroform	67-66-3	< 7
Chloromethane	74-87-3	< 5
cis-1,2-Dichloroethene	156-59-2	< 5
cis-1,3-Dichloropropene	10061-01-5	< 5
Dichloromethane	75-09-2	< 5
Ethylbenzene	100-41-4	< 5
m,p-Xylenes	NA	< 5
Methyl n-Butyl Ketone	591-78-6	< 50
Methylbenzene	108-88-3	< 5
o-Xylene	95-47-6	< 5
Styrene	100-42-5	< 5
Tetrachloroethene	127-18-4	< 5
trans-1,2-Dichloroethene	156-60-5	< 5
trans-1,3-dichloropropene	10061-02-6	< 5
Tribromomethane	75-25-2	< 5
Trichloroethlene	79-01-6	< 5
Vinyl Chloride	75-01-4	< 2

Note & Abbreviations:

1. Only one well of six produced condensate during pneumatic conductivity testing therefore, one water sample was collected.

<	less than MDL
CAS	chemical abstracts service registry number
DW	depressurization well
KO	knockout tank
ug/m^3	micrograms per cubic meter
NA	not applicable

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Appendix B

Design Calculations

Table B-1. Data Evaluation for Extraction Well DW-1S, Pneumatic Conductivity Test, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Assumptions -

Well Screen Length (feet) -	15
Well Diameter (feet) -	0.33
Formation Porosity (v/v) -	0.25
Percent Moisture (%) -	10%

Distance-Drawdown Relationships -

Distance (Feet)	Observed/Calculated Vacuum (Drawdown - IWC) @ Air Flow (SCFM)					
	250 SCFM	210 SCFM	200 SCFM	150 SCFM	**94 SCFM**	82 SCFM
10	-0.81	-0.68	-0.65	-0.49	**-0.29**	-0.27
25	-0.56	-0.47	-0.45	-0.34	**-0.24**	-0.18
35	-0.47	-0.40	-0.38	-0.28	**-0.17**	-0.16
55	-0.35	-0.29	-0.28	-0.21	**-0.12**	-0.12
70	-0.29	-0.24	-0.23	-0.17	-0.11	-0.09
85	-0.23	-0.20	-0.19	-0.14	-0.09	-0.08
100	-0.19	-0.16	-0.15	-0.11	-0.07	-0.06
115	-0.15	-0.13	-0.12	-0.09	-0.06	-0.05
130	-0.12	-0.10	-0.10	-0.07	-0.04	-0.04
145	-0.09	-0.08	-0.07	-0.05	-0.03	-0.03
160	-0.06	-0.05	-0.05	-0.04	-0.02	-0.02
175	-0.04	-0.03	-0.03	-0.02	-0.01	-0.01
190	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01
205	0.00	0.00	0.00	0.00	0.00	0.00

Data Analysis -

Parameter	Value @ Air Flow (SCFM)					
	250	210	200	150	**94**	82
R^2	NA	NA	NA	NA	0.938092222	NA
Slope	0.620337699	0.521083667	0.496270159	0.372202619	0.233246975	0.203470765
y-intercept	-1.430648793	-1.201744986	-1.144519035	-0.858389276	-0.537923946	-0.469252804
Maximum ROI (Feet)	202	202	202	202	202	202
Observed Well Efficiency (%)	NA	NA	NA	NA	22%	NA
Design Parameters -						
Desired Minimum Vacuum (IWC)	0.1	0.1	0.1	0.1	0.1	0.1
ROI @ Minimum Vacuum (feet)	140	130	127	109	75	65
Pore Volume Exchange (per day)	1.74	1.68	1.68	1.71	2.24	2.61
Pore Volume Exchange (per week)	12.19	11.79	11.74	11.99	15.71	18.29
Required Wellhead Vacuum (IWC)	-6.553	-5.505	-5.243	-3.932	**-2.464**	-2.149

Notes/Formulas -

1. Values in BOLD represent field data. Values in regular font represent calculated values based on distance-drawdown relationship.
2. Field data used is from Depth C for each location during Hr 7 VCS Test on 3/22/07.
3. Maximum ROI (feet) based on minimum ROI during VCS Test.
4. Boxed solid line values represent selected design assumptions for wells DW-1S, DW-4S, DW-5S & DW-6S.

Table B-1. Data Evaluation for Extraction Well DW-1S, Pneumatic Conductivity Test, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

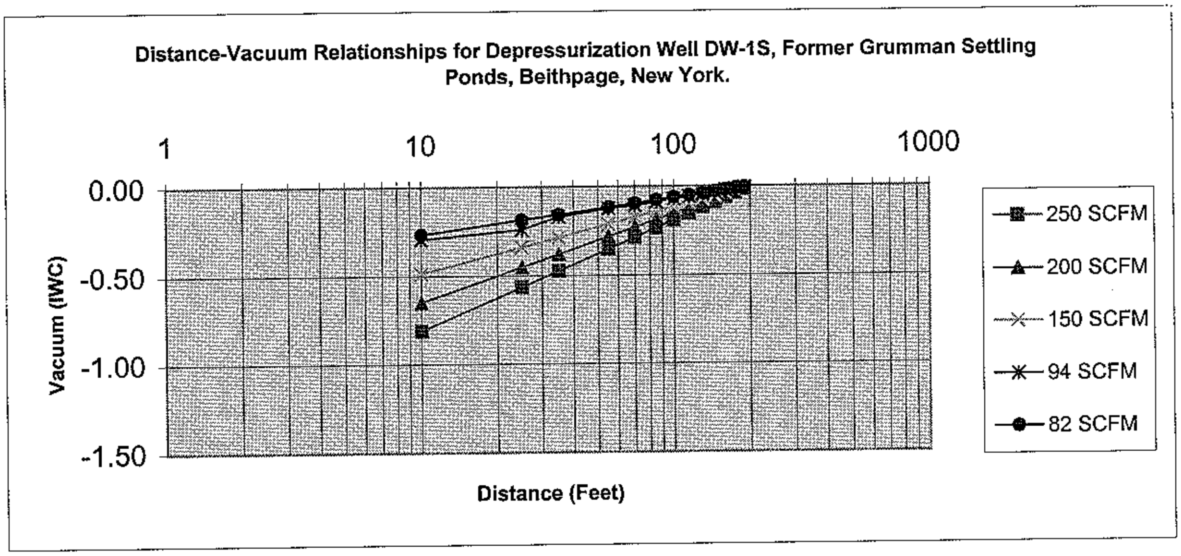

Table B-2. Data Evaluation for Extraction Well DW-2S, Pneumatic Conductivity Test, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Assumptions -

Well Screen Length (feet) -	7
Well Diameter (feet) -	0.33
Formation Porosity (v/v) -	0.25
Percent Moisture (%) -	10%

Distance-Drawdown Relationships -

Distance (Feet)	Observed/Calculated Vacuum (Drawdown - IWC) @ Air Flow (SCFM)						
	250 SCFM	200 SCFM	**146 SCFM**	**105 SCFM**	**98 SCFM**	66 SCFM	45 SCFM
10	-3.24	-2.60	**-1.94**	**-1.39**	**-1.28**	-0.86	-0.58
25	-1.83	-1.46	**-1.03**	**-0.73**	**-0.67**	-0.48	-0.33
35	-1.31	-1.05	**-0.87**	**-0.63**	**-0.56**	-0.35	-0.24
50	-0.76	-0.61	**-0.44**	**-0.36**	**-0.29**	-0.20	-0.14
53	-0.67	-0.54	-0.41	-0.32	-0.26	-0.18	-0.12
56	-0.59	-0.47	-0.36	-0.29	-0.23	-0.15	-0.11
59	-0.51	-0.40	-0.32	-0.26	-0.20	-0.13	-0.09
61	-0.45	-0.36	-0.29	-0.23	-0.18	-0.12	-0.08
64	-0.38	-0.30	-0.24	-0.20	-0.15	-0.10	-0.07
67	-0.31	-0.25	-0.20	-0.18	-0.12	-0.08	-0.06
70	-0.24	-0.19	-0.16	-0.15	-0.10	-0.06	-0.04
73	-0.18	-0.14	-0.12	-0.12	-0.07	-0.05	-0.03
76	-0.12	-0.09	-0.09	-0.10	-0.05	-0.03	-0.02
79	-0.06	-0.04	-0.05	-0.07	-0.02	-0.01	-0.01
81	-0.02	-0.01	-0.03	-0.06	-0.01	0.00	0.00
82	0.00	0.00	-0.02	-0.05	0.00	0.00	0.00
84	0.04	0.03	0.00	-0.03	0.02	0.01	0.01
87	0.09	0.07	0.04	-0.01	0.04	0.02	0.02
88	0.11	0.09	0.05	0.00	0.04	0.03	0.02
90	0.15	0.12	0.07	0.01	0.06	0.04	0.03

Data Analysis -

Parameter	'Value @ Air Flow (SCFM)						
	250	200	**146**	**105**	**98**	66	45
R^2	NA	NA	0.990491182	0.989758068	0.990417317	NA	NA
Slope	3.551931862	2.84154549	2.086797	1.447112903	1.39235729	0.937710012	0.63934774
y-intercept	-6.79608222	-5.436865776	-4.012268706	-2.818408033	-2.66406423	-1.794165706	-1.2232948
Maximum ROI (Feet)	82	82	84	89	82	82	82
Observed Well Efficiency (%)	NA	NA	45%	46%	48%	NA	NA

Design Parameters -

	250	200	146	105	98	66	45
Desired Minimum Vacuum (IWC)	0.1	0.1	0.1	0.1	0.1	0.1	0.1
ROI @ Minimum Vacuum (feet)	77	76	75	76	69	64	57
Pore Volume Exchange (per day)	12.34	10.20	7.56	5.35	5.92	4.68	4.01
Pore Volume Exchange (per week)	86.41	71.41	52.95	37.43	41.42	32.75	28.08
Required Wellhead Vacuum (IWC)	-14.555	-11.644	**-8.867**	**-6.071**	**-5.504**	-3.843	-2.620

Notes/Formulas -

1. Values in BOLD represent field data. Values in regular font represent calculated values based on distance-drawdown relationship.
2. Field data used is from Depth B for each location during Hrs 4, 5 & 6 of VCS Test on 3/20/07.
3. Maximum ROI (feet) based on minimum ROI during VCS Test.
4. Boxed solid line values represent selected design assumptions for Well DW-2S, DW-8S, DW-9S, DW-10S, DW-11S.

Table B-2. Data Evaluation for Extraction Well DW-2S, Pneumatic Conductivity Test, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

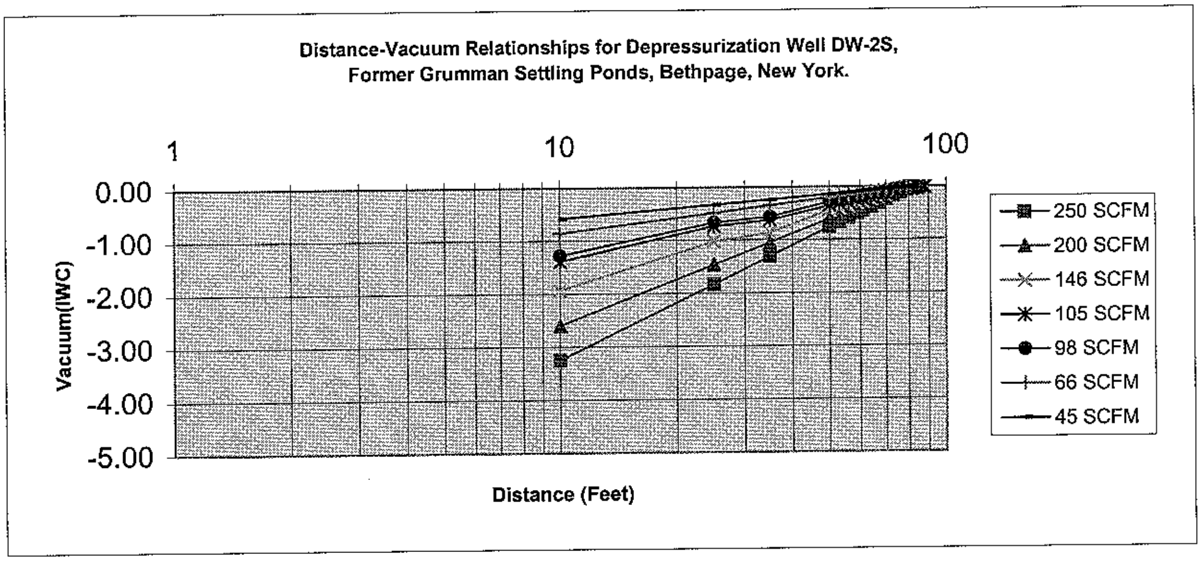

Table B-3. Data Evaluation for Extraction Well DW-3S, Pneumatic Conductivity Test, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Assumptions -

Well Screen Length (feet) -	20
Well Diameter (feet) -	0.33
Formation Porosity (v/v) -	0.25
Percent Moisture (%) -	10%

Distance-Drawdown Relationships -

Distance (Feet)	Observed/Calculated Vacuum (Drawdown - IWC) @ Air Flow (SCFM)					
	104 SCFM	100 SCFM	**77 SCFM**	**73 SCFM (4)**	79 SCFM	45 SCFM
34	**-0.36**	-0.35	**-0.26**	**-0.29**	-0.27	-0.16
55.3	**-0.26**	-0.26	**-0.20**	**-0.19**	-0.20	-0.11
80.8	**-0.19**	-0.18	**-0.18**	**-0.16**	-0.14	-0.08
100	-0.15	-0.14	-0.15	-0.12	-0.11	-0.06
120	-0.11	-0.11	-0.13	-0.09	-0.09	-0.05
140	-0.08	-0.08	-0.12	-0.07	-0.06	-0.04
160	-0.06	-0.05	-0.11	-0.05	-0.04	-0.02
180	-0.03	-0.03	-0.09	-0.03	-0.02	-0.01
200	-0.01	-0.01	-0.08	-0.01	-0.01	-0.01
220	0.01	0.01	-0.07	0.00	0.01	0.00
240	0.02	0.02	-0.07	0.01	0.02	0.01
260	0.04	0.04	-0.06	0.03	0.03	0.02
280	0.05	0.05	-0.05	0.04	0.04	0.02
300	0.07	0.07	-0.04	0.05	0.05	0.03
320	0.08	0.08	-0.04	0.06	0.06	0.04
340	0.09	0.09	-0.03	0.07	0.07	0.04
360	0.10	0.10	-0.03	0.07	0.08	0.05
380	0.11	0.11	-0.02	0.08	0.09	0.05
400	0.13	0.12	-0.02	0.09	0.10	0.05

Data Analysis -

Parameter	Value @ Air Flow (SCFM)					
	104	100	**77**	**73**	79	45
R^2	0.995251005	NA	0.911150571	0.951988395	NA	NA
Slope	0.454453651	0.436974664	0.226098981	0.344421501	0.345209985	0.196638599
y-intercept	-1.057401347	-1.016732064	-0.604452655	-0.806319919	-0.803218331	-0.457529429
Maximum ROI (Feet)	212	212	471	219	212	212
Observed Well Efficiency (%)	51%	NA	41%	57%	NA	NA
Design Parameters -						
Desired Minimum Vacuum (IWC)	0.1	0.1	0.1	0.1	0.1	0.1
ROI @ Minimum Vacuum (feet)	128	125	170	112	109	66
Pore Volume Exchange (per day)	0.65	0.65	0.27	0.59	0.68	1.06
Pore Volume Exchange (per week)	4.54	4.54	1.89	4.12	4.75	7.41
Required Wellhead Vacuum (IWC)	**-2.065**	-2.045	**-1.490**	**-1.405**	-1.615	-0.827

Notes/Formulas -

1. Values in BOLD represent field data. Values in regular font represent calculated values based on distance-drawdown relationship.
2. Field data used is from Depth B for each location during Hrs 4, 5 & 6 of VCS Test on 6/13/07.
3. Maximum ROI (feet) based on minimum ROI during VCS Test.
4. Based on data evaluation provided above, ARCADIS considers data from hour 5 (73 SCFM) to be outliers. Data is not used in further calculations.
5. Boxed solid line values represent selected design assumptions for Well DW-3S.
6. Boxed dashed line values represent selected design assumptions for Well DW-7S.

Table B-3. Data Evaluation for Extraction Well DW-3S, Pneumatic Conductivity Test, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

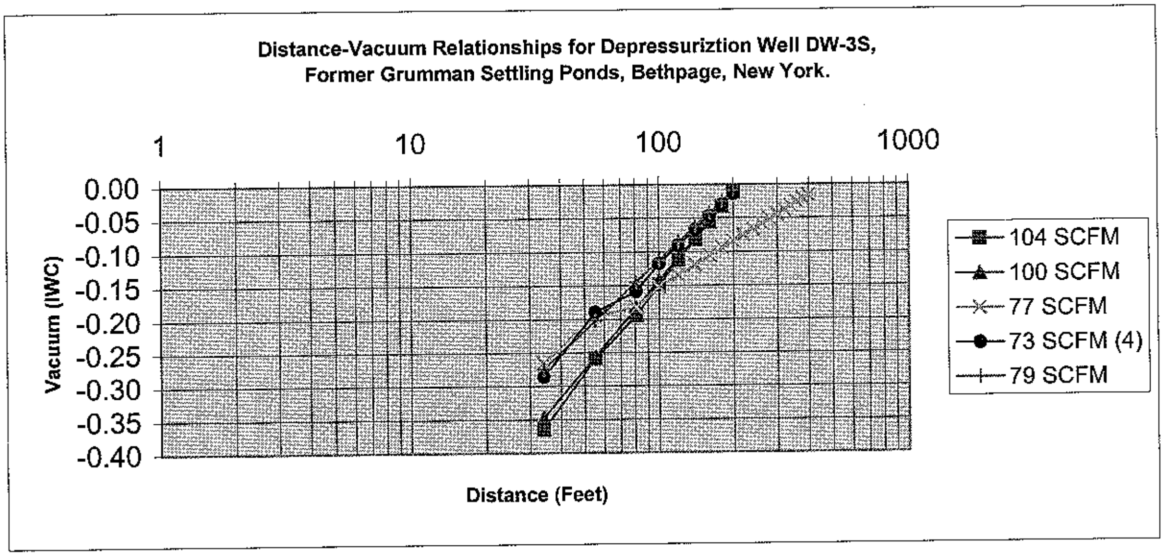

Table B-4. Data Evaluation for Extraction Well DW-1D, Pneumatic Conductivity Test, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Assumptions -

Well Screen Length (feet) -	5
Well Diameter (feet) -	0.33
Formation Porosity (v/v) -	0.25
Percent Moisture (%) -	10%

Distance-Drawdown Relationships -

Distance (Feet)	Observed/Calculated Vacuum (Drawdown - IWC) @ Air Flow (SCFM)						
	150 SCFM	125 SCFM	**80 SCFM**	75 SCFM	**54 SCFM**	**49 SCFM**	9 SCFM
13	-6.31	-5.26	**-3.23**	-3.16	**-2.327**	**-2.104**	-0.38
28	-4.12	-3.43	**-2.096**	-2.06	**-1.522**	**-1.37**	-0.25
35	-3.48	-2.90	**-1.428**	-1.74	**-1.031**	**-0.97**	-0.21
58	-2.03	-1.69	**-1.222**	-1.02	**-0.86**	**-0.80**	-0.12
60	-1.94	-1.61	-0.98	-0.97	-0.70	-0.66	-0.12
65	-1.71	-1.42	-0.87	-0.85	-0.61	-0.59	-0.10
70	-1.49	-1.25	-0.77	-0.75	-0.54	-0.52	-0.09
75	-1.30	-1.08	-0.67	-0.65	-0.47	-0.46	-0.08
80	-1.11	-0.93	-0.58	-0.56	-0.40	-0.40	-0.07
85	-0.94	-0.78	-0.49	-0.47	-0.34	-0.34	-0.06
90	-0.78	-0.65	-0.41	-0.39	-0.28	-0.29	-0.05
95	-0.62	-0.52	-0.33	-0.31	-0.22	-0.24	-0.04
100	-0.47	-0.40	-0.26	-0.24	-0.17	-0.19	-0.03
105	-0.33	-0.28	-0.19	-0.17	-0.12	-0.15	-0.02
110	-0.20	-0.17	-0.13	-0.10	-0.07	-0.11	-0.01
115	-0.07	-0.06	-0.07	-0.04	-0.03	-0.07	0.00
118	0.00	0.00	-0.03	0.00	0.00	-0.04	0.00
120	0.05	0.04	-0.01	0.02	0.02	-0.03	0.00
123	0.12	0.10	0.03	0.06	0.04	-0.01	0.01

Data Analysis -

Parameter	Value @ Air Flow (SCFM)						
	150	125	**80**	75	**54**	**49**	9
R^2	NA	NA	0.940732079	NA	0.946706321	0.954016295	NA
Slope	6.587099	5.489248847	3.249772292	3.293549308	2.371355502	2.095750227	0.395225917
y-intercept	-13.64863249	-11.37386041	-6.762151323	-6.824316244	-4.913507696	-4.386003595	-0.818917949
Maximum ROI (Feet)	118	118	120	118	118	124	118
Observed Well Efficiency (%)	NA	NA	20%	NA	20%	21%	NA

Design Parameters -

	150	125	80	75	54	49	9
Desired Minimum Vacuum (IWC)	0.1	0.1	0.1	0.1	0.1	0.1	0.1
ROI @ Minimum Vacuum (feet)	114	113	112	110	107	111	66
Pore Volume Exchange (per day)	4.70	3.98	2.59	2.52	1.92	1.62	0.84
Pore Volume Exchange (per week)	32.93	27.83	18.12	17.66	13.42	11.35	5.91
Required Wellhead Vacuum (IWC)	-66.958	-55.799	**-33.570**	-33.479	**-24.010**	**-21.350**	-4.018

Notes/Formulas -

1. Values in BOLD represent field data. Values in regular font represent calculated values based on distance-drawdown relationship.
2. Field data used is from Depth D for each location during Hrs 4, 5 & 6 (all with Manifold) of VCS Test on 3/20/07.
3. Maximum ROI (feet) based on minimum ROI during VCS Test.
4. Boxed solid line values represent selected design assumptions for wells DW-1D, DW-4D, DW-5D & DW-6D.

Table B-4. Data Evaluation for Extraction Well DW-1D, Pneumatic Conductivity Test, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

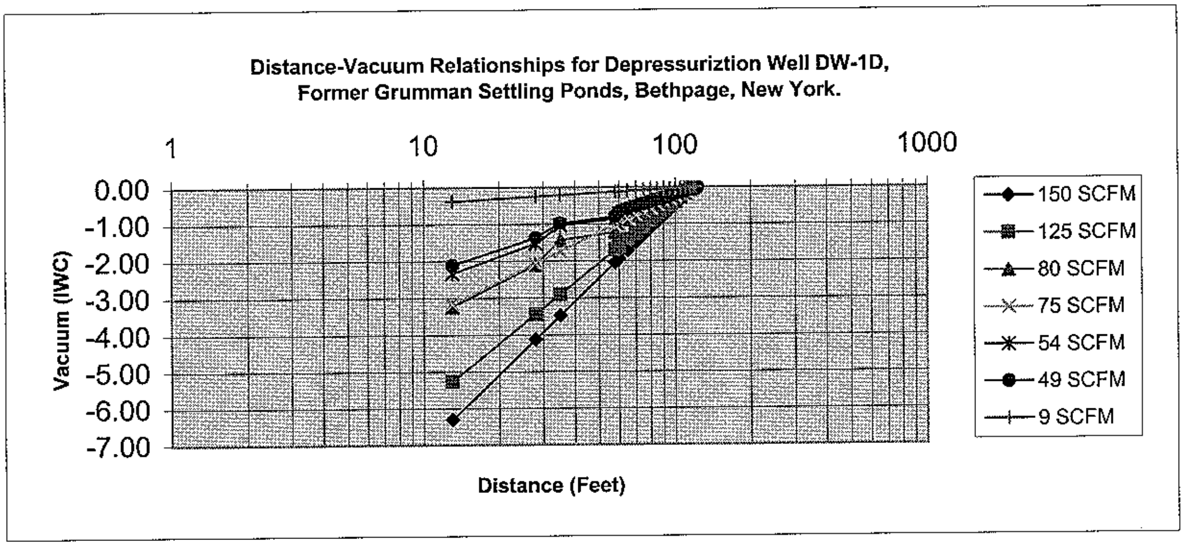

Table B-5. Data Evaluation for Extraction Well DW-2D, Pneumatic Conductivity Test, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Assumptions -

Well Screen Length (feet) -	20
Well Diameter (feet) -	0.33
Formation Porosity (v/v) -	0.25
Percent Moisture (%) -	10%

Distance-Drawdown Relationships -

Distance (Feet)	Observed/Calculated Vacuum (Drawdown - IWC) @ Air Flow (SCFM)					
	219 SCFM	**158 SCFM**	**141 SCFM**	100 SCFM	75 SCFM	50 SCFM
13	**-3.39**	**-2.47**	**-2.35**	-1.58	-1.18	-0.79
28	**-2.79**	**-2.01**	**-1.93**	-1.25	-0.94	-0.62
35	**-2.56**	**-1.85**	**-1.78**	-1.15	-0.86	-0.58
53	**-2.08**	**-1.50**	**-1.43**	-0.97	-0.73	-0.49
100	-1.56	-1.11	-1.08	-0.70	-0.53	-0.35
150	-1.19	-0.83	-0.82	-0.53	-0.39	-0.26
200	-0.92	-0.64	-0.63	-0.40	-0.30	-0.20
250	-0.72	-0.48	-0.49	-0.31	-0.23	-0.15
300	-0.55	-0.36	-0.38	-0.23	-0.17	-0.11
350	-0.41	-0.25	-0.28	-0.16	-0.12	-0.08
400	-0.28	-0.16	-0.19	-0.10	-0.08	-0.05
450	-0.18	-0.08	-0.12	-0.05	-0.04	-0.03
500	-0.08	-0.01	-0.05	-0.01	-0.01	0.00
550	0.01	0.05	0.01	0.03	0.02	0.02

Data Analysis -

Parameter	Value @ Air Flow (SCFM)					
	219	**158**	**141**	100	75	50
R^2	0.98826527	0.990816361	0.985319298	NA	NA	NA
Slope	2.114664833	1.565801386	1.467744435	0.991013535	0.743260152	0.495506768
y-intercept	-5.786830742	-4.238438381	-4.011533974	-2.682555938	-2.011916953	-1.341277969
Maximum ROI (Feet)	545	509	541	509	509	509
Observed Well Efficiency (%)	52%	54%	56%	NA	NA	NA
Design Parameters -						
Desired Minimum Vacuum (IWC)	0.1	0.1	0.1	0.1	0.1	0.1
ROI @ Minimum Vacuum (feet)	489	440	462	404	374	320
Pore Volume Exchange (per day)	0.09	0.08	0.07	0.06	0.05	0.05
Pore Volume Exchange (per week)	0.65	0.58	0.47	0.44	0.38	0.35
Required Wellhead Vacuum (IWC)	**-11.08**	**-7.846**	**-7.191**	-4.967	-3.725	-2.483

Notes/Formulas -

1. Values in BOLD represent field data. Values in regular font represent calculated values based on distance-drawdown relationship.
2. Field data used is from Depth D for each location during Hrs 3, 5 & 6 of VCS Test on 3/21/07.
3. Maximum ROI (feet) based on minimum ROI during VCS Test.
4. Boxed solid line values represent selected design assumptions for well DW-2D.

Table B-5. Data Evaluation for Extraction Well DW-2D, Pneumatic Conductivity Test, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

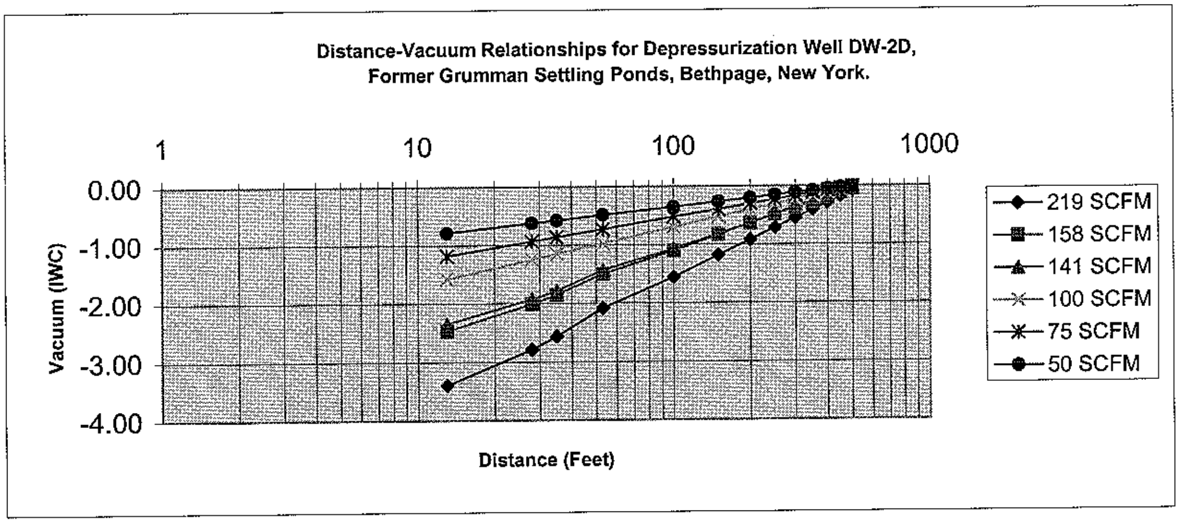

Table B-6. Data Evaluation for Extraction Well DW-3D, Pneumatic Conductivity Test, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Assumptions -

Well Screen Length (feet) -	20
Well Diameter (feet) -	0.33
Formation Porosity (v/v) -	0.25
Percent Moisture (%) -	10%

Distance-Drawdown Relationships -

Distance (Feet)	Observed/Calculated Vacuum (Drawdown - IWC) @ Air Flow (SCFM)					
	150 SCFM	**102 SCFM**	**75 SCFM[(4)]**	**71 SCFM**	70 SCFM	49 SCFM
53	-0.37	**-0.25**	**-0.14**	**-0.20**	-0.17	-0.12
79	-0.25	**-0.17**	**-0.11**	**-0.12**	-0.12	-0.08
102.3	-0.17	**-0.11**	**-0.09**	**-0.09**	-0.08	-0.05
112	-0.14	-0.09	-0.08	-0.07	-0.06	-0.05
127	-0.10	-0.07	-0.07	-0.05	-0.05	-0.03
142	-0.06	-0.04	-0.06	-0.03	-0.03	-0.02
157	-0.03	-0.02	-0.05	-0.02	-0.01	-0.01
172	0.00	0.00	-0.05	0.00	0.00	0.00
187	0.02	0.02	-0.04	0.01	0.01	0.01
202	0.05	0.03	-0.03	0.02	0.02	0.02
217	0.07	0.05	-0.03	0.03	0.03	0.02
237	0.10	0.07	-0.02	0.05	0.05	0.03
252	0.12	0.08	-0.02	0.06	0.05	0.04
267	0.14	0.09	-0.01	0.07	0.06	0.04
282	0.15	0.10	-0.01	0.08	0.07	0.05
297	0.17	0.12	0.00	0.08	0.08	0.06
312	0.18	0.13	0.00	0.09	0.09	0.06

Data Analysis -

Parameter	Value @ Air Flow (SCFM)					
	150	**102**	**75**	**71**	70	49
R^2	NA	0.999648944	0.987723229	0.972764294	NA	NA
Slope	0.72513025	0.493088568	0.184780469	0.372546181	0.338394115	0.236875881
y-intercept	-1.62370865	-1.104121881	-0.458947562	-0.836532536	-0.757730703	-0.530411492
Maximum ROI (Feet)	173	173	305	176	173	173
Observed Well Efficiency (%)	NA	42%	24%	48%	NA	NA
Design Parameters -						
Desired Minimum Vacuum (IWC)	0.1	0.1	0.1	0.1	0.1	0.1
ROI @ Minimum Vacuum (feet)	126	109	88	95	88	66
Pore Volume Exchange (per day)	0.96	0.88	1.00	0.80	0.92	1.16
Pore Volume Exchange (per week)	6.71	6.15	6.97	5.63	6.47	8.11
Required Wellhead Vacuum (IWC)	-4.280	**-2.635**	**-1.897**	**-1.753**	-1.997	-1.398

Notes/Formulas -

1. Values in BOLD represent field data. Values in regular font represent calculated values based on distance-drawdown relationship.
2. Field data used is from Depth D for each location during Hrs 4, 5 & 6 of VCS Test on 6/14/07.
3. Maximum ROI (feet) based on minimum ROI during VCS Test.
4. Based on data evaluation provided above, ARCADIS considers data from hour 5 (75 SCFM) to be outliers. Data is not used in further calculations.
5. Boxed solid line values represent selected design assumptions for Well DW-3D.
6. Boxed dashed line values represent selected design assumptions for Well DW-7D.

Table B-6. Data Evaluation for Extraction Well DW-3D, Pneumatic Conductivity Test, Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

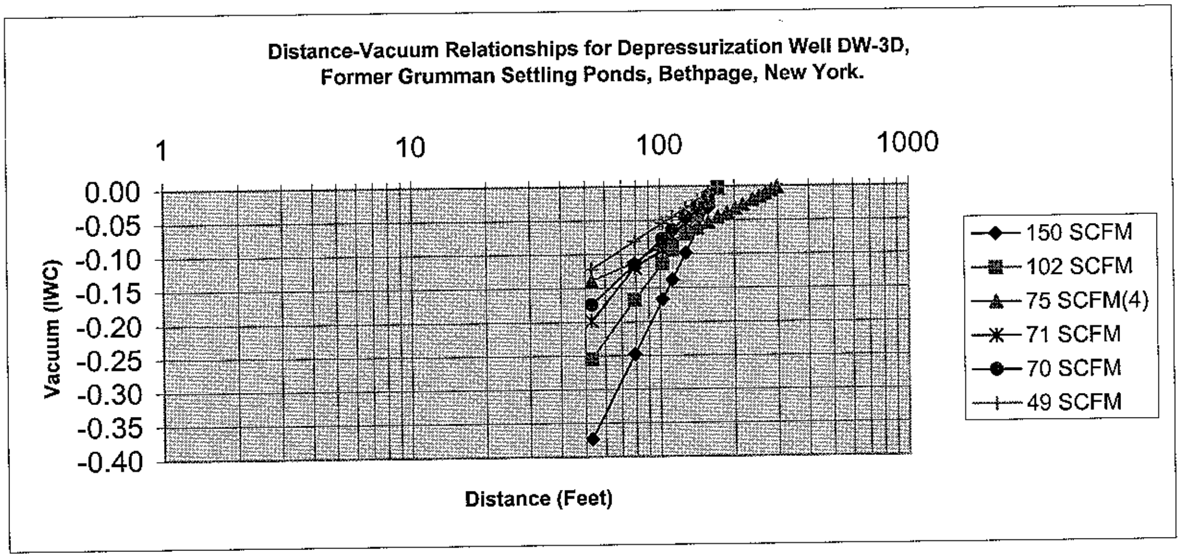

Table B-7. Individual Depressurization Pipe Sizing Preliminary Calculations, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Pressure Loss formula:

$$\Delta P = \left(\frac{0.0625 L v^2}{25{,}000 * d}\right) / C$$

L = length of pipe in feet
v = velocity of air through pipe in feet per second
d = inside diameter of pipe in inches
C = Conversion (0.361 psi)
ΔP = pressure loss in iwc

Well ID	Design Flow Rate (scfm)	Nominal Diameter (inches)	Effective Inside Diameter (inches)	Pipe Length (feet)	Velocity (ft/min)	Velocity (ft/s)	Pressure Loss (iwc)
DW-7D	49.0	4	3.938	417	579	10	0.684
DW-7S	45.0	4	3.938	410.5	532	9	0.568
DW-3D	102.0	4	3.938	565	1206	20	4.014
DW-3S	79.0	4	3.938	560	934	16	2.386
DW-5D	75.0	4	3.938	769.3	887	15	2.955
DW-5S	150.0	6	5.798	775.5	818	14	1.722
DW-6S	150.0	6	5.798	967.5	818	14	2.148
DW-6D	75.0	4	3.938	968	887	15	3.718
DW-1S	150.0	6	5.798	1150	818	14	2.554
DW-1D	75.0	4	3.938	1154	887	15	4.432
DW-4S	150.0	6	5.798	1346.5	818	14	2.990
DW-4D	75.0	4	3.938	1351	887	15	5.189
DW-8S	66.0	4	3.938	1487.5	780	13	4.424
DW-9S	66.0	4	3.938	1603	780	13	4.768
DW-2D	100.0	6	5.798	1714	545	9	1.692
DW-2S	66.0	4	3.938	1718	780	13	5.110
DW-10S	66.0	4	3.938	1834	780	13	5.455
DW-11S	66.0	4	3.938	1936.5	780	13	5.760

Notes & Abbreviations:

1. This calculation sheet is for pipe sizing only.
2. Pipe size for individual wells based on maximum pressure loss of 10 iwc.
3. Assumes piping is 17 high density poly ethylene.

ft/s feet per second
ft/min feet per minute
iwc inches of water column
psi pounds per square inch
scfm standard cubic feet per minute

Table B-8. Summary Table Schedule of Depressurization Wells, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Shallow Wells

Western Access Road	*Radius (feet)*	*Flow (scfm)*	*Screen (ft bls)*	*Well Head Req. Vac (iwc)*
DW-7S	66	45	10-30	-0.8
DW-3S	109	79	10-30	-1.6

Southern Access Road	*Radius (feet)*	*Flow (scfm)*	*Screen (ft bls)*	*Well Head Req. Vac (iwc)*
DW-5S	109	150	15-30	-3.932
DW-6S	109	150	15-30	-3.932
DW-1S	109	150	15-30	-3.932
DW-4S	109	150	15-30	-3.932
DW-8S	64	66	10-17	-3.843
DW-9S	64	66	10-17	-3.843
DW-2S	64	66	10-17	-3.843
DW-10S	64	66	10-17	-3.843
DW-11S	64	66	10-17	-3.843

Total for 11 Shallow wells 1,054 scfm
Safety factor 30%
1,370 scfm

Deep Wells

Western Access Road	*Radius (feet)*	*Flow (scfm)*	*Screen (ft bls)*	*Well Head Req. Vac (iwc)*
DW-7D	66	49	30-40	-1.4
DW-3D	109	102	30-50	-2.6

Southern Access Road	*Radius (feet)*	*Flow (scfm)*	*Screen (ft bls)*	*Well Head Req. Vac (iwc)*
DW-5D	110	75	42-47	-33.479
DW-6D	110	75	42-47	-33.479
DW-1D	110	75	42-47	-33.479
DW-4D	110	75	42-47	-33.479
DW-2D	404	100	27-47	-4.967

Total for 7 Deep wells 551 scfm
Safety factor 30%
716 scfm

Abbreviations:

ft bls feet below land surface
iwc inches water column
scfm standard cubic feet per minute

Table B-9. Depressurization System Headloss Calculations for Blower BL-200, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Pressure Loss formula for Straight Pipe and Duct:

$$\Delta P = \left(\frac{0.0625Lv^2}{25{,}000{*}d} \right) / C$$

L	= length of pipe in feet
v	= velocity of air through pipe in feet per second
d	= inside diameter of pipe in inches
C	= Conversion (0.361 psi)
ΔP	= pressure loss in iwc

Location Description	Design Flow Rate (scfm)	Inside Diameter (inches)	Pipe Length (feet)	Fitting/Valve Equivalent Length (feet)	Minor Loss Coefficient (ξ)	Fitting/Valve Quantity	Velocity (ft/min)	Velocity (ft/s)	Pressure Loss (iwc)
Well Head [1]	75	--	--	--	--	--	--	--	33.479
From Well Header to Treatment Shed									
4" SDR. 17 HDPE [2]	75	3.9	1351.0	--	--	--	887	15	5.189
Elbow (90)	75	3.9	--	16.7	--	4	887	15	0.257
Building Interior to Blower [3]									
4" SCH. 80 PVC	100	3.8	5.75	--	--	--	1250	21	0.045
Erdco Flowmeter	100	--	--	--	--	--	--	--	2.320
Ball Valve[4]	100	3.8	--	--	0.050	1	--	--	0.026
4"×6" Expansion	100	3.8	--	2.31	--	1	1250	21	0.018
Elbow (90)	100	5.8	--	16.7	--	1	553	9	0.017
Tee (Run)	175	5.8	--	12.3	--	1	967	16	0.038
Tee (Run)	250	5.8	--	12.3	--	1	1382	23	0.078
Tee (Run)	325	5.8	--	12.3	--	1	1796	30	0.133
Tee (Branch)	716	5.8	--	32.7	--	1	3957	66	1.710
6" SCH. 80 PVC	716	5.8	15.75	--	--	--	3957	66	0.824
Butterfly Valve	716	6.0	--	7.5	--	2	3647	61	0.639
Elbow (90)	716	5.8	--	16.7	--	3	3957	66	2.620
Knockout Tank	716	--	--	--	--	1	--	--	7.000
Air Filter	716	--	--	--	--	1	--	--	4.791
6"×4" Reducer	716	4.0	--	2.31	--	1	8205	137	0.748
From Blower to Heat Exchager									
4"×6" Expansion	716	4.0	--	2.31	--	1	8205	137	0.748
6" SCH. 40 C.S.	716	6.0	6.4	--	--	--	3647	61	0.273
Elbow(90)	716	6.0	--	16.7	--	1	3647	61	0.712
Tee (branch)	716	6.0	--	32.7	--	1	3647	61	1.394
6"×10" Expansion	2087	6.0	--	9.44	--	1	10629	177	3.420
10" A. Duct	2087	10.0	20.8	--	--	--	3826	64	0.586
Butterfly Valve	2087	10.0		7.5	--	1	3826	64	0.211
Elbow(90)	2087	10.0	--	26.0	--	3	3826	64	2.197
10"×12" Expansion	2087	10.0	--	5.77	--	1	3826	64	0.163

Continued on following page.

Table B-9. Depressurization System Headloss Calculations for Blower BL-200, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Location Description	Design Flow Rate (scfm)	Inside Diameter (inches)	Pipe Length (feet)	Fitting/Valve Equivalent Length (feet)	Minor Loss Coefficient (ξ)	Fitting/Valve Quantity	Velocity (ft/min)	Velocity (ft/s)	Pressure Loss (iwc)
From Heat Exchager to Carbon Unit									
12"×10" Reducer	2087	10.0	--	5.77	--	1	3826	64	0.163
Heat Exchanger	2087	--	--	--	--	--	--	--	5.536
Elbow(90)	2087	10.0	--	26.0	--	3	3826	64	2.197
10" A. Duct	2087	10.0	28.0	--	--	--	3826	64	0.789
10"×12" Expansion	2087	10.0	--	5.77	--	1	3826	64	0.163
Carbon Unit and Stack									
Carbon Unit	2087	--	--	--	--	2	--	--	3.600
25"×10" Contraction	2087	10.0	--	12.24	--	1	3826	64	0.345
Elbow (90)	2087	10.0	–	26.0	--	2	3826	64	1.465
10"×16" Expansion	2087	10.0	--	9.53		1	3826.4	63.8	0.268
16"A. Duct	2087	16.0	35.0	--	--	--	1495	25	0.094
Total Losses Vacuum (iwc)									59.932
Total Losses Pressure (iwc)									24.323

Notes, Calculations & Abbreviations:

1. Design vacuum from DW-4D used as worst-case value.
2. Design belowgrade pipe loss from DW-4D used as worst-case value.
3. Design flowrate from DW-2D (100 SCFM) used as worst-case value because it is furthest from blower.
4. Head losses for ball valve are calculated using:

$$\Delta h = \frac{\xi v^2}{2g}$$

Δh Headloss in iwc
ξ: Minorloss coefficient
v: Velocity of air through pipe (ft/s)
g: Acceleration of gravity

5. Head loss for reducer/ expansion is calculated using:

$\log(L_{equiv}) = -0.56424 + 0.120936\,F + 0.99912\,\log(D_{small})$, where:
F: Value dependent on the attached diameters and fitting type
Lequiv: Equivalent length of smaller pipe, feet
D_{small}: Nominal diameter of smaller pipe, inches
log( ): Base 10 logarithm

6. Head losses for flowmeter, knockout tank, filter, and carbon obtained directly from individual manufacturers.
7. Equivalent lengths for other fittings obtained from mulitple hydraulic/pnuematic pressure loss resources.

ft/s feet per second
ft/min feet per minute
iwc inches of water column
psi pounds per square inch
scfm standard cubic feet per minute

Table B-10. Depressurization System Headloss Calculations for Blower BL-300 and 400, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Pressure Loss formula for Straight Pipe and Duct:

$$\Delta P = \left(\frac{0.0625Lv^2}{25{,}000 * d} \right) / C$$

L = length of pipe in feet
v = velocity of air through pipe in feet per second
d = inside diameter of pipe in inches
C = Conversion (0.361 psi)
ΔP = pressure loss in iwc

Location Description	Design Flow Rate (scfm)	Inside Diameter (inches)	Pipe Length (feet)	Fitting/Valve Equivalent Length (feet)	Minor Loss Coefficient (ξ)	Fitting/Valve Quantity	Velocity (ft/min)	Velocity (ft/s)	Pressure Loss (iwc)
Well Head [1]	--	--	--	--	--	--	--	--	3.932
From Well Head to Treatment Shed									
4" SDR. 17 HDPE [2]	66	3.9	1936.5	--	--	--	780.3	13.0	5.760
Elbow (90)	66	3.9	--	16.7	--	4	795.6	13.3	0.209
Building Interior to Blower [3]									
4" SCH. 80 PVC	66	3.8	5.8	--	--	--	824.9	13.7	0.020
Erdco Flowmeter	66	--	--	--	--	--	--	--	2.100
Ball Valve [4]	66	3.8	--	--	0.050	1	--	--	0.011
4"×6" Expansion	66	3.8	--	2.31	--	1	825	14	0.008
Elbow (90)	66	5.8	--	16.7	--	1	359.7	6.0	0.007
Tee (Run)	132	5.8	--	12.3	--	1	719.4	12.0	0.021
Tee (Run)	198	5.8	--	12.3	--	1	1079.2	18.0	0.048
Tee (Run)	264	5.8	--	12.3	--	1	1438.9	24.0	0.084
Tee (Run)	330	5.8	--	12.3	--	1	1798.6	30.0	0.132
Tee (Run)	480	5.8	--	12.3	--	1	2616.1	43.6	0.279
Tee (Run)	630	5.8	--	12.3	--	1	3433.7	57.2	0.481
Tee (Run)	780	5.8	--	12.3	--	1	4251.2	70.9	0.737
Tee (Run)	930	5.8	--	12.3	--	1	5068.7	84.5	1.048
Tee (Run)	1009	5.8	--	12.3	--	1	5499.3	91.7	1.234
Tee (Run)	1054	5.8	--	12.3	--	1	5744.6	95.7	1.346
Elbow (90)	1370	5.8	--	16.7	--	1	7466.9	124.4	3.088
6" SCH. 80 PVC	1370	5.8	4	--	--	--	7571	126	0.766
Butterfly Valve	1370	6.0	--	7.5	--	1	6977.4	116.3	1.171
Tee (Branch)	685	5.8	--	32.7	--	1	3785.5	63.1	1.565
6" SCH. 80 PVC	685	5.8	11	--	--	--	3785	63	0.526
Butterfly Valve	685	6.0	--	7.5	--	2	3488.7	58.1	0.585
Elbow (90)	685	5.8	--	16.7	--	3	3733.4	62.2	2.316
Knockout Tank	685	--	--	--	--	1	--	--	7.000
Air Filter	685	--	--	--	--	--	--	--	3.891
6"×4" Reducer	685	4.0	--	2.31	--	1	7850	131	0.685

Continued on following page.

Table B-10. Depressurization System Headloss Calculations for Blower BL-300 and 400, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Location Description	Design Flow Rate (scfm)	Inside Diameter (inches)	Pipe Length (feet)	Fitting/Valve Equivalent Length (feet)	Minor Loss Coefficient (ξ)	Fitting/Valve Quantity	Velocity (ft/min)	Velocity (ft/s)	Pressure Loss (iiwc)
From Blower to Heat Exchanger									
4"×6" Expansion	685	4.0	--	2.31	--	1	7850	131	0.685
6" SCH. 40 C.S.	685	6.0	11.0	--	--	--	3488.7	58.1	0.429
Tee (Run)	1370	6.0	--	12.3	--	1	6977	116	1.920
6" SCH. 40 C.S.	1370	6.0	5.0	--	--	--	6977.4	116.3	0.780
Tee (Run)	2087	6.0	--	12.3	--	1	10629	177	4.455
6" SCH. 40 C.S.	2087	6.0	3.0	--	--	--	10629.0	177.2	1.087
6"×10" Expansion	2087	6.0	--	9.44	--	1	10629	177	3.420
10" A.Duct	2087	10.0	20.8	--	--	--	3826.4	63.8	0.586
Butterfly Valve	2087	10.0		7.5	--	1	3826	63.8	0.211
Elbow (90)	2087	10.0	--	26.0	--	3	3826.4	63.8	2.197
10"×12" Expansion	2087	10.0	--	5.77	--	1	3826	64	0.163
From Heat Exchanger to Carbon Unit									
12"×10" Reducer	2087	10.0	--	5.77	--	1	3826	64	0.163
Heat Exchanger	--	--	--	--	--	--	--	--	5.536
Elbow (90)	2087	10.0	--	26.0	--	3	3826.4	63.8	2.197
10" A. Duct	2087	10.0	28.0	--	--	--	3826.4	63.8	0.789
10"×12" Expansion	2087	10.0	--	5.77	--	1	3826	64	0.163
Carbon Unit and Stacks									
Carbon Unit	2087	--	--	--	--	2	--	--	3.600
25"×10" Contraction	2087	10.0	--	12.24	--	1	3826	64	0.345
Elbow(90)	2087	10.0	--	26.0	--	2	3826.4	63.8	1.465
10"×16" Expansion	2087	10.0	--	9.53		1	3826.4	63.8	0.268
16" A. Duct	2087	16.0	35.0	--	--	--	1494.7	24.9	0.094
Total Losses Vacuum (iwc)									39.050
Total Losses Pressure (iwc)									30.552

Notes, Calculations & Abbreviations:

1. Design vacuum from DW-4S used as worst-case value.
2. Design below grade pipe loss from DW-11S used as worst-case value.
3. Design flowrate from DW-11S (66 SCFM) used as worst-case value because it is furthest from blower.
4. Head losses for ball valve are calculated using:

$$\Delta h = \frac{\xi v^2}{2g}, \text{ where:}$$

Δh Headloss in iwc
ξ: Minor loss coefficient
v: Velocity of air through pipe (ft/s)
g: Acceleration of gravity

5. Head loss for reducer/ expansion is calculated using:

$$\log(L_{equiv}) = -0.56424 + 0.120936\, F + 0.99912 \log(D_{small}), \text{ where:}$$

F: Value dependent on the attached diameters and fitting type
L_{equiv}: Equivalent length of smaller pipe, feet
D_{small}: Nominal diameter of smaller pipe, inches
log( ): Base 10 logarithm

ft/s	feet per second
ft/min	feet per minute
iwc	inches of water column
psi	pounds per square inch
scfm	standard cubic feet per minute

Table B-11. Basis of Vapor Design Concentrations, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Individual Depressurization Well Design Concentrations

CONSTITUENT (ug/m3)		DW-7S(1,7)	DW-7D(1,8)	DW-3S(9)	DW-3D(10)	DW-5S(1,7)	DW-5D(1,8)	DW-6S	DW-6D	DW-1S(3)
	Depressurization Well ID:	DW-7S(1,7)	DW-7D(1,8)	DW-3S(9)	DW-3D(10)	DW-5S(1,7)	DW-5D(1,8)	DW-6S	DW-6D	DW-1S(3)
	Screened:	(10-30)	(30-50)	(10-30)	(30-50)	(15-30)	(42-47)	(15-30)	(42-47)	(15-30)
	Well Design Flow (scfm):	45	49	79	102	150	75	150	75	150
	Well Design Flow (m3/min)	1.3	1.4	2.2	2.9	4.2	2.1	4.2	2.1	4.2
	Design Basis:	SGP-13	SGP-13	DW-03S	DW-03D	SGP-14	SGP-14	SVP-4	SVP-4	DW-1S
	Sample ID:	19.5 - 20	41 - 41.5	DW-3S-20070613	DW-3D-20070614	19.5 - 20	47.5 - 48	SVP-4(15')	SVP-4(40')	DW1S
	Sample Date:	5/29/2007	5/31/2007	6/13/2007	6/14/2007	6/1/2007	6/1/2007	10/26/2004	10/26/2004	3/22/2007
	Depth:	19.5-20	41-41.5	19.5-20	44.5-45	19.5-20	44.5-48	15	40	15-30
	Units:	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)
Volatile Organic Compounds	CAS Number									
1,1,1-Trichloroethane	71-55-6	< 8.1	< 17	660	720	78	39	71	<110	54
1,1-Dichloroethane	75-34-3	< 13	< 27	170	220	1.5	1.5	19	<85	< 12
1,1-Dichloroethylene	75-35-4	< 12	< 25	< 11	< 13	1.4	< 0.028	<9.9	<83	< 12
1,2-Dichloroethene	540-59-0	--	--	--	--	--	--	<9.9	<83	*<24*
1,3-Butadiene	106-99-0	< 52	< 110	< 12	< 14	17	160	31	400	< 13
2,2,4-Trimethylpentane	540-84-1	--	--	--	--	--	--	<12	<98	NA
2-Butanone (Methyl ethyl ketone)	78-93-3	< 13	< 27	49	< 19	11	200	18	270	47
2-Hexanone (Methyl n-Butyl Ketone)	591-78-6	< 9.8	< 21	< 11	< 13	3.5	24	<10	<86	< 12
4-Methyl-2-Pentanone	108-10-1	< 6.9	< 15	< 22	< 26	1	9.6	<10	<86	< 24
Acetone	67-64-1	< 52	< 110	130 J	53	51	790 J	140	2100	< 32
Benzene	71-43-2	< 10	< 22	< 8.6	< 10	6.2	59	45	640	< 9.5
Benzene, 1,2,4-trimethyl	95-63-6	--	--	--	--	--	--	<12	<100	NA
Bromomethane (Methyl bromide)	74-83-9	< 33	< 70	< 11	< 13	< 0.08	1.6	<9.7	<82	< 12
Carbon disulfide	75-15-0	< 14	< 29	< 8.4	< 10	3	14	17	<65	< 9.2
Carbon tetrachloride	56-23-5	< 17	< 37	< 3.4	< 4.1	0.92	0.93	<16	<130	31
Chlorobenzene	108-90-7	< 14	< 31	< 12	< 15	< 0.035	< 0.035	<12	100	< 14
Chloroform	67-66-3	< 12	< 25	71	75	6.2	3.8	<12	<100	< 14
cis-1,2-Dichloroethylene	156-59-2	33,000	70,000	8,800 D	17,000 D	< 0.021	< 0.021	<9.9	<83	130
Cyclohexane	110-82-7	--	--	--	--	--	--	72	260	NA
Dichlorodifluoromethane (CFC-12)	75-71-8	< 14	< 29	*<3.2*	*2.3*	2.4	2.2	<12	<100	*<74*
Ethylbenzene	100-41-4	< 13	< 27	< 23	< 28	4.4	15	12	<91	< 26
1,1,2-Trichlorotrifluoroethane (Freon 113)	76-13-1	< 21	< 45	21	27	3.8	2.5	<19	<160	17
m&p-Xylenes	NA	< 26	< 56	< 47	< 56	20	46	30	140	68
Methyl tert-butyl ether	1634-04-4	*< 20*	*< 23*	< 20	< 23	*< 20*	*< 23*	<9	<76	< 21
n-Heptane	142-82-5	--	--	--	--	--	--	82	290	NA
n-Hexane	110-54-3	--	--	--	--	--	--	74	340	NA
o-Xylene	95-47-6	< 15	< 32	< 23	< 28	6.4	17	11	<91	28
p-Dichlorobenzene	106-46-7	--	--	--	--	--	--	<15	<130	NA
p-Ethyltoluene	622-96-8	--	--	--	--	--	--	<12	<100	NA
Styrene	100-42-5	< 9.8	< 21	< 23	< 28	1.2	4.9	<11	<89	< 25
tert-Butyl alcohol	75-65-0	--	--	--	--	--	--	<76	<640	NA
Tetrachloroethylene	127-18-4	1,200	2,200	570	800	25	5.3	56	<140	44
Toluene (Methylbenzene)	108-88-3	< 12	< 26	270	40	21	92	64	570	59
trans-1,2-Dichloroethene	156-60-5	530	720 J	330	430	< 0.03	< 0.029	<9.9	<83	< 12
trans-1,3-Dichloropropene	10061-02-6	< 13	< 27	< 12	< 15	< 0.031	< 0.031	<11	<95	< 13
Trichloroethylene	79-01-6	52,000	77,000	39,000 D	65,000 D	410	100	640	<110	840
Trichlorofluoromethane (CFC-11)	75-69-4	*21*	*21*	21	21	*21*	*21*	<14	<120	NA
Vinyl chloride	75-01-4	< 17	< 36	< 14	< 17	< 0.041	< 0.04	<6.4	<54	28
Xylene (total)	1330-20-7	--	--	--	--	--	--	42	150	*<26*
Total VOCs:		86,751	149,941	50,092	84,388	696	1,609	1424	5260	1346

CONSTITUENT (ug/m3)		DW-1D(4)	DW-4S	DW-4D	DW-8S(1)	DW-9S(2)	DW-2S(5)	DW-2D(6)	DW-10S(1)	DW-11S(1)
	Depressurization Well ID:	DW-1D(4)	DW-4S	DW-4D	DW-8S(1)	DW-9S(2)	DW-2S(5)	DW-2D(6)	DW-10S(1)	DW-11S(1)
	Screened:	(42-47)	(15-30)	(42-47)	(10-17)	(10-17)	(10-17)	(27-47)	(10-17)	(10-17)
	Well Design Flow (scfm):	75	150	75	66	66	66	100	66	66
	Well Design Flow (m3/min)	2.1	4.2	2.1	1.9	1.9	1.9	2.8	1.9	1.9
	Design Basis:	DW-1D	SVP-3	SVP-3	SVP-3	DW-2S	DW-2S	DW-2D	SVP-1	SVP-1
	Sample ID:	DWID INF	SVP-3(15')	SVP-3(40')	SVP-3(15')	PCT ASP-1	PCT ASP-1	DW-2D INF	SVP-1(15')	SVP-1(15')
	Sample Date:	3/23/2007	10/26/2004	10/26/2004	10/26/2004	3/20/2007	3/20/2007	3/21/2007	10/27/2004	10/27/2004
	Depth:	42-47	15	40	15	10-17	10-17	27-47	15	15
	Units:	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)
Volatile Organic Compounds	CAS Number									
1,1,1-Trichloroethane	71-55-6	88	150	310	150	1.4	1.4	59	9.8	9.8
1,1-Dichloroethane	75-34-3	< 12	29	160	29	< 0.45	< 0.45	< 3.9	<2	<2
1,1-Dichloroethylene	75-35-4	18	<12	<40	<12	1.5	1.5	< 3.9	<2	<2
1,2-Dichloroethene	540-59-0	*<39*	34	150	34	*<2*	*<2*	*<2*	<2	<2
1,3-Butadiene	106-99-0	< 14	17	110	17	< 0.49	< 0.49	< 4.3	29	29
2,2,4-Trimethylpentane	540-84-1	NA	<14	<47	<14	*2.6*	*2.6*	*<2.3*	<2.3	<2.3
2-Butanone (Methyl ethyl ketone)	78-93-3	42	35	56	35	35	35	49	15	15
2-Hexanone (Methyl n-Butyl Ketone)	591-78-6	< 13	<12	<41	<12	< 0.45	< 0.45	< 4	<2	<2
4-Methyl-2-Pentanone	108-10-1	< 25	<12	<41	<12	< 0.9	< 0.9	< 8	<2	<2
Acetone	67-64-1	< 33	330	570	330	8.4	8.4	< 11	240	240
Benzene	71-43-2	< 9.8	22	83	22	< 0.35	< 0.35	< 3.1	27	27
Benzene, 1,2,4-trimethyl	95-63-6	NA	<15	<49	<15	*6.4*	*6.4*	*6.9*	4.9	4.9
Bromomethane (Methyl bromide)	74-83-9	< 12	<12	<39	<12	< 0.43	< 0.43	< 3.8	<1.9	<1.9
Carbon disulfide	75-15-0	< 9.5	78	65	78	< 0.34	< 0.34	< 3	18	18
Carbon tetrachloride	56-23-5	40	<19	<63	<19	< 0.14	< 0.14	< 1.2	<3.1	<3.1
Chlorobenzene	108-90-7	< 14	<14	<46	<14	< 0.51	< 0.51	< 4.5	<2.3	<2.3
Chloroform	67-66-3	22	<15	<49	<15	0.68	0.68	< 4.8	<2.4	<2.4
cis-1,2-Dichloroethylene	156-59-2	36	23	120	23	630	630	83	<2	<2
Cyclohexane	110-82-7	NA	76	220	76	*79*	*79*	*130*	<1.7	<1.7
Dichlorodifluoromethane (CFC-12)	75-71-8	*<120*	<15	<49	<15	*<2.5*	*<2.5*	*<2.5*	<2.5	<2.5
Ethylbenzene	100-41-4	< 27	<13	<43	<13	< 0.95	< 0.95	< 8.5	7.8	7.8
1,1,2-Trichlorotrifluoroethane (Freon 113)	76-13-1	45	<23	<77	<23	0.46	0.46	4.8	<3.8	<3.8
m&p-Xylenes	NA	< 53	26	52	26	2.3	2.3	< 17	23	23
Methyl tert-butyl ether	1634-04-4	< 22	<11	<36	<11	< 0.79	< 0.79	< 7	2.9	2.9
n-Heptane	142-82-5	NA	45	110	45	*53*	*53*	*130*	40	40
n-Hexane	110-54-3	NA	19	74	19	*31*	*31*	*120*	23	23
o-Xylene	95-47-6	< 27	<13	<43	<13	1.1	1.1	< 8.5	7.4	7.4
p-Dichlorobenzene	106-46-7	NA	<18	<60	<18	*11*	*11*	--	9	9
p-Ethyltoluene	622-96-8	NA	<15	<49	<15	*<2.5*	*<2.5*	--	5.9	5.9
Styrene	100-42-5	< 26	<13	<43	<13	< 0.94	< 0.94	< 8.3	<2.1	<2.1
tert-Butyl alcohol	75-65-0	NA	<91	<300	<91	*<15*	*<15*	*39*	18	18
Tetrachloroethylene	127-18-4	83	81	160	81	9.5	9.5	25	55	55
Toluene (Methylbenzene)	108-88-3	< 12	45	110	45	1.5	1.5	< 3.7	41	41
trans-1,2-Dichloroethene	156-60-5	< 12	13	40	13	< 0.44	< 0.44	< 3.9	<2	<2
trans-1,3-Dichloropropene	10061-02-6	< 14	<14	<45	<14	< 0.5	< 0.5	< 4.4	<2.3	<2.3
Trichloroethylene	79-01-6	1600	860	2500	860	140	140	390	24	24
Trichlorofluoromethane (CFC-11)	75-69-4	NA	<17	<56	<17	*<2.8*	*<2.8*	*<2.8*	<2.8	<2.8
Vinyl chloride	75-01-4	33	<7.7	<26	<7.7	3.1	3.1	< 5	<1.3	<1.3
Xylene (total)	1330-20-7	*<43*	27	52	27	--	--	--	31	31
Total VOCs:		2007	1910	4942	1910	1018	1018	1037	632	632

Notes:

1. Data based on nearby SGP.
2. Data based on nearby PCT location.
3. Underlined and italic values for location DW-1S are from SGP-05 interval 34-34.5 ft for sampling conducted on 5/5/06.
4. Underlined and italic values for location DW-1D are from SGP-05 interval 49-49.5 ft for sampling conducted on 5/5/06.
5. Underlined and italic values for location DW-2S are from SGP-2 interval 15 ft for sampling conducted on 10/26/04.
6. Underlined and italic values for location DW-2D are from SGP-2 interval 40 ft for sampling conducted on 10/27/04.
7. Underlined and italic are from Well 3S pilot test results 6/13/07.
8. Underlined and italic are from Well 3D pilot test results 6/14/07.
9. Underlined and italic values for location DW-3S are from SGP-11 interval 19.5-20 ft for sampling conducted on 3/23/07.
10. Underlined and italic values for location DW-3D are from SGP-11D interval 44.5-45 ft for sampling conducted on 3/22/07.

Abbreviations:

--	not analyzed
<26	underlined and italic values were not analyzed for in subject sample, value taken from adjacent locations per footnotes.
Bold	detected compound.
CAS	chemical abstracts service registry number
ND	not detected
ug/m3	micrograms per meter cubed

Table B-12. Summary of Vapor Design Concentrations and Mass Loading Rates, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

CONSTITUENT (ug/m^3)	Units:	Shallow Well System Design Concentration (ug/m^3)	Deep Well System Design Concentration (ug/m^3)	Total Influent Design Concentration (ug/m^3)	Shallow Well System Design Concentration (ppbv)	Deep Well System Design Concentration (ppbv)	Total Influent Design Concentration (ppbv)	Shallow Well System Design Mass Loading (lbs/yr)	Deep Well System Design Mass Loading (lbs/yr)	Total Influent Design Mass Loading (lbs/yr)
Volatile Organic Compounds	**CAS Number**									
1,1,1-Trichloroethane	71-55-6	110.5	203.5	142.4	19.63	36.15	25.30	3.82	3.68	7.50
1,1-Dichloroethane	75-34-3	21.6	62.7	35.7	5.17	15.01	8.55	0.75	1.13	1.88
1,1-Dichloroethylene	75-35-4	0.4	2.5	1.1	0.09	0.60	0.27	0.01	0.04	0.06
1,2-Dichloroethene	540-59-0	7.0	20.4	11.6	1.70	4.99	2.83	0.24	0.37	0.61
1,3-Butadiene	106-99-0	13.9	91.2	40.5	6.11	39.96	17.73	0.48	0.66	1.15
2,2,4-Trimethylpentane	540-84-1	0.3	0.0	0.2	0.07	0.00	0.04	0.01	0.00	0.01
2-Butanone (Methyl ethyl ketone)	78-93-3	27.9	86.2	47.9	9.18	28.33	15.75	0.97	0.89	1.86
2-Hexanone (Methyl n-Butyl Ketone)	591-78-6	0.5	3.3	1.4	0.12	0.77	0.34	0.02	0.06	0.08
4-Methyl-2-Pentanone	108-10-1	0.1	1.3	0.5	0.03	0.31	0.13	0.00	0.02	0.03
Acetone	67-64-1	135.7	480.8	254.1	55.35	196.15	103.69	4.69	3.52	8.21
Benzene	71-43-2	15.2	106.4	46.5	4.61	32.30	14.11	0.52	0.35	0.87
Benzene, 1,2,4-trimethyl	95-63-6	1.4	1.3	1.4	0.28	0.25	0.27	0.05	0.02	0.07
Bromomethane (Methyl bromide)	74-83-9	0.0	0.2	0.1	0.00	0.05	0.02	0.00	0.00	0.00
Carbon disulfide	75-15-0	21.1	10.8	17.5	6.57	3.35	5.46	0.73	0.19	0.92
Carbon tetrachloride	56-23-5	4.5	5.6	4.9	0.70	0.86	0.75	0.16	0.10	0.26
Chlorobenzene	108-90-7	0.0	13.6	4.7	0.00	2.86	0.98	0.00	0.00	0.00
Chloroform	67-66-3	6.3	17.4	10.1	1.25	3.45	2.01	0.22	0.31	0.53
cis-1,2-Dichloroethylene	156-59-2	2170.6	9408.3	4655.3	530.62	2299.93	1138.03	75.05	170.05	245.10
Cyclohexane	110-82-7	35.7	88.9	54.0	10.06	25.04	15.20	1.23	0.97	2.20
Dichlorodifluoromethane (CFC-12)	75-71-8	0.3	0.7	0.5	0.07	0.14	0.09	0.01	0.01	0.02
Ethylbenzene	100-41-4	3.3	2.0	2.9	0.74	0.46	0.64	0.11	0.04	0.15
1,1,2-Trichlorotrifluoroethane (Freon 113)	76-13-1	4.6	12.3	7.2	0.58	1.56	0.92	0.16	0.22	0.38
m&p-Xylenes	NA	25.3	32.4	27.7	5.76	7.38	6.31	0.87	0.24	1.12
Methyl tert-butyl ether	1634-04-4	0.4	0.0	0.2	0.10	0.00	0.06	0.01	0.00	0.01
n-Heptane	142-82-5	32.5	78.0	48.2	7.70	18.46	11.39	1.13	0.70	1.82
n-Hexane	110-54-3	21.2	78.1	40.7	5.83	21.49	11.20	0.73	0.58	1.31
o-Xylene	95-47-6	7.5	2.3	5.7	1.71	0.53	1.31	0.26	0.04	0.30
p-Dichlorobenzene	106-46-7	2.5	0.0	1.6	0.40	0.00	0.27	0.09	0.00	0.09
p-Ethyltoluene	622-96-8	0.7	0.0	0.5	0.15	0.00	0.10	0.03	0.00	0.03
Styrene	100-42-5	0.2	0.7	0.3	0.04	0.15	0.08	0.01	0.01	0.02
tert-Butyl alcohol	75-65-0	2.3	7.1	3.9	0.72	2.26	1.25	0.08	0.13	0.21
Tetrachloroethylene	127-18-4	136.4	382.1	220.8	19.49	54.58	31.54	4.72	6.91	11.62
Toluene (Methylbenzene)	108-88-3	55.3	112.5	74.9	14.22	28.93	19.27	1.91	0.63	2.54
trans-1,2-Dichloroethene	156-60-5	50.0	149.1	84.0	12.23	36.44	20.54	1.73	2.69	4.42
Trichloroethylene	79-01-6	5609.0	19522.7	10385.6	1011.75	3521.48	1873.35	193.93	352.87	546.80
Trichlorofluoromethane (CFC-11)	75-69-4	5.5	8.6	6.5	0.94	1.49	1.13	0.19	0.16	0.34
Vinyl chloride	75-01-4	4.4	4.5	4.4	1.66	1.70	1.67	0.15	0.08	0.23
Xylene (total)	1330-20-7	15.4	27.5	19.5	3.50	6.26	4.45	0.53	0.13	0.66
Total VOCs:		**8,550**	**31,025**	**16,265**	**1,739**	**6,394**	**3,337**	**295**	**548**	**843**

Notes, Abbreviations and Calculation on next page

Table B-12. Summary of Vapor Design Concentrations and Mass Loading Rates, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Notes, Abbreviations and Calculation:

1. Values for ND and NA results set to zero for design calculations.
2. Constituents shown are for analytes that were detected in one or more soil gas samples used for design purposes.

--	not analyzed
Bold	detected compound.
CAS	chemical abstracts service registry number
lbs/yr	pounds per year
ND	not detected
ppbv	parts per billion by volume
ppmv	parts per million by volume
ug/m^3	micrograms per meter cubed

$$\text{ppmv} = \frac{\text{mass removed}(\mu g)}{\text{air flow}(m^3)} \times \frac{0.0237}{\text{molecularweight}}$$

Table B-13. Preliminary NYSDEC DAR-1 Annual Guidance Concentration Air Modeling Analysis, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Discharge Temperature	T	560	°R
Ambient Temperature	T_a	525	°R
Exit Flow	Q	2086	scfm
Stack Height	h_s	30	ft
Building Height	h_b	8	ft
Ratio of Heights	h_s/h_b	3.75	
Plume rise credit? $h_s/h_b > 1.5$?	(If no, $h_e=h_s$)	(If Yes, $h_e = h_s + 1.1\ (F_m)^{1/3}$)	
Momentum Flux	$F_m = T_a/T * V^2 * R^2$	n/a	ft^4/s^2
Effective Stack Height	h_e	30.0	ft
Reduction Factor? $2.5 > h_s/h_b > 1.5$?	RF	No, do not reduce impact	
Actual Annual Impact	C_a	$RF*6*Q_a/h_e^{2.25}$	
Mass Flow	Q_a	S lbs emitted for last 12 months	

Notes, Assumptions & Abbreviations:

1. The stack discharge temperature is 100°F based on anticipated conditions.
2. The ambient temperature is estimated at 65°F for design purposes.
3. AGC refers to the Annual Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated December 22, 2003.

CAS chemical abstracts service registry number
fps feet per second
scfm standard cubic feet per minute
ug/m^3 micrograms per cubic meter
lb/yr pounds per year
ppb parts per billion
°R = °F + 460

Table B-13. Preliminary NYSDEC DAR-1 Annual Guidance Concentration Air Modeling Analysis, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Compounds	CAS Number	Molecular Weight	Maximum Limit on C_a (AGC[3]) ug/m^3	Maximum Allowable Annual Mass Flow Q_a lb/yr	Design Mass Flow per Year lb/yr	**Percent of Maximum Allowable Annual Mass Flow %**
1,1,1-Trichloroethane	71-55-6	133.4	1,000	351,052.10	7.50	**0.00**
1,1-Dichloroethane	75-34-3	99	0.63	221.16	1.88	**0.85**
1,1-Dichloroethylene	75-35-4	97	70	24,573.65	0.06	**0.00**
1,2-Dichloroethene	540-59-0	97	1,900	666,998.99	0.61	**0.00**
1,3-Butadiene	106-99-0	54.09	0.028	9.83	1.15	**11.66**
2,2,4-Trimethylpentane	540-84-1	114.22	3,300	1,158,471.92	0.01	**0.00**
2-Butanone (Methyl ethyl ketone)	78-93-3	72.11	5,000	1,755,260.49	1.86	**0.00**
2-Hexanone (Methyl n-Butyl Ketone)	591-78-6	100.2	48	16,850.50	0.08	**0.00**
4-Methyl-2-Pentanone	108-10-1	100.2	3,000	1,053,156.29	0.03	**0.00**
Acetone	67-64-1	58.09	28,000	9,829,458.74	8.21	**0.00**
Benzene	71-43-2	78.1	0.13	45.64	0.87	**1.92**
Benzene, 1,2,4-trimethyl	95-63-6	120.2	290	101,805.11	0.07	**0.00**
Bromomethane (Melthyl bromide)	74-83-9	94.95	5	1,755.26	0.00	**0.00**
Carbon disulfide	75-15-0	76.1	700	245,736.47	0.92	**0.00**
Carbon tetrachloride	56-23-5	153.8	0.067	23.52	0.26	**1.10**
Chlorobenzene	108-90-7	112.6	110	38,615.73	0.00	**0.00**
Chloroform	67-66-3	119.4	0.043	15.10	0.53	**3.52**
cis-1,2-Dichloroethylene	156-59-2	96.95	1,900	666,998.99	245.10	**0.04**
Cyclohexane	110-82-7	84.16	6,000	2,106,312.59	2.20	**0.00**
Dichlorodifluoromethane (CFC-12)	75-71-8	120.92	12,000	4,212,625.17	0.02	**0.00**
Ethylbenzene	100-41-4	106.2	1,000	351,052.10	0.15	**0.00**
1,1,2-Trichlorotrifluoroethane (Freon 113)	76-13-1	187.4	180,000	63,189,377.62	0.38	**0.00**
m&p-Xylenes	NA	104.1	100	35,105.21	1.12	**0.00**
Methyl tert-butyl ether	1634-04-4	88.15	3,000	1,053,156.29	0.01	**0.00**
n-Heptane	142-82-5	100.21	3,900	1,369,103.18	1.82	**0.00**
n-Hexane	110-54-3	86.18	200	70,210.42	1.31	**0.00**
o-Xylene	95-47-6	104.1	100	35,105.21	0.30	**0.00**
p-Dichlorobenzene	106-46-7	147	0.09	31.59	0.09	**0.27**
p-Ethyltoluene	622-96-8	120.19	NA	NA	0.03	**--**
Styrene	100-42-5	104.15	1,000	351,052.10	0.02	**0.00**
tert-Butyl alcohol	75-65-0	74.12	720	252,757.51	0.21	**0.00**
Tetrachloroethylene	127-18-4	165.9	1	351.05	11.62	**3.31**
Toluene (Methylbenzene)	108-88-3	92.14	400	140,420.84	2.54	**0.00**
trans-1,2-Dichloroethene	156-60-5	96.95	1,900	666,998.99	4.42	**0.00**
Trichloroethylene	79-01-6	131.39	0.50	175.53	546.80	**311.52**
Trichlorofluoromethane (CFC-11)	75-69-4	137.38	NA	NA	0.34	**--**
Vinyl chloride	75-01-4	62.5	0.11	38.62	0.23	**0.60**
Xylene (total)	1330-20-7	104.1	100	35,105.21	0.66	**0.00**

Notes, Assumptions & Abbreviations:

1. The stack discharge temperature is 100°F based on anticipated conditions.
2. The ambient temperature is estimated at 65°F for design purposes.
3. AGC refers to the Annual Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated December 22, 2003.

CAS chemical abstracts service registry number
fps feet per second
scfm standard cubic feet per minute
ug/m^3 micrograms per cubic meter
lb/yr pounds per year
ppb parts per billion
°R = °F + 460

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Appendix C

Preliminary Sampling and Analysis Plan

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To Be Provided Under Separate Cover

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Appendix D

NYSDEC Minor Facility Air Registration Form and Town of Oyster Bay Discharge Authorization Letter

New York State Department of Environmental Conservation
Air Facility Registration

DEC ID
- -

Owner/Firm				Taxpayer ID 136400434
Name	Northrop Grumman Systems Corporation			
Street Address	Mail Stop Z18-025, 600 Grumman Road West			
City / Town / Village	Bethpage	State or Province NY	Country USA	Zip 11714-3583

Owner/Firm Contact		
Name	Larry Leskovjan	Phone No. 516-575-2333

Facility		
Name	Northrop Grumman Systems Corporation	
Location Address	Mail Stop Z18-025, 600 Grumman Road West, Bethpage, NY	
■ City / □ Town / □ Village	New York	Zip 11714-3583

Facility Information

Total Number of Emission Points: 1 (stack)	☐ Cap by Rule

Description

Northrop Grumman Systems Corporation (NG) is implementing the Operable Unit 3 (OU3) Soil Gas Interim Remedial Measure (SG IRM) pursuant to the Order On Consent (Consent Order or CO) Index # W1-0018-04-01 that was executed by the New York State Department of Environmental Conservation (NYSDEC) and NG, effective July 4, 2005 (NYSDEC 2005). The present day Bethpage Community Park property (Park), which the NYSDEC has termed the "Former Grumman Settling Ponds Area" and designated as OU3, as well as the adjacent Plant 24 Access Road Property are collectively referred to herein as the Site. NG has elected to implement an Interim Remedial Measures (IRMs) soil gas mitigation system to address non-Freon 12 and non-Freon 22 related soil gas that may be emanating from the Park. The SG IRM will use a subsurface depressurization system (SDS) to prevent VOCs in the on-site soil gas from migrating off-site along the site southern and western property boundary (i.e. on the Plant 24 Access Road Property). SDS will consist of vertical extraction wells connected to regenerative type vacuum blowers to induce and maintain a vacuum in the subsurface. The collected soil gas will be vented through a 30-foot high stack located in the vicinity of the treatment buildings. Soil gas treatment will be provided during initial system operation through a single 10,000-lb carbon adsorption bed.

A summary of the anticipated design mass loading rate of individual VOCs along with a preliminary NYSDEC DAR-1 air model evaluation is provided in Appendix B, Table B-13, of the 95% Design Report.

Standard Industrial Classification Codes

NAICS 336411					

HAP CAS Numbers

See Table B-13					

Applicable Federal and New York State Requirements (Part Nos.)

201-3.3 (29)					

Certification

I certify that this facility will be operated in conformance with all provisions of existing regulations.

Responsible Official	Title Deputy Commissioner
Signature	Date / / .

7/29/96

NORTHROP GRUMMAN

Northrop Grumman Corporation
Integrated Systems

Eastern Region
600 Grumman Road West
Bethpage, New York 11714-5000

ESH&M-07L-049
September 6, 2007

Mr. Maurice J. Osman
Chief Chemist
Cedar Creek WPCP
3340 Merrick Road
Wantagh, New York 11793

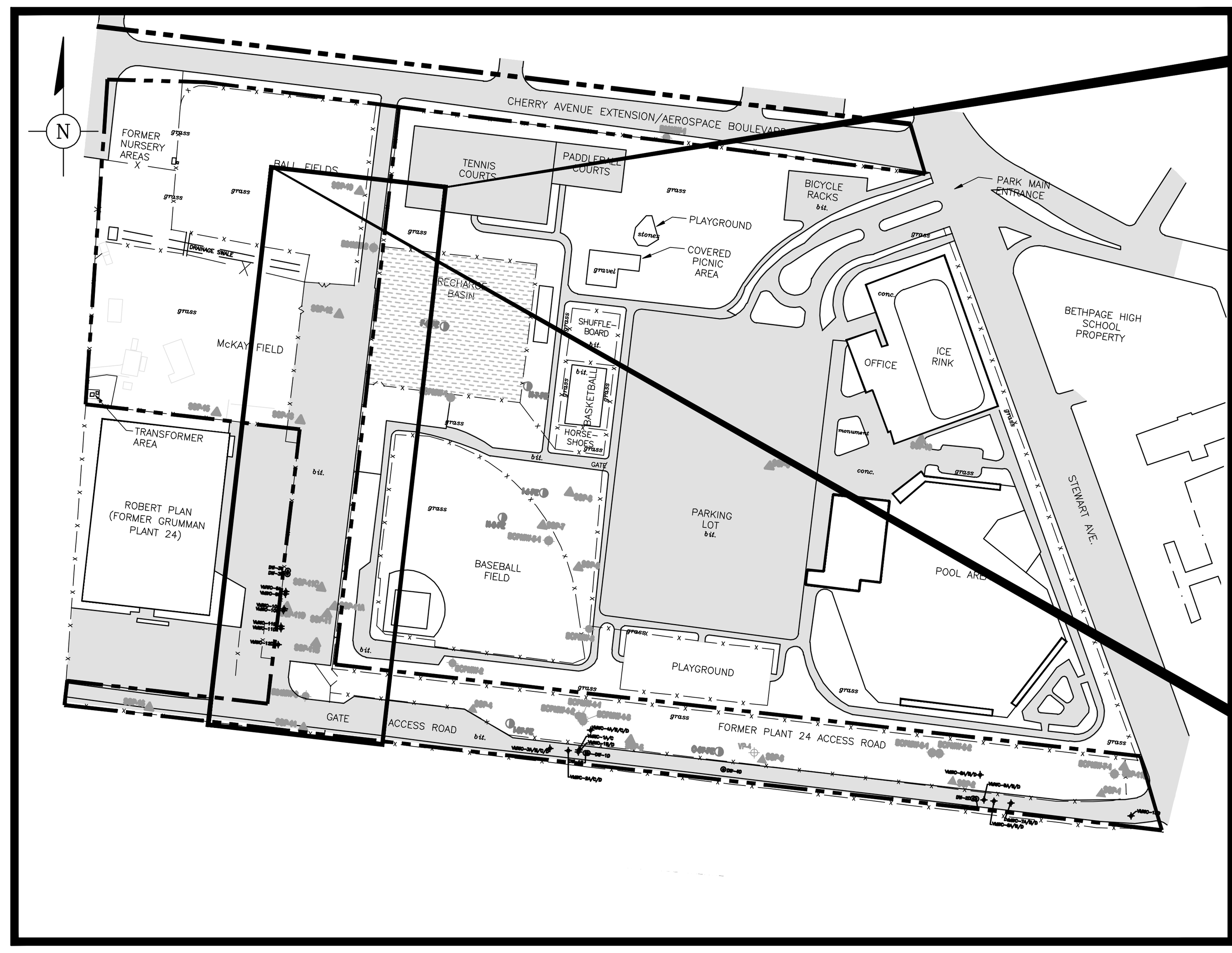
Subject: Request for Discharge of IRM Condensate Water to Nassau County POTW, Northrop Grumman Systems Corporation, Bethpage, New York

Dear Mr. Osman:

Northrop Grumman Systems Corporation (Northrop Grumman) has prepared this letter to provide information to the Nassau County Department of Public Works (DPW) in regard to our plan to discharge water associated with the operation of a soil gas interim remedial measure (IRM) located at Former Grumman Settling Ponds in Bethpage, New York. We request that water associated with this activity be permitted to be discharged to the POTW. This letter provides DPW with details regarding the origin of the condensate water, an estimate of the anticipated quantity, and expected contaminant concentrations of the water that we propose to discharge to the POTW.

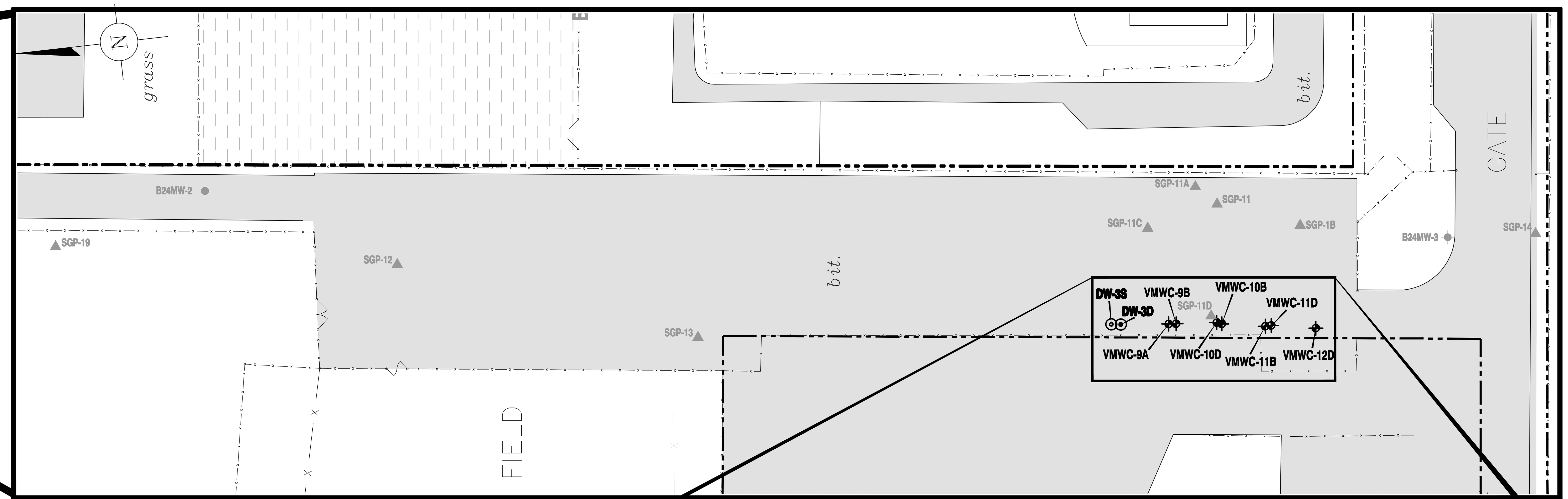
Northrop Grumman entered into Order On Consent (Consent Order or CO) Index # W1-0018-04-01 with the New York State Department of Environmental Conservation (NYSDEC) effective July 4, 2005. The present day Bethpage Community Park property (Park), which the NYSDEC has termed the "Former Grumman Settling Ponds Area" and has designated Operable Unit 3 (OU3) has been owned and operated by the Town of Oyster Bay since 1962. The CO allows the implementation of IRMs for OU3. In response to NYSDEC's December 22, 2006 letter to Northrop Grumman, Northrop Grumman has elected to implement a soil gas mitigation system as an IRM.

The soil gas IRM will consist of regenerative type extraction blowers connected to vertical vapor extraction wells. The purpose of the extraction blowers and wells will be to generate negative pressure within the subsurface soils; thereby preventing the offsite migration of volatile organic compounds (VOCs) from onsite soil gas. To protect the blowers from moisture damage, air-moisture separators will be installed immediately prior to the regenerative blowers. The moisture collected in the separators is essentially condensed water. It is anticipated that the concentration of total VOCs in the condensate will be less than 100 parts per billion (ppb) based on the analytical results of a recent pilot test conducted at the Site. It is anticipated that the condensate will be generated at a rate of less than 300 gallons per month based on the same pilot test. Water would most likely be transferred to the POTW as a monthly discharge (e.g., approximately 300-gallons of condensate will be transferred once per month via the existing sanitary sewer intake located on NG property).



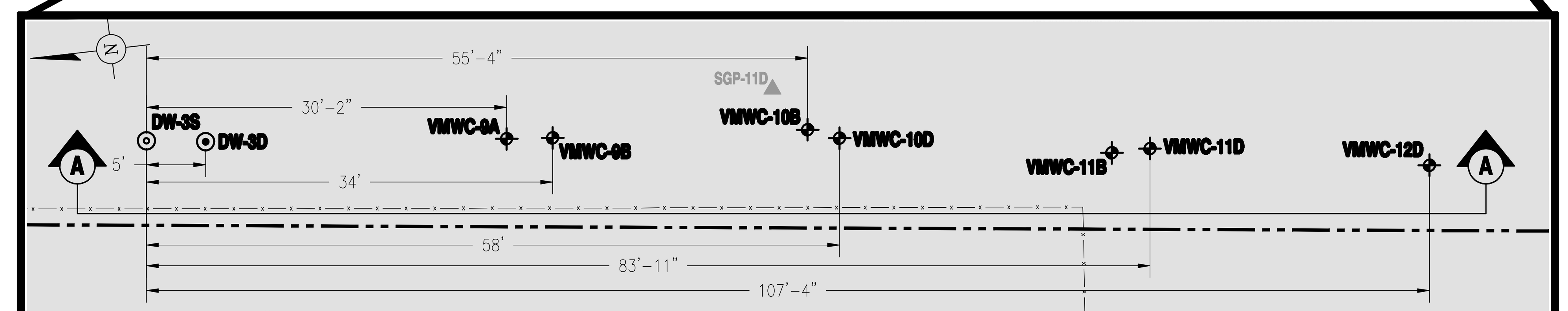
SITE PLAN

0 200' 400'
SCALE IN FEET



AREA OF DETAIL–FORMER PLANT 24
WESTERN ACCESS ROAD

0 40' 80'
SCALE IN FEET



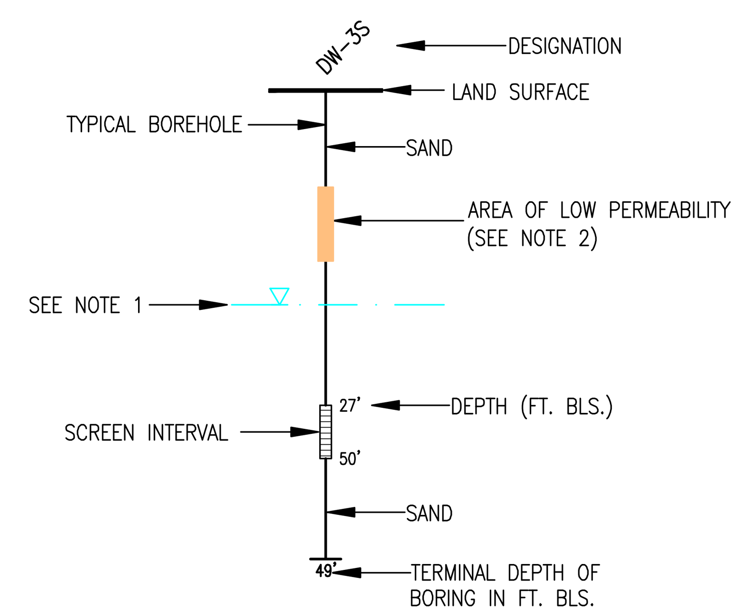
DEPRESURRIZATION WELLS DW–3S & DW–3D
WITH ASSOCIATED VACUUM MONITORING
WELL CLUSTERS (VMWC)

0 10' 20'
SCALE IN FEET

LEGEND:

- NORTHROP GRUMMAN PROPERTY LINE
- FENCE
- LIMITS OF BETHPAGE HIGH SCHOOL MAIN BUILDING
- bit. BITUMINOUS PAVEMENT
- SGP-11 TEMPORARY SOIL GAS POINT INSTALLED DURING OU-3 REMEDIAL INVESTIGATION
- BCP-MW-4-2 MONITORING WELLS
- O-97-PZ PIEZOMETER
- VP-4 VERTICAL PROFILE BORING (VP)
- DW-3S SHALLOW DEPRESSURIZATION WELL (DW–S)
- DW-3D DEEP DEPRESSURIZATION WELL (DW–D)
- VMWC-9A VACUUM MONITORING WELL CLUSTER (VMWC)

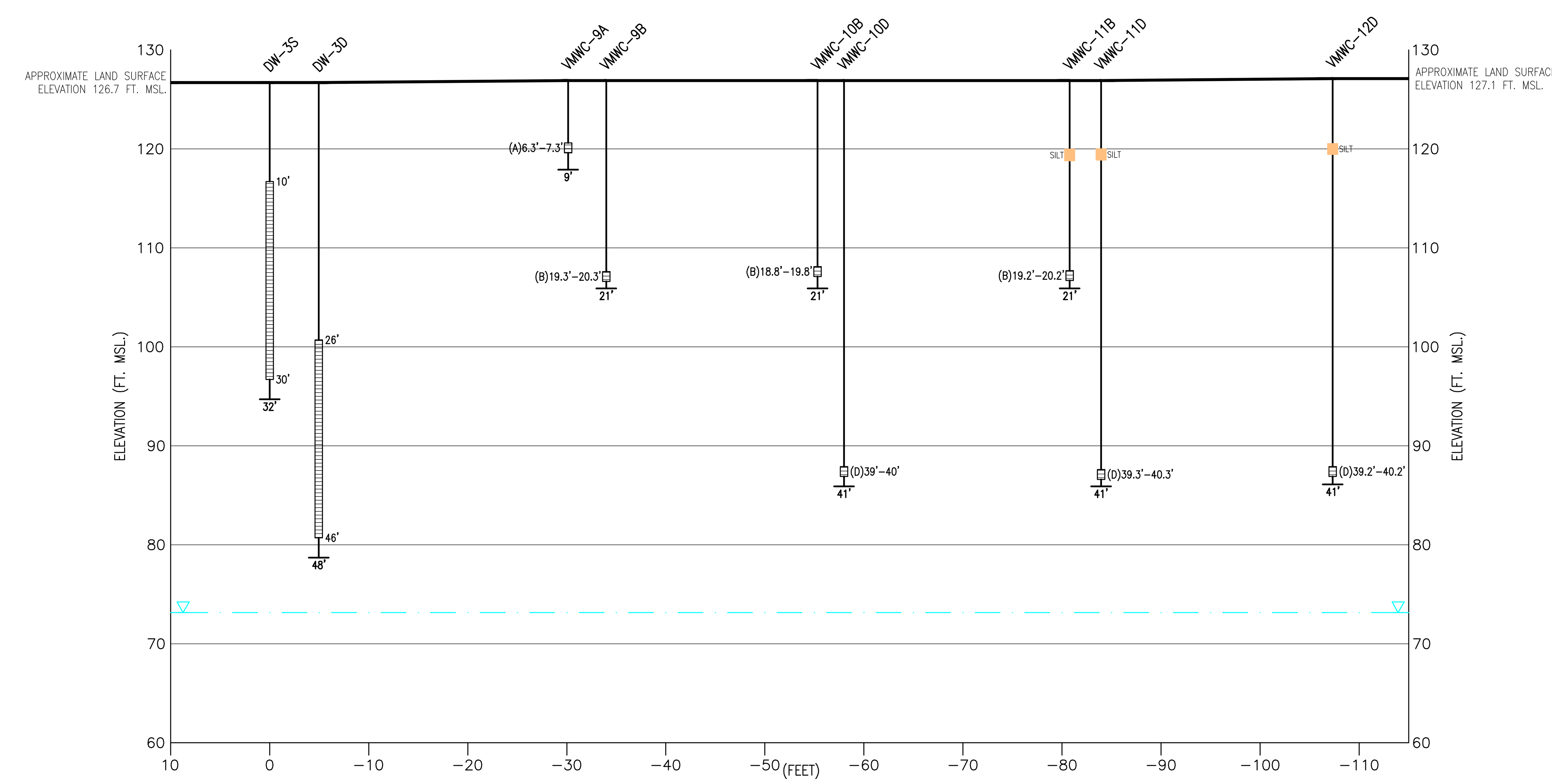
EXPLANATION



DEFINITIONS:
FT. BLS. – FEET BELOW LAND SURFACE

NOTES:

1. WATER TABLE ESTIMATE WAS OBTAINED DURING PNEUMATIC CONDUCTIVITY TEST FROM B24MW–3 ON JUNE 13, 2007.
2. LOW PERMEABILITY ZONES (CLAY, SILT, SILTY CLAY AND SANDY CLAY) WITH A THICKNESS GREATER THAN 6–INCHES ARE SHOWN.
3. TEMPORARY SOIL GAS LOCATIONS ARE BASED ON FIELD MEASUREMENTS AND ARE APPROXIMATE.
4. LOCATION OF MONITORING WELLS, PIEZOMETERS, DEPRESSURIZATION WELLS AND VACUUM MONITORING WELLS BASED ON MULTIPLE SURVEYS PROVIDED BY NELSON & POPE ENGINEERS AND SURVEYORS.



CROSS–SECTION A–A
HORIZONTAL SCALE: 1"=10'
VERTICAL SCALE: 1"= 10'

NO.	ISSUED DATE	REVISION DESCRIPTION	BY/CKD

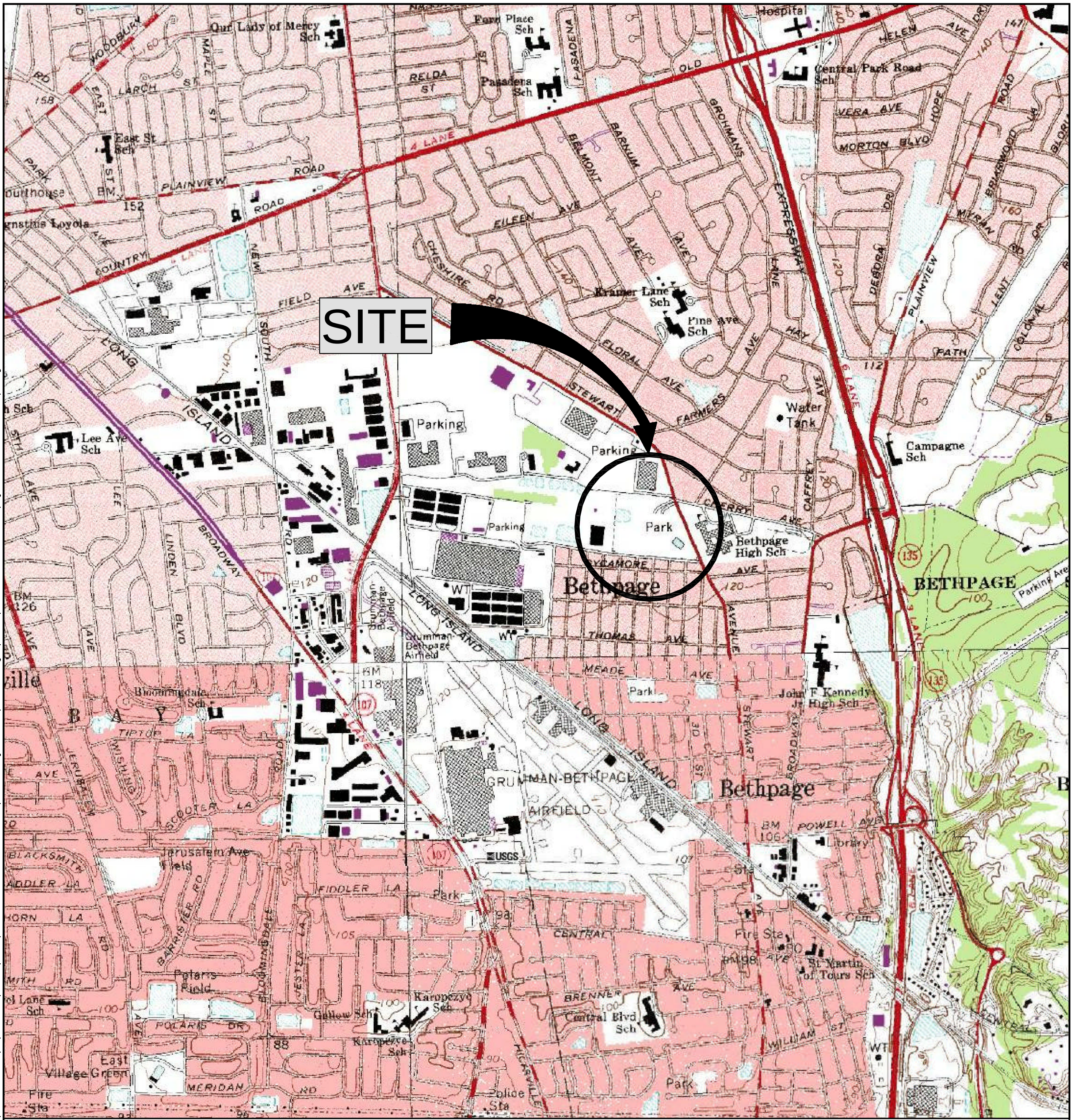
ARCADIS OF NEW YORK, INC.
Two Huntington Quadrangle
Suite 1S10
Melville, NY 11747
Tel: 631-249-7600 Fax: 631-249-7610
www.arcadis-us.com

NORTHROP GRUMMAN OPERABLE UNIT 3
SOIL GAS REMEDIAL MEASURE
FORMER GRUMMAN SETTLING PONDS
BETHPAGE, NEW YORK

FORMER PLANT 24
WESTERN ACCESS ROAD
PNEUMATIC CONDUCTIVITY TEST
LOCATIONS AND WELL CONFIGURATIONS

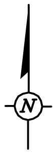
PROJECT MANAGER	DEPARTMENT MANAGER	LEAD DESIGN PROF.	CHECKED BY
C. SAN GIOVANNI	M. WOLFERT	C. TUOHY	K. ZEGEL
		TASK/PHASE NUMBER 00002	DRAWN BY A. SANCHEZ
		PROJECT NUMBER NY001464.1407	DRAWING NUMBER A-2

Acad Version : R17.0s (LMS Tech) User Name : alsanchez
Date\Time : Fri, 07 Sep 2007 – 3:52pm Path\Name : G:\APROJECT\Northrop Grumman\Superfund\2007\OU3\NY001464.1407 VCS IRM\VCS Desig–Const\95% Design\Cadd\DEC_95% Submittal\APDX A–2_ Nrwdc.dwg
Current Plotstyle : ByColor Layout1



0 2000' 4000'

SCALE IN FEET



SOURCE:
USGS 7.5 MIN. AMITYVILLE QUADRANGLE, AMITYVILLE, NY. 1994
USGS 7.5 MIN. FREEPORT QUADRANGLE, FREEPORT, NY., 1994
USGS 7.5 MIN. HICKSVILLE QUADRANGLE, HICKSVILLE, NY., 1967, PHOTOREVISED 1979
USGS 7.5 MIN. HUNTINGTON QUADRANGLE, HUNTINGTON, NY. 1967, PHOTOREVISED 1979

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Suite 1S10, Melville, NY 11747
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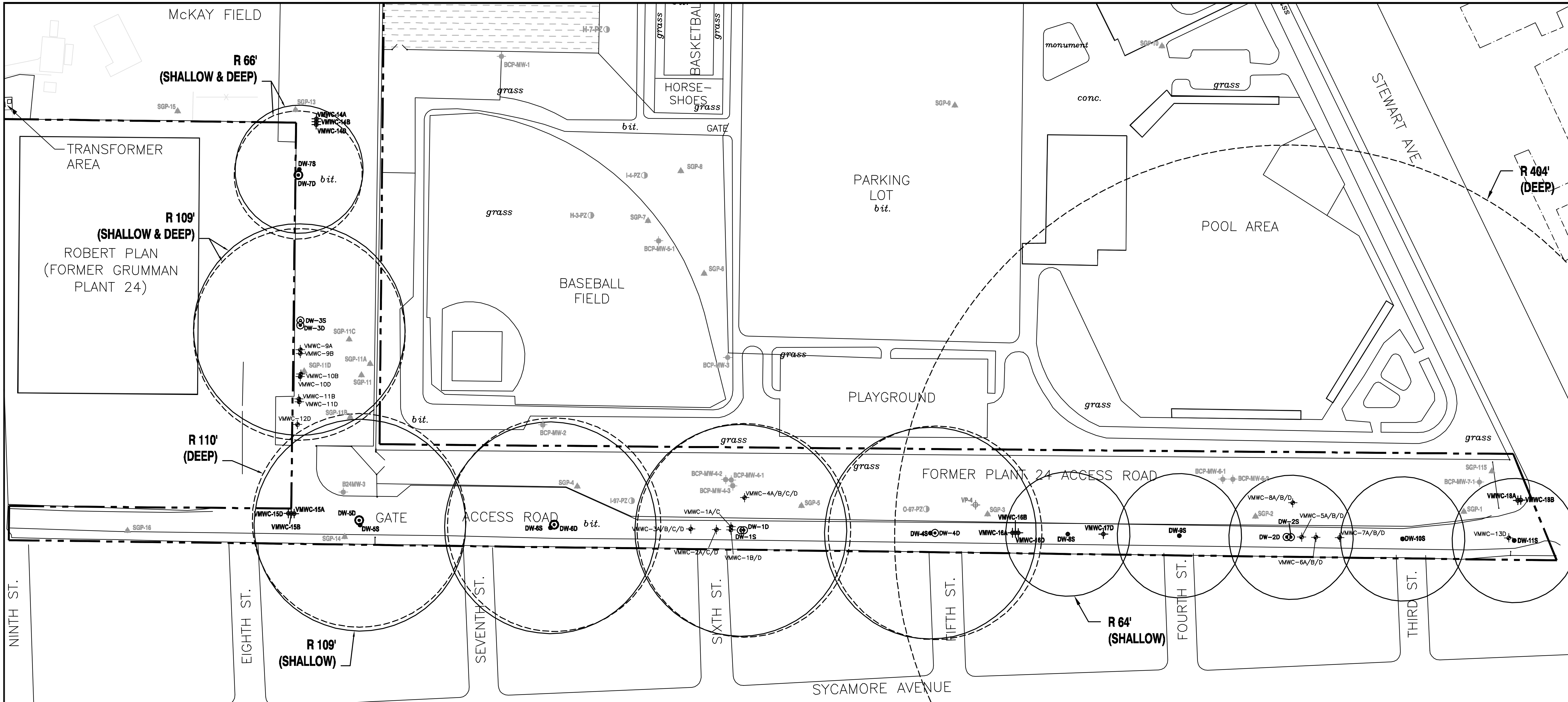
www.arcadis-us.com

PROJECT MANAGER	DEPARTMENT MANAGER	LEAD DESIGN PROF.	CHECKED BY
C. SAN GIOVANNI	C. TUOHY	C. TUOHY	K. ZEGEL
SITE LOCATION MAP		TASK/PHASE NUMBER 00004	DRAWN BY A. SANCHEZ
		PROJECT NUMBER NY001464.1407	FIGURE 1

Acad Version : R17.0s (LMS Tech) Date\Time : Fri, 07 Sep 2007 – 11:09am
User Name : alsanchez Path\Name : G:\APROJECT\Northrop Grumman\Superfund\2007\OU3\NY001464.1407 VCS IRM\VCS Desig-Const\95% Design\Cadd\DEC_95% Submittal\Figure 1_Location Map.dwg



LEGEND:

bit.	BITUMINOUS PAVEMENT
— · —	NORTHROP GRUMMAN PROPERTY LINE
—x—x—	FENCE
— · · —	LIMITS OF BETHPAGE HIGH SCHOOL MAIN BUILDING
———	SHALLOW RADIUS OF INFLUENCE
- - - -	DEEP RADIUS OF INFLUENCE
SGP-1 ▲	TEMPORARY SOIL GAS POINT INSTALLED DURING OU-3 REMEDIAL INVESTIGATION
BCP-MW-4-2	MONITORING WELLS
O-97-PZ	PIEZOMETER
VP-4	VERTICAL PROFILE BORING
VMWC-5A/B/D	VACUUM MONITORING WELL CLUSTER (VMWC)
DW-2S	SHALLOW DEPRESSURIZATION WELL (DW-S)
DW-1D	DEEP DEPRESSURIZATION WELL (DW-D)
VMWC-14A	PROPOSED VMWC
DW-10S ●	PROPOSED FULL SCALE SHALLOW DEPRESSURIZATION WELL
DW-7D	PROPOSED FULL SCALE DEEP DEPRESSURIZATION WELL

NOTES:

1. TEMPORARY SOIL GAS LOCATIONS ARE BASED ON FIELD MEASUREMENTS AND ARE APPROXIMATE.
2. LOCATION OF MONITORING WELLS, PIEZOMETERS, DEPRESSURIZATION WELLS AND VACUUM MONITORING WELLS BASED ON MULTIPLE SURVEYS PROVIDED BY NELSON & POPE ENGINEERS AND SURVEYORS.

NO.	ISSUED DATE	REVISION DESCRIPTION	BY/CKD
0	9/2007	95% DESIGN SUBMITTAL	PR

KEYPLAN

SEAL

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Melville, NY 11747
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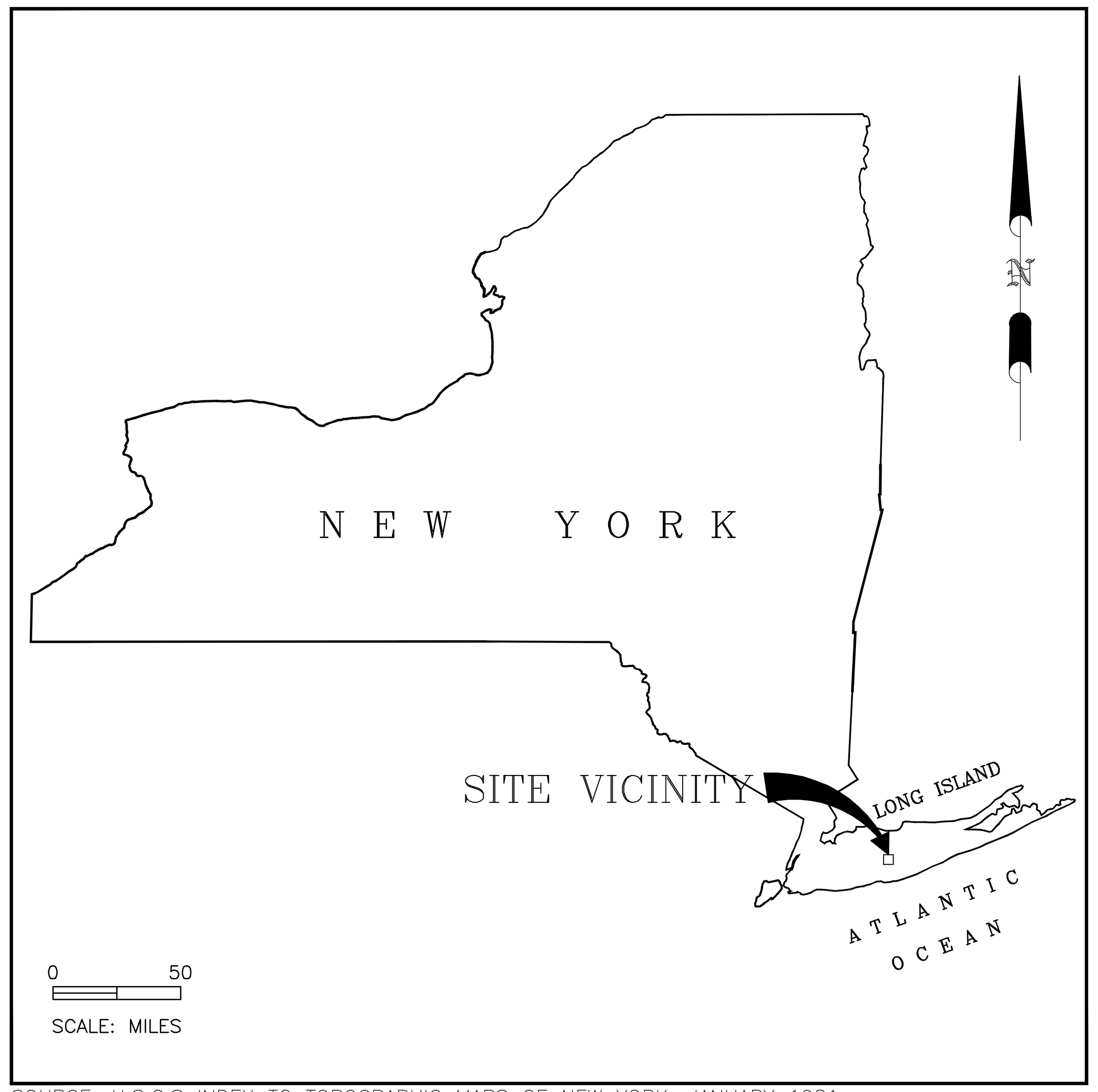
www.arcadis-us.com

NORTHROP GRUMMAN OPERABLE UNIT 3
SOIL GAS REMEDIAL MEASURE
FORMER GRUMMAN SETTLING PONDS
BETHPAGE, NEW YORK

RADIUS OF INFLUENCE FOR SOIL GAS DEPRESSURIZATION SYSTEM

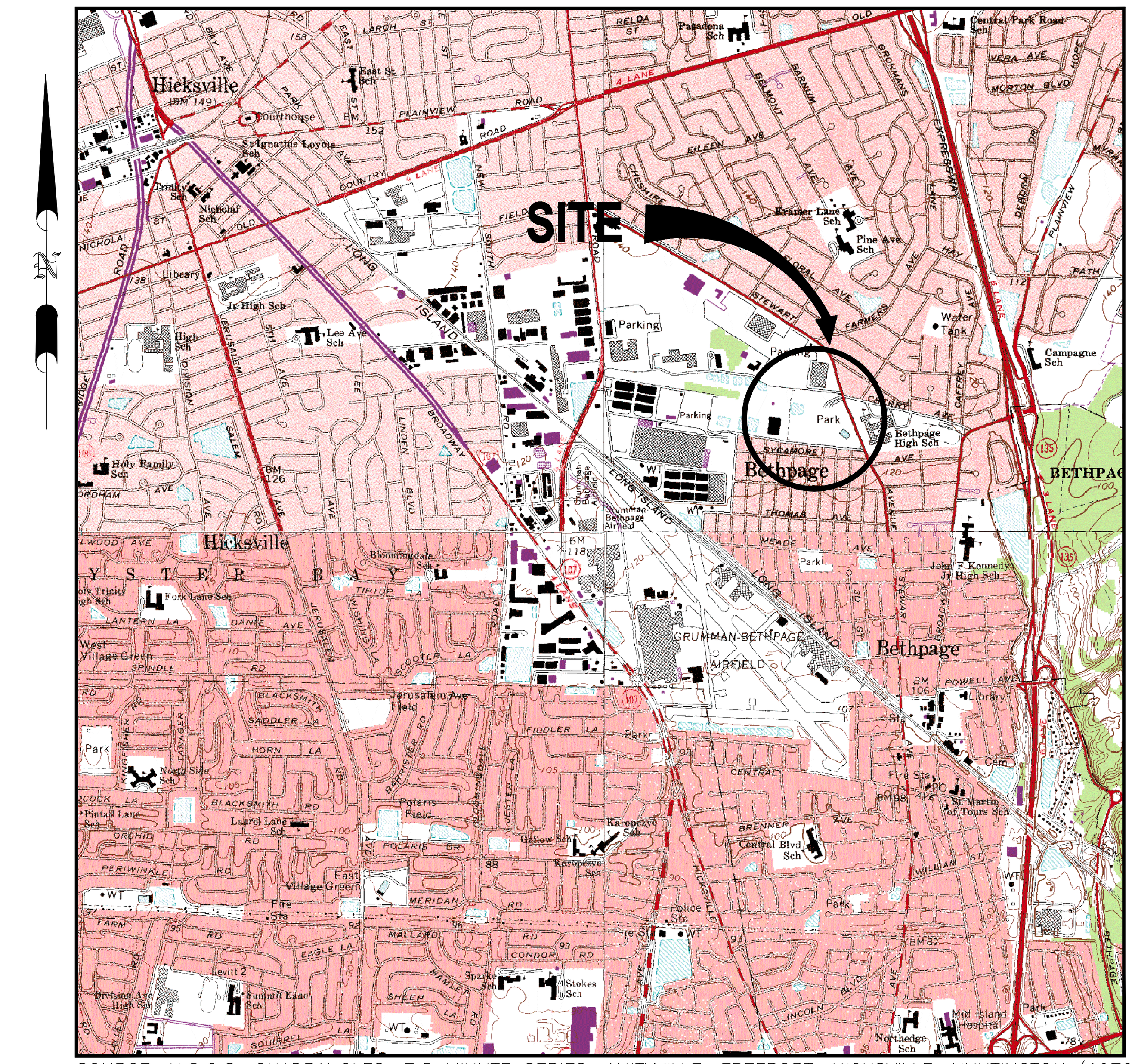
PROJECT MANAGER	C. SAN GIOVANNI
DEPARTMENT MANAGER	C. TUOHY
LEAD DESIGN PROF.	C. TUOHY
CHECKED BY	K. ZEGEL
TASK/PHASE NUMBER	00004
DRAWN BY	A. SANCHEZ
PROJECT NUMBER	NY001464.1407
FIGURE	2

LIST OF DRAWINGS	
DRAWING NO.	DRAWING TITLE
1	SITE PLAN AND NOTES
2	SOIL EROSION AND SEDIMENT CONTROL PLAN, DETAILS AND NOTES
3	PROCESS AND INSTRUMENTATION DIAGRAM (P&ID)
4	BUILDING LAYOUT AND DETAILS
5	BUILDING ELEVATIONS AND DETAILS
6	MISCELLANEOUS DETAILS AND NOTES
7	ELECTRICAL ONE-LINE DIAGRAM
8	ELECTRICAL LAYOUT, SCHEMATICS, AND RISER DIAGRAMS
9	ELECTRICAL SIGNAL LIST AND RISER DIAGRAM



SOURCE: U.S.G.S INDEX TO TOPOGRAPHIC MAPS OF NEW YORK, JANUARY 1981.

STATE MAP



SOURCE: U.S.G.S. QUADRANGLES, 7.5 MINUTE SERIES, AMITYVILLE, FREEPORT, HICKSVILLE, HUNTINGTON (1979).

SITE VICINITY MAP

SCALE: 1" = 2,000'-0"

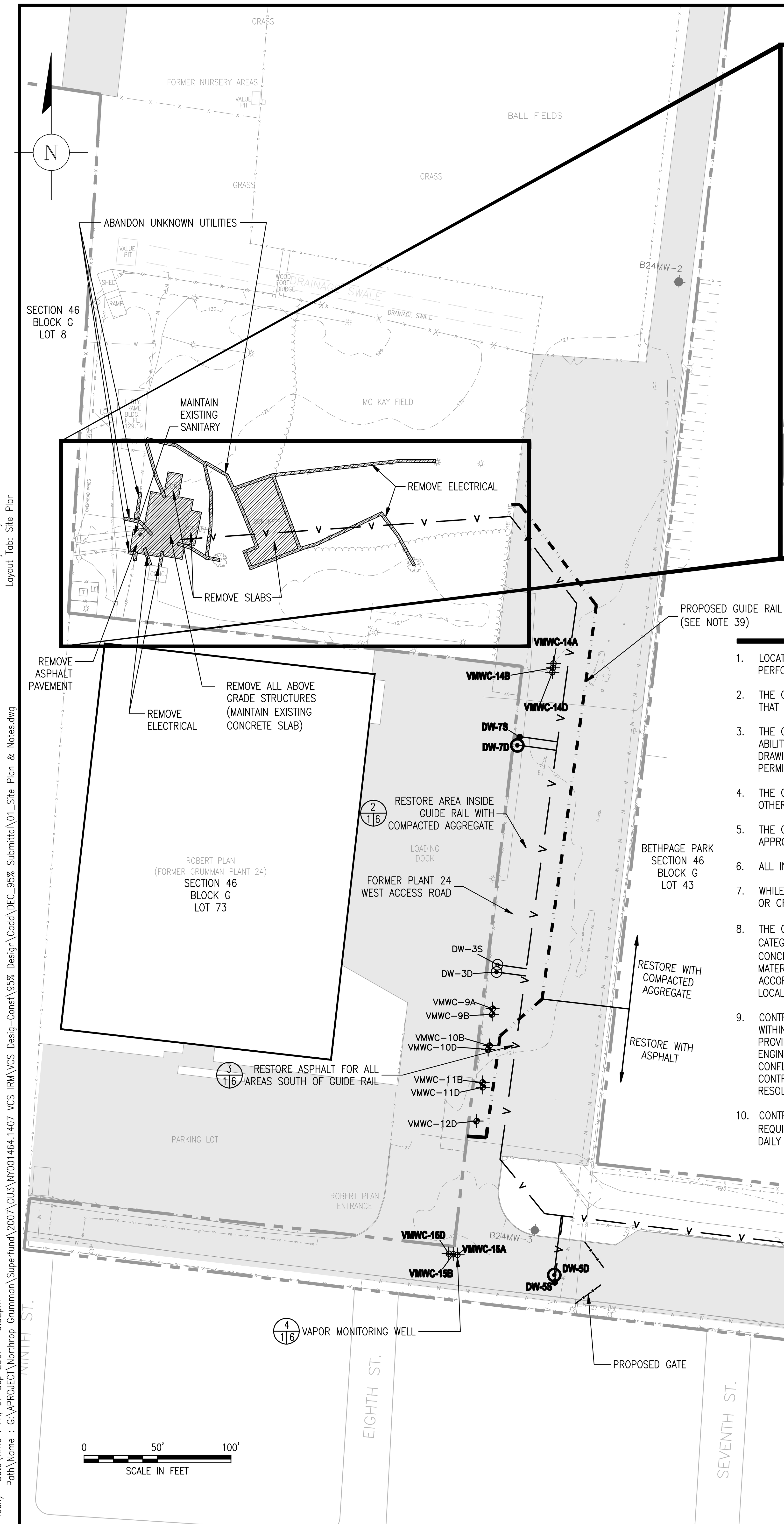
95% DESIGN DRAWINGS
OPERABLE UNIT 3
SOIL GAS INTERIM REMEDIAL MEASURE (IRM)

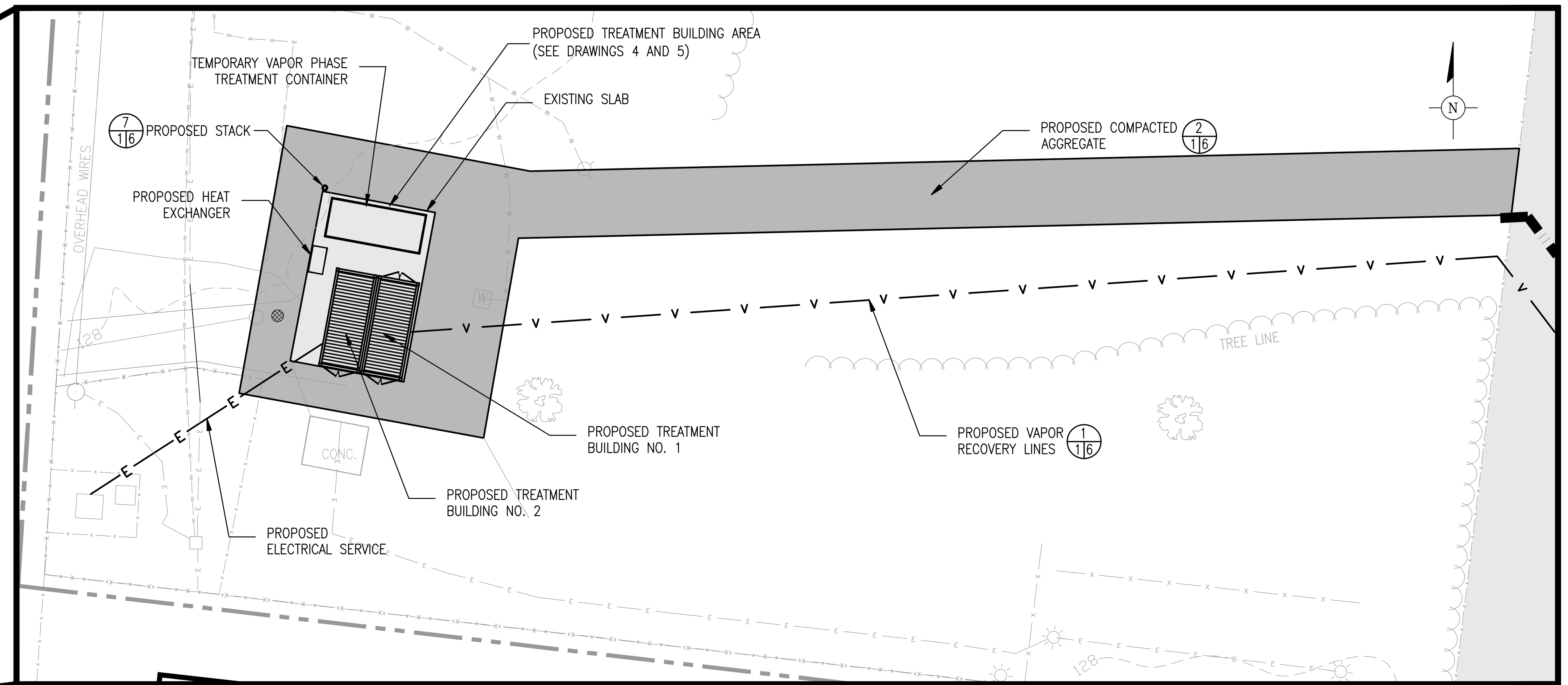
FORMER GRUMMAN SETTLING PONDS
BETHPAGE, NEW YORK
NYSDEC SITE ID No. 1-30-003A

PREPARED FOR:

NORTHROP GRUMMAN SYSTEMS CORPORATION
SEPTEMBER 2007

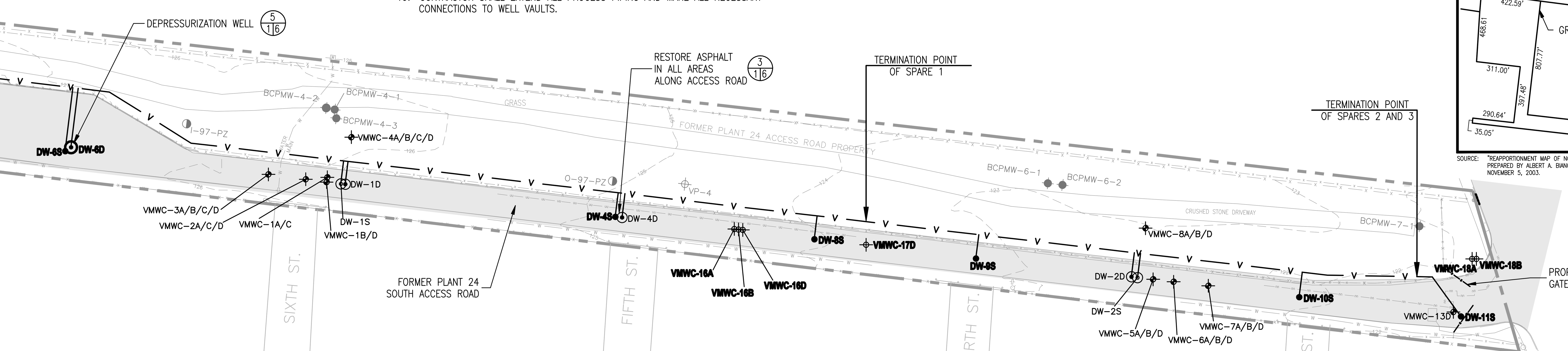
User Name : alsanchez
Date\Time : Thu, 06 Sep 2007 - 12:37pm
Path\Name : G:\APROJECT\Northrop Grumman\Superfund\2007\OU3\NY001464.1407 VCS IRM\VCS Desig-Const\95% Design\Cadd\DEC_95% Submittal\00_Title Sheet.dwg





DETAIL

0 20' 40'
SCALE IN FEET



LEGEND

	PROPERTY LINE NORTHROP GRUMMAN	VMWC-5A/B/D	EXISTING VACUUM MONITORING WELL CLUSTER (VMWC)
W	EXISTING WATER MAIN	VMWC-18A	PROPOSED VMWC
UU	UNKNOWN EXISTING UNDERGROUND UTILITY	DW-2S	EXISTING SHALLOW DEPRESSURIZATION WELL (DW-S)
G	EXISTING GAS LINE	DW-1D	EXISTING DEEP DEPRESSURIZATION WELL (DW-D)
S	EXISTING SANITARY LINE	DW-10S	PROPOSED FULL SCALE SHALLOW DEPRESSURIZATION WELL
E	EXISTING UNDERGROUND ELECTRIC LINE	DW-7D	PROPOSED FULL SCALE DEEP DEPRESSURIZATION WELL
T	EXISTING TELEPHONE LINE	V	PROPOSED VAPOR RECOVERY LINES
X	EXISTING 6' CHAIN LINK FENCE	W	PROPOSED WATER LINE
123	EXISTING CONTOUR ELEVATION	E	PROPOSED ELECTRIC LINE
	EXISTING CONCRETE CURB	T	PROPOSED TELEPHONE LINE
	EXISTING DROP CURB		PROPOSED GUIDE RAIL
	EXISTING MONITORING WELLS		ITEM TO BE DEMOLISHED/ABANDONED
	EXISTING PIEZOMETER		PROPOSED GRAVEL AREA
	FORMER RI SOIL BORING LOCATION		
	EXISTING GUIDE RAIL		
	UTILITY POLE		
	LIGHT POLE		
	HYDRANT		
	WATER VALVE		
	WATER METER		
	LIMITS OF WOODED AREA		
	TRANSFORMER		
	EXISTING PAVED AREA		

DETAIL/SECTION DESIGNATION
1
1|6
DRAWING NUMBER WHERE DETAIL/SECTION IS SHOWN
DRAWING NUMBER WHERE DETAIL/SECTION IS CALLED FROM

GENERAL NOTES

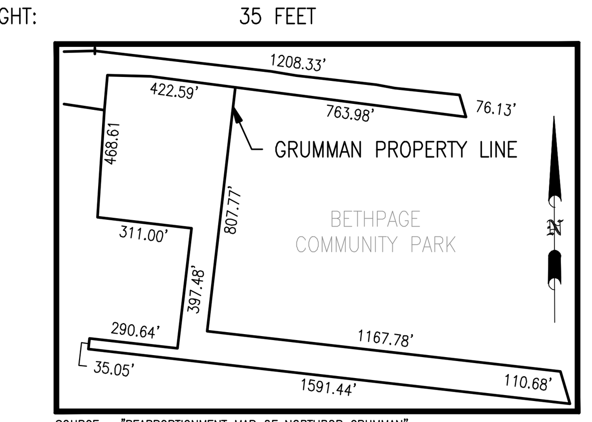
1. LOCATION OF WORK: ALL WORK DESCRIBED IN THESE DRAWINGS/SPECIFICATIONS SHALL BE PERFORMED ON BEHALF OF NORTHROP GRUMMAN SYSTEMS CORPORATION, INC.
2. THE CONTRACTOR SHOULD VISIT THE SITE AND EXAMINE ALL OF THE PHYSICAL CONDITIONS THAT AFFECT THE FINAL BID PRICE.
3. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY FIELD MEASUREMENTS TO VERIFY THE ABILITY TO EXECUTE THE WORK IN ACCORDANCE WITH THIS SCOPE OF WORK AND DRAWINGS. NO ADDITIONS OR REVISIONS TO THE BID OR CONTRACT PRICE WILL BE PERMITTED BASED ON EXISTING CONDITIONS.
4. THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIAL, AND EQUIPMENT, UNLESS OTHERWISE STATED, NECESSARY TO PERFORM THIS WORK.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL TRADE PERMITS, AND APPROVALS NECESSARY TO PERFORM THIS WORK.
6. ALL INFORMATION PRESENTED IN THIS REQUEST REGARDING THE SITE IS CONFIDENTIAL.
7. WHILE CONSTRUCTION ACTIVITIES ARE UNDER WAY AT LEAST ONE CONTRACTOR, FOREMAN, OR CREW SUPERVISOR SHALL BE PRESENT AT THE JOB SITE AT ALL TIMES.
8. THE CONTRACTOR SHALL SEGREGATE ALL EXCAVATED/DEMOLITION MATERIALS INTO TWO CATEGORIES: CONCRETE/ASPHALT/METAL MATERIAL AND SOIL MATERIAL. CONCRETE/ASPHALT/METAL MATERIAL SHALL BE DISPOSED OF BY CONTRACTOR. SOIL MATERIAL WILL BE CHARACTERIZED AND DISPOSED OF BY THE CONTRACTOR IN ACCORDANCE WITH THE SPECIFICATIONS ON DRAWING 2 AND ALL FEDERAL, STATE AND LOCAL REGULATIONS.
9. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND VERIFYING LOCATION OF ALL UTILITIES WITHIN AREA AFFECTED BY CONSTRUCTION. COPIES OF PRINTS OBTAINED OR LOCATIONS PROVIDED TO CONTRACTOR WITH RESPECT TO UTILITIES SHALL BE SUPPLIED TO THE ENGINEER WITH A RECORD SET OF DRAWINGS AT COMPLETION OF CONSTRUCTION. IF A CONFLICT EXISTS BETWEEN THE UTILITY LOCATION AND THE CONSTRUCTION DRAWINGS, CONTRACTOR IS TO NOTIFY THE ENGINEER IMMEDIATELY SO THAT THE CONFLICT MAY BE RESOLVED.
10. CONTRACTOR IS RESPONSIBLE FOR PROVIDING THE ENGINEER WITH ALL INFORMATION REQUIRED TO COMPLETE A SET OF "RECORD" DRAWINGS BY KEEPING A RECORD SET OF DAILY PROGRESSION OF WORK.
11. UNLESS OTHERWISE NOTED, ALL AREAS DISTURBED BY THIS WORK SHALL BE RESTORED TO ORIGINAL CONDITION.
12. CONTRACTOR TO PROTECT AND PRESERVE ALL EXISTING FEATURES (I.E. MONITORING WELLS, EQUIPMENT, ETC.) WITHIN AREAS AFFECTED BY CONSTRUCTION. DAMAGE SUSTAINED TO AN EXISTING FEATURE WILL BE REPAIRED/REPLACED AT CONTRACTOR'S EXPENSE.
13. THE CONTRACTOR SHALL PERFORM ALL WORK IN ACCORDANCE WITH ALL COUNTY, LOCAL, STATE, AND FEDERAL REGULATIONS, INCLUDING, BUT NOT LIMITED TO, ALL APPLICABLE LOCAL, STATE, AND/OR FEDERAL (OSHA, USEPA, AND DOT, ETC.) RULES AND REGULATIONS.
14. UNLESS OTHERWISE INDICATED HEREIN, ALL MATERIALS AND EQUIPMENT FURNISHED UNDER THIS CONTRACT SHALL BE NEW, FREE FROM DEFECTS, AND SHALL BE GUARANTEED FOR A PERIOD OF AT LEAST ONE YEAR FROM THE DATE OF ACCEPTANCE OF THE WORK. THE CONTRACTOR SHALL FURNISH, AT NO COST TO THE ENGINEER, ALL LABOR AND MATERIALS NECESSARY TO CORRECT PROBLEMS DUE TO FAULTY WORKMANSHIP OR MATERIALS.
15. OTHER CONSTRUCTION ACTIVITIES MAY BE TAKING PLACE CONCURRENTLY WITH THIS PROJECT. THE CONTRACTOR SHALL CONSULT WITH THE VARIOUS PARTIES AND SHALL COORDINATE SCHEDULES.
16. THE INFORMATION SHOWN ON THE DRAWINGS CONCERNING TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATIONS AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO.
17. TRENCHING WILL BE PERFORMED IN AREAS WHERE VEHICULAR TRAFFIC MAY BE PRESENT. THE CONTRACTOR(S) SHALL NOTIFY THE TOWN OF OYSTER BAY HIGHWAY DEPARTMENT AND ENGINEER OF THE PROPOSED START OF WORK WITHIN THESE TRAFFIC AREAS A MINIMUM OF 48 HOURS PRIOR TO THE START OF THE WORK. FURTHERMORE, THE CONTRACTOR WILL PERFORM THIS WORK IN A MANNER TO ALLOW FOR MINIMAL DISRUPTION TO TRAFFIC. THIS WILL INCLUDE PERFORMING WORK IN ACCORDANCE WITH TOWN OF OYSTER BAY HIGHWAY DEPARTMENT REQUIREMENTS IN SECTIONS AND/OR PROVIDING TRAFFIC PLATES TO ALLOW TRENCH SECTIONS TO BE DRIVEN OVER. TRAFFIC CONTROLS SHALL BE PROVIDED AS REQUIRED BY TOWN OF OYSTER BAY HIGHWAY DEPARTMENT REQUIREMENTS.
18. PIPE ROUTING SHOWN FOR CONSTRUCTION LAYOUT PURPOSES ONLY. ACTUAL ROUTING TO BE FIELD DETERMINED AND IS SUBJECT TO ENGINEER'S APPROVAL.
19. CONTRACTOR SHALL EXTEND ALL PROCESS PIPING AND MAKE ALL NECESSARY CONNECTIONS TO WELL VAULTS.
20. ALL PIPING PRESSURE TESTS SHALL BE MADE BY THE CONTRACTOR IN THE PRESENCE OF THE ENGINEER.
21. THE CONTRACTOR SHALL PROVIDE ALL PRODUCTS AND PROPERLY CALIBRATED TESTING EQUIPMENT REQUIRED TO PERFORM THE PIPING PRESSURE TESTING WORK.
22. TESTS MAY BE PERFORMED ON SEPARATE SECTIONS OF PIPING TO EXPEDITE CONSTRUCTION. THE CONTRACTOR SHALL NOT PERFORM PRESSURE TESTING AGAINST SYSTEM VALVES. VAPOR RECOVERY LINE SECTIONS SHALL BE PNEUMATICALLY TESTED AT 50 PSI FOR ONE HOUR.
23. AFTER THE INITIAL PRESSURE TEST ON PIPING IS COMPLETED SUCCESSFULLY, THE CONTRACTOR SHALL BACKFILL THE TRENCHES AS SPECIFIED.
24. EXCAVATIONS SHALL BE KEPT FREE FROM STANDING WATER.
25. CONTRACTOR SHALL NOTIFY THE ENGINEER AT THE COMPLETION OF EXCAVATIONS AND TRENCHING TO ALLOW FOR INSPECTIONS.
26. CONTRACTOR SHALL PROVIDE APPROPRIATE SAFETY BARRICADES AROUND TRENCHING AND EXCAVATION TO PREVENT ACCIDENTS OR UNAUTHORIZED ENTRY.
27. BACKFILL OF TRENCHES IN UNPAVED AREAS WILL BE APPLIED IN 1-FOOT COMPACTED LIFTS SUCH THAT A MINIMUM 90% PROCTOR DENSITY IS ACHIEVED (95% MODIFIED PROCTOR DENSITY SHALL BE ACHIEVED IN PAVED AREAS AND UNDER TREATMENT BUILDING FOUNDATIONS).
28. CONTRACTOR'S FILL SOURCE MUST BE TESTED BY CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO COMMENCING THE WORK AND/OR PLACING THE MATERIAL.
29. EXCAVATIONS WILL BE BACKFILLED AS PROMPTLY AS WORK PERMITS ONCE REQUIRED INSPECTIONS HAVE BEEN COMPLETED.
30. DO NOT PLACE MATERIALS ON SURFACES THAT ARE MUDDY, FROZEN, OR CONTAIN ICE OR FROST.
31. CONTRACTOR SHALL PLACE A STRIP(S) OF UTILITY WARNING TAPE SPACED AT 18 INCHES ON CENTER IN ALL TRENCHED AREAS. THIS TAPE SHALL CONTAIN A WIRE FOR METAL DETECTION OR HAVE AN ALUMINUM CORE. TAPE SHALL BE PLACED AT A DEPTH OF 6 INCHES IN NON-PAVED AREAS AND BELOW THE SUBBASE IN PAVED AREAS.
32. ALL CONCRETE AND PAVEMENT CUTS ARE TO BE SMOOTH EDGE SAW CUTS BY CIRCULAR SAW BLADES.
33. SURVEY NOTE: MAP FEATURES BASED ON SURVEY PREPARED BY NELSON & POPE ENGINEERS AND SURVEYORS, "EXISTING TOPOGRAPHY", DATED 4-19-07.
34. LOCATION OF MONITORING WELLS, PIEZOMETERS, DEPRESSURIZATION WELLS AND VACUUM MONITORING WELLS BASED ON MULTIPLE SURVEYS PROVIDED BY NELSON & POPE ENGINEERS AND SURVEYORS.
35. EXISTING FEATURES ON PARK AND OFF-SITE ARE BASED ON AERIAL PHOTOGRAPHY AND ARE APPROXIMATE.
36. ALL PAVED AREAS ALONG SOUTHERN ACCESS ROAD TO BE RESTORED. THE INDICATED AREA ALONG THE WESTERN LEG OF THE ACCESS ROAD IS TO BE RESTORED. THE DISTURBED AREA PROTECTED BY THE GUIDE RAIL SHOULD RECEIVE COMPACTED AGGREGATED AS SHOWN.
37. ALL DEPRESSURIZATION LINES SHALL BE CLEANED OUT WITH POTABLE WATER PRIOR TO PRESSURE TESTING UNDER THE DIRECTION OF THE ENGINEER.
38. SPARE DEPRESSURIZATION PIPES TO BE CAPPED AT TERMINATION POINT. FINAL LOCATIONS AND CAPPING METHOD TO BE APPROVED BY ENGINEER.
39. GUIDE RAIL TO BE PROVIDED IN ACCORDANCE WITH NEW YORK STATE DEPARTMENT OF TRANSPORTATION REGULATIONS. CONTRACTOR SHALL PROVIDE SUBMITTAL TO BE APPPROVED BY ENGINEER.

ZONING NOTES:

SECTION 46 BLOCK G, LOT 92 LIE WITHIN THE TOWN OF OYSTER BAY AND ARE ZONED "GB" GENERAL BUISNESS.

THE FOLLOWING IS A PARTIAL LISTING OF ZONING REQUIREMENTS PRINTED IN THE CODE OF THE TOWN OF OYSTER BAY:

MAXIMUM LOT WIDTH/FRONTAGE:	40 FEET
MAXIMUM BUILDING COVERAGE:	80%
MINIMUM FRONT YARD SETBACK:	10 FEET
MINIMUM REAR YARD SETBACK:	20 FEET
MAXIMUM BUILDING HEIGHT:	35 FEET



SOURCE: "REAPPORTIONMENT MAP OF NORTHROP GRUMMAN" PREPARED BY ALBERT A. BIANCO, PROFESSIONAL LAND SURVEYOR, NOVEMBER 5, 2003.

SCALE VERIFICATION
THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING:
USE TO VERIFY FIGURE REPRODUCTION SCALE

NO.	ISSUED DATE	REVISION DESCRIPTION	BY/CKD
1	9/2007	95% DESIGN SUBMITIAL	AS/KZ
0	7/2007	50 TO 75 % DESIGN SUBMITIAL	AS/KZ

KYRIACOS PIERIDES, PH.D., P.E.
N.Y. LIC. NO. 073670

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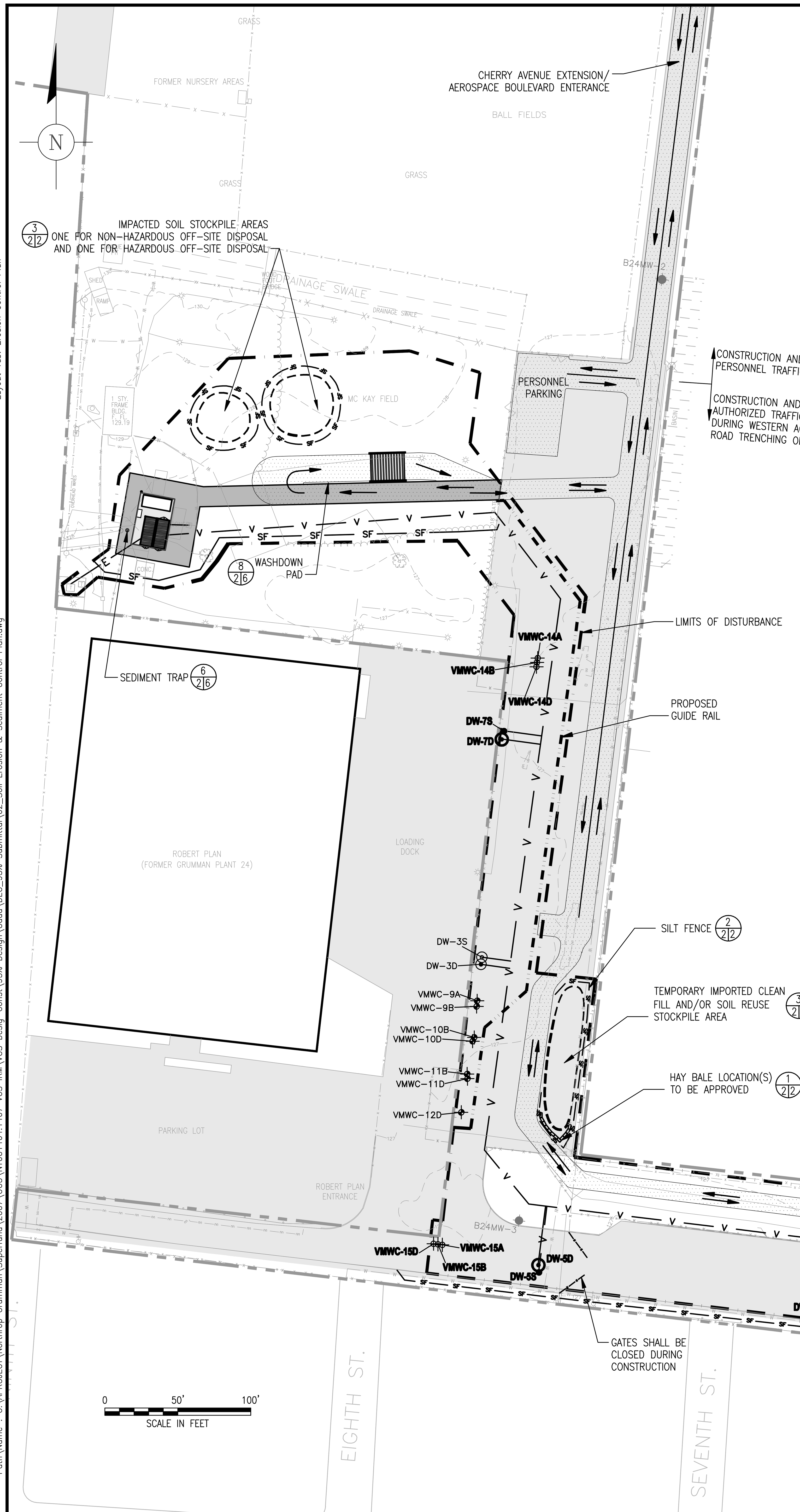
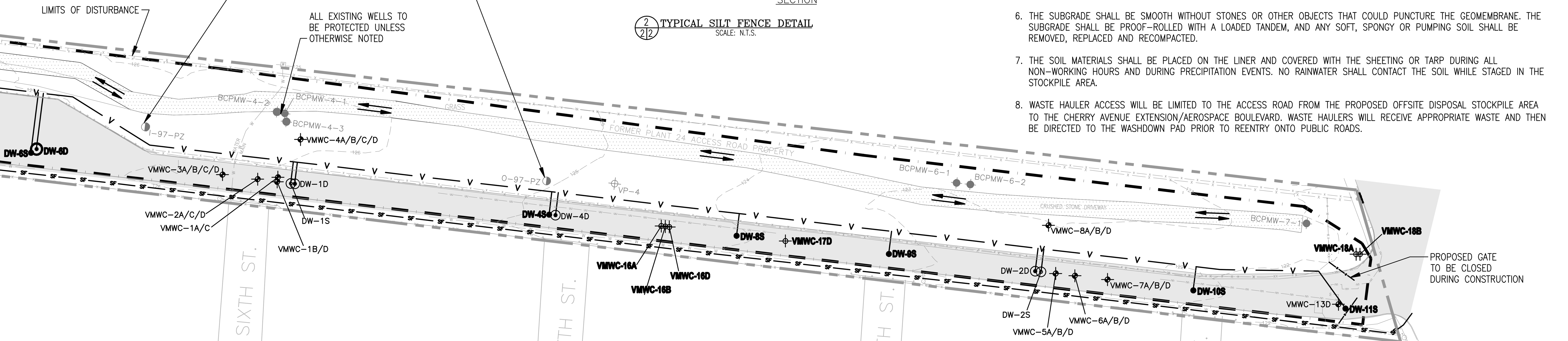
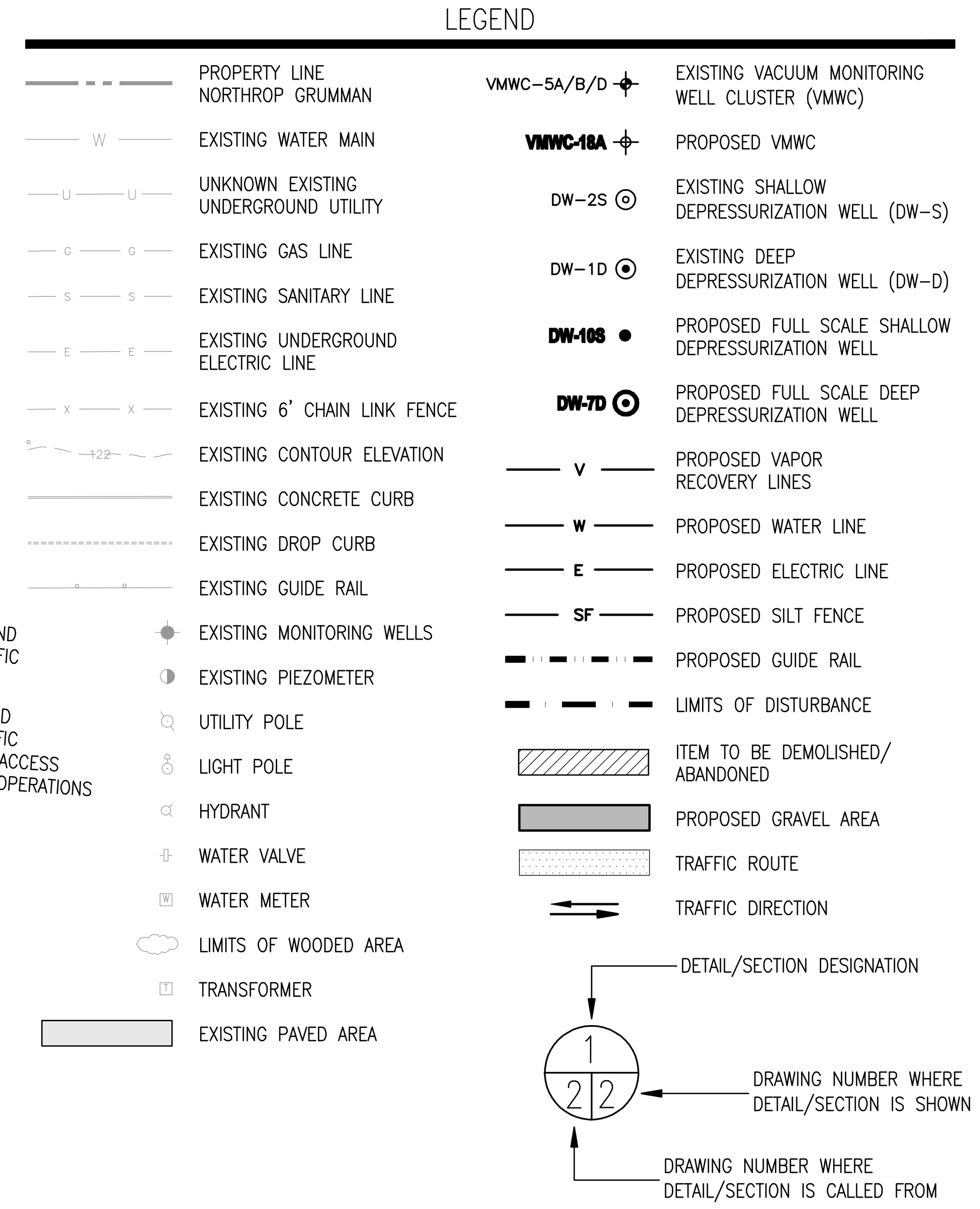
NORTHROP GRUMMAN OPERABLE UNIT 3
SOIL GAS INTERIM REMEDIAL MEASURE
FORMER GRUMMAN SETTLING PONDS
BETHPAGE, NEW YORK

PROJECT MANAGER: C. SAN GIOVANNI	DEPARTMENT MANAGER: C. TUOHY	LEAD DESIGN PROF.: C. TUOHY	CHECKED BY: K. ZEGEL
SITE PLAN AND NOTES		TASK/PHASE NUMBER: 00004	DRAWN BY: A. SANCHEZ
		PROJECT NUMBER: NY001464.1407	DRAWING NUMBER: 1

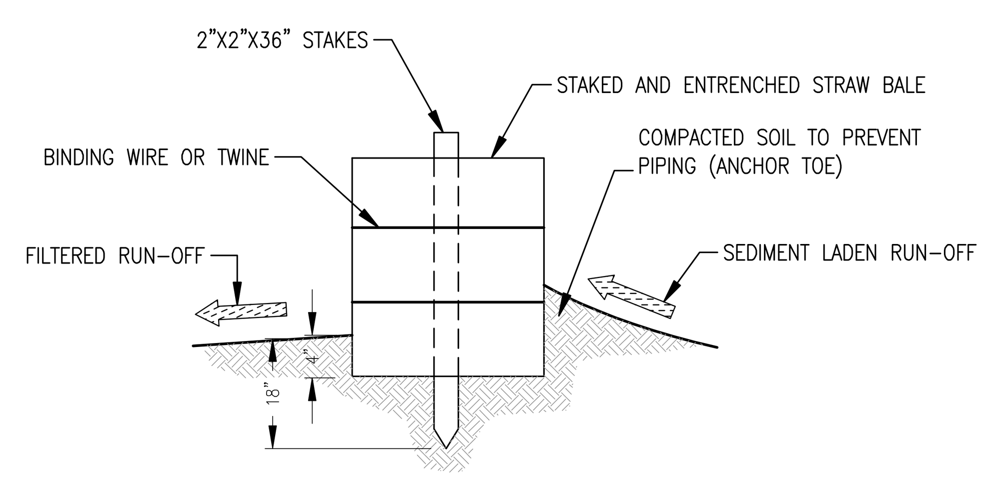




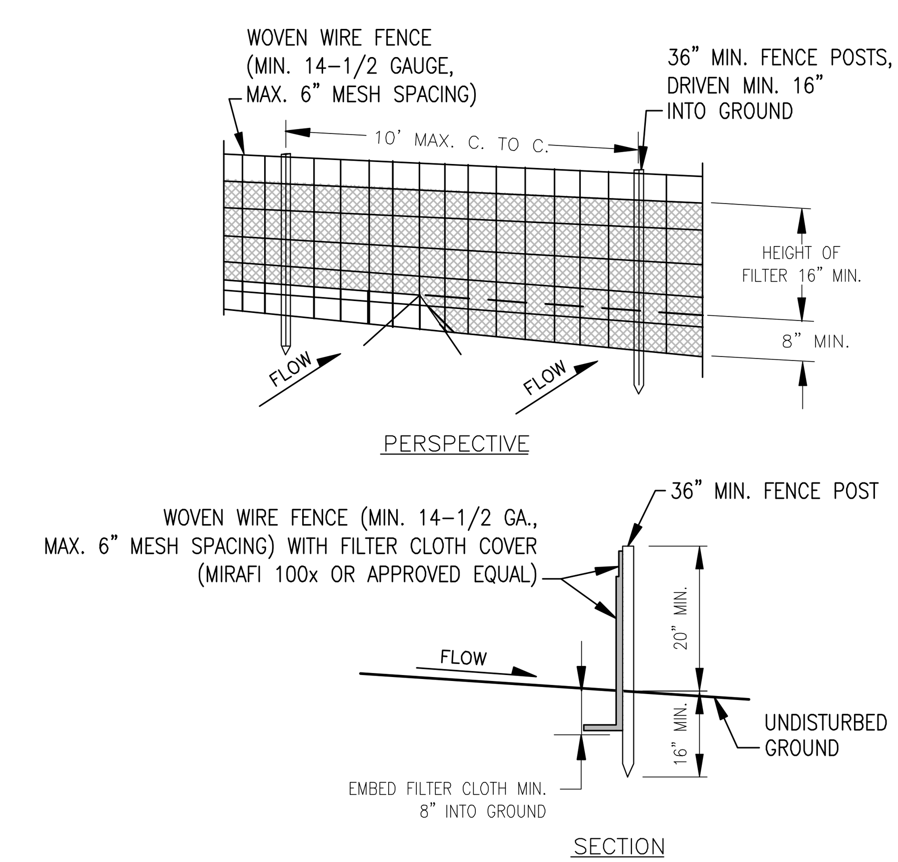


SEDIMENT AND EROSION CONTROL PLAN AND NOTES:

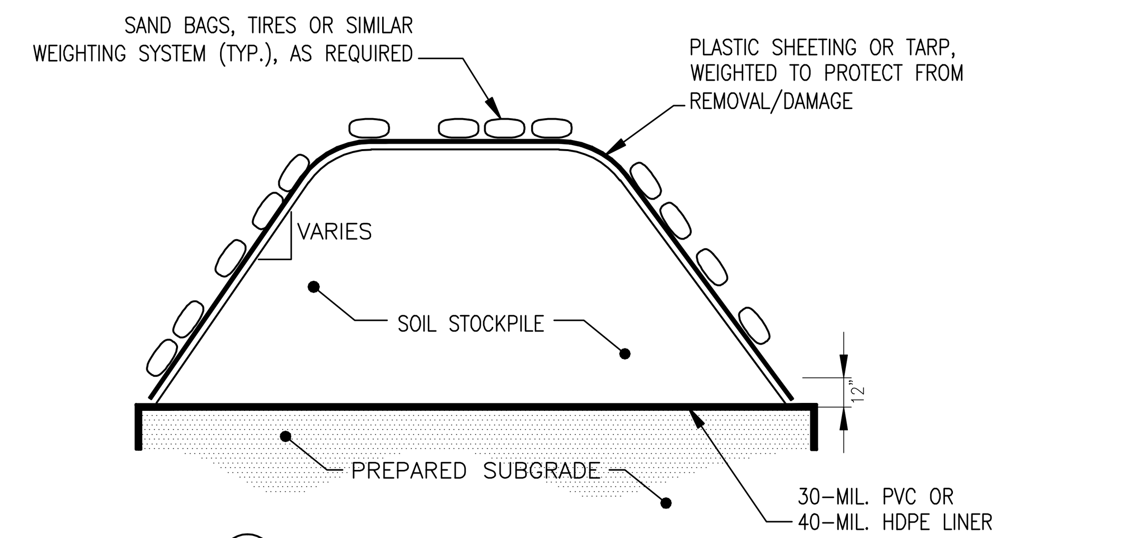
1. SEDIMENT AND EROSION CONTROL MEASURES ARE TO BE USED AS DIRECTED BY THE ENGINEER. ALL WORK SHALL BE IN ACCORDANCE WITH THE NEW YORK STANDARDS FOR EROSION AND SEDIMENT CONTROL.
2. ALL SOIL AND EROSION CONTROL MEASURES ARE TO BE INSPECTED AND, IF NECESSARY, REPAIRED AFTER EVERY MAJOR STORM EVENT, AND AS DIRECTED BY THE ENGINEER.
3. THE CONTRACTOR SHALL MAINTAIN AND KEEP FUNCTIONAL ALL DRAINAGE STRUCTURES IN THE VICINITY OF THE AREA OF DISTURBANCE OR DOWNGRADIENT OF THE AREA OF DISTURBANCE AND THOSE STRUCTURES WHERE CONTRACTOR HAS INSTALLED SEDIMENT & EROSION CONTROL MEASURES.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLIANCE WITH THIS SEDIMENT AND EROSION CONTROL PLAN. ALL SEDIMENT AND EROSION CONTROL PRACTICES ARE TO BE INSTALLED PRIOR TO ANY MAJOR SOIL DISTURBANCES, OR IN THEIR PROPER SEQUENCE, AND MAINTAINED UNTIL PERMANENT PROTECTION IS ESTABLISHED.
5. ALL TOPSOIL NOT TO BE USED FOR FINAL GRADING SHALL BE REMOVED FROM THE SITE IMMEDIATELY. ALL TOPSOIL REQUIRED FOR FINAL GRADING AND STORED ON SITE SHALL BE LIMED, FERTILIZED, TEMPORARILY SEEDED, AND MULCHED (IF SEASON AND CLIMATE LOGICAL CONDITIONS WARRANT MULCHING) WITHIN FIVE (5) DAYS IN ACCORDANCE WITH THE NEW YORK STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL.
6. DURING CONSTRUCTION, EXCAVATED MATERIAL SHALL BE PILED ON THE UPHILL SIDE OF THE EXCAVATIONS AND/OR NORTHERN-SIDE OF ACCESS ROAD AWAY FROM ANY DRAINAGE DITCHES AND RESIDENTIAL AREAS. UNLESS OTHERWISE SPECIFIED OR DIRECTED, ALL EXCAVATIONS SHALL BE BACKFILLED IMMEDIATELY AFTER THE CONSTRUCTION HAS BEEN COMPLETED. EXCAVATIONS IN EARTH SHALL THEN RECEIVE TEMPORARY SEEDING AND MULCH AS PER THE REQUIREMENTS SPECIFIED. EXCAVATIONS IN PAVED AREAS SHALL IMMEDIATELY RECEIVE A TEMPORARY SURFACING OF STONE TO PREVENT THE ERODING OF THE EARTH AND WASHING OF THE EARTH INTO ANY DRAINS OR DRAINAGE DITCHES. ALL TOPSOIL NOT TO BE USED FOR BACKFILL AND NOT REMOVED FROM THE SITE WITHIN FIVE (5) DAYS SHALL BE LIMED, FERTILIZED, SEEDED, AND MULCHED AS SPECIFIED.
7. CONTRACTOR PARKING AND TRAFFIC SHALL BE LIMITED TO THE ROADWAY AREAS. WHERE CONSTRUCTION VEHICLES LEAVE PAVED AREAS, STABILIZED CONSTRUCTION ENTRANCES ARE TO BE CONSTRUCTED. CARE SHALL BE TAKEN TO MINIMIZE SEDIMENT TRANSPORT RESULTING FROM VEHICLE TRAFFIC.
8. AFTER THE PROJECT HAS BEEN COMPLETED, THE CONTRACTOR SHALL HAVE THE RESPONSIBILITY FOR INSURING THAT ALL PERMANENT SOIL EROSION AND SEDIMENT CONTROL MEASURES ARE IN PROPER WORKING CONDITION AND THAT ALL TEMPORARY SOIL EROSION AND SEDIMENT CONTROL MEASURES HAVE BEEN REMOVED OR REPLACED BY PERMANENT CONTROLS (REVEGETATION).
9. MAINTENANCE OF ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES ON THE PROJECT SITE SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL WORK UNDER THIS CONTRACT IS COMPLETE, THROUGH AND INCLUDING ALL GUARANTEE AND BOND PERIODS, AND HENCE FORTH THE RESPONSIBILITY OF THE OWNER.
10. PERMANENT VEGETATION SHALL BE SEEDED OR SODDED ON ALL EXPOSED AREAS WITHIN FIVE (5) DAYS AFTER FINAL GRADING. CONTRACTOR SHALL REPLACE AND MAINTAIN PERMANENT VEGETATION UNTIL SUCH TIME AS IT IS ACCEPTED BY THE ENGINEER. MULCH AS NECESSARY FOR SEED PROTECTION AND ESTABLISHMENT.
11. MAINTENANCE OF ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES ON THE PROJECT SITE SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL WORK UNDER THIS CONTRACT IS COMPLETE, THROUGH AND INCLUDING ALL GUARANTEE AND BOND PERIODS, AND HENCE FORTH THE RESPONSIBILITY OF THE OWNER.
12. WHEN TRENCH EXCAVATION IS LOCATED ADJACENT TO AN IMPOUNDMENT OR MANMADE CHANNEL, EXCAVATED MATERIAL SHALL BE STOCKPILED ON THE SIDE OF THE TRENCH OPPOSITE THE WATER COURSE, IN ORDER TO MINIMIZE SILTATION. IN ADDITION TO STOCKPILE LOCATION REQUIREMENTS FOR THESE AFOREMENTIONED WORK AREAS, A METHOD OF SILTATION CONTROL (SILT FENCING) SHALL ALSO BE EMPLOYED.
13. DITCHES WHICH ARE FILLED, OR PARTLY INOPERATIVE SHALL BE CLEANED AND MADE OPERATIVE BEFORE THE CONTRACTOR STOPS WORK FOR ANY DAY, AND SHALL BE MAINTAINED IN A CONDITION SATISFACTORY TO THE OWNER FOR THE DURATION OF THE CONTRACT.
14. WATER FROM AGGREGATE WASHINGS, DECONTAMINATION, OR OTHER OPERATIONS SHALL BE TESTED THEN DISPOSED OF OFF-SITE IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL LAWS.
15. POLLUTANTS SUCH AS FUELS, LUBRICANTS, BITUMENS, RAW SEWAGE, AND OTHER HARMFUL MATERIALS SHALL NOT BE DISCHARGED INTO OR NEAR IMPOUNDMENTS OR INTO NATURAL OR MANMADE CHANNELS. WASH WATER OR WASTE FROM CONCRETE MIXING OPERATIONS SHALL NOT BE ALLOWED TO ENTER ANY DRAINAGE STRUCTURES.
16. ALL APPLICABLE REGULATIONS OF FISH AND WILDLIFE AGENCIES AND STATUTES RELATING TO THE PREVENTION AND ABATEMENT OF POLLUTION SHALL BE COMPLIED WITH IN THE PERFORMANCE OF THE CONTRACT.
17. ANY MATERIAL GENERATED BY ANY ACTIVITY FOR THE DEVELOPMENT, MODIFICATION, AND CONSTRUCTION OF THE FACILITY SHALL NOT BE BURNED ON OR OFF THE CONTRACT SITE. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, LAND CLEARING MATERIAL AND DEMOLITION MATERIAL. SUCH MATERIAL SHALL HEREINAFTER BE REFERRED TO AS DISPOSABLE MATERIAL IN THE CLEARING AND GRUBBING OPERATION.
18. WHEN IT BECOMES NECESSARY, THE ENGINEER WILL INFORM THE CONTRACTOR OF UNSATISFACTORY CONSTRUCTION PROCEDURES AND OPERATIONS INSOFAR AS EROSION CONTROL, WATER, AND AIR POLLUTION ARE CONCERNED. IF THE UNSATISFACTORY CONSTRUCTION PROCEDURES AND OPERATIONS ARE NOT CORRECTED PROMPTLY, THE ENGINEER MAY SUSPEND THE PERFORMANCE OF ANY OR ALL OF OTHER CONSTRUCTION UNTIL THE UNSATISFACTORY CONDITION HAS BEEN CORRECTED.
19. PRE-CHARACTERIZATION AND HANDLING OF MATERIALS SHALL BE CONDUCTED IN ACCORDANCE WITH THE SOIL MANAGMENT PLAN.
20. ANY MATERIALS CHARACTERIZED ABOVE SOIL CLEAN UP OBJECTIVES FOR INDUSTRIAL SITES SHALL BE DISPOSED OF OFF-SITE, IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. MATERIALS SHALL BE REMOVED FROM THE SITE AS SOON AS POSSIBLE. TEMPORARY STAGING SHALL BE CONDUCTED IN DESIGNATED AREA ON McKAY FIELD.
21. ANY MATERIALS CHARACTERIZED BELOW SOIL CLEANUP OBJECTIVES SHALL BE REUSED AS FILL MATERIAL IN AREAS THAT WILL BE PAVED IN ACCORDANCE WITH SUBPART 375-6: REMEDIAL PROGRAM SOIL CLEANUP OBJECTIVES FOR INDUSTRIAL SITES. TEMPORARY STAGING SHALL BE CONDUCTED IN DESIGNATED AREA ON McKAY FIELD.
22. ANY TRENCHING AND/OR EARTHWORK ACTIVITIES SHALL BE LIMITED TO THE LIMITS OF DISTURBANCE.
23. CONTRACTOR SHALL PROTECT ALL TREES LOCATED IN OF NEAR LIMITS OF DISTURBANCE.
24. CONTRACTOR SHALL LOCATE AND PROTECT ALL MONITORING WELLS.
25. CONTRACTOR SHALL IMPLEMENT DUST SUPRESSION AND AIR MONITORING ACTIVITIES IN CONFORMANCE WITH THE COMMUNITY AIR MONITORING PLAN FOR THE SITE.
26. SEEDING SHALL BE APPLIED AS DIRECTED BY ENGINEER.
27. TRAFFIC SHALL BE LIMITED TO THE DESIGNATED ROUTES.
28. ALL CONSTRUCTION EQUIPMENT SHALL BE STORED WITHIN THE 6-FOOT FENCE AROUND MCKAY FIELD , WITH LOCKING GATES.



1 / 2|2 TYPICAL HAY BALE DETAIL
SCALE: N.T.S.



2 / 2|2 TYPICAL SILT FENCE DETAIL
SCALE: N.T.S.



3 / 2|2 TYPICAL SOIL STOCKPILE DETAIL
SCALE: N.T.S.

NOTES:

1. THIS DETAIL APPLIES TO EXCAVATED SOIL MATERIAL FROM WITHIN THE LIMITS OF DISTURBANCE. THIS DETAIL IS NOT REQUIRED FOR IMPORTED FILL, AS APPROVED BY THE ENGINEER.
2. A 30-MIL PVC OR 40-MIL. HDPE LINER SHALL BE PLACED ON THE BOTTOM OF THE STOCKPILE AREA AND ANCHORED A MINIMUM 6 INCHES BELOW THE SURFACE. THE LINER SHALL BE PROPERLY SEAMED TO FORM A LEAK-PROOF LINER. THE MATERIALS AND INSTALLATION METHODS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW.
3. THE SURFACE OF THE STAGING AREA SHALL BE GRADED TO PROMOTE FLOW AWAY FROM THE STOCKPILE.
4. SILT FENCE SHALL BE CONSTRUCTED AROUND THE PERIMETER OF THE STOCKPILE AREA.
5. RAMPS SHALL BE CONSTRUCTED AS NECESSARY FOR ACCESS TO THE STOCKPILE AREA.
6. THE SUBGRADE SHALL BE SMOOTH WITHOUT STONES OR OTHER OBJECTS THAT COULD PUNCTURE THE GEOMEMBRANE. THE SUBGRADE SHALL BE PROOF-ROLLED WITH A LOADED TANDEM, AND ANY SOFT, SPONGY OR PUMPING SOIL SHALL BE REMOVED, REPLACED AND RECOMPACTED.
7. THE SOIL MATERIALS SHALL BE PLACED ON THE LINER AND COVERED WITH THE SHEETING OR TARP DURING ALL NON-WORKING HOURS AND DURING PRECIPITATION EVENTS. NO RAINWATER SHALL CONTACT THE SOIL WHILE STAGED IN THE STOCKPILE AREA.
8. WASTE HAULER ACCESS WILL BE LIMITED TO THE ACCESS ROAD FROM THE PROPOSED OFFSITE DISPOSAL STOCKPILE AREA TO THE CHERRY AVENUE EXTENSION/AEROSPACE BOULEVARD. WASTE HAULERS WILL RECEIVE APPROPRIATE WASTE AND THEN BE DIRECTED TO THE WASHDOWN PAD PRIOR TO REENTRY ONTO PUBLIC ROADS.

Current Plotstyle : ByColor
Layout Tab: Erosion Control Plan
Date\Time : Fri, 07 Sep 2007 - 3:35pm
Path\Name : G:\APROJECT\Northrop Grumman\Superfund\2007\OU3\NY001464.1407 VCS IRM\VCS Desig-Const\95% Design\Cadd\DEC_95% Submittal\02_Soil Erosion & Sediment Control Plan.dwg
Acad Version : R17.0s (LMS Tech)
User Name : alsanchez

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NORTHROP GRUMMAN OPERABLE UNIT 3
SOIL GAS INTERIM REMEDIAL MEASURE
FORMER GRUMMAN SETTLING PONDS
BETHPAGE, NEW YORK

SOIL EROSION AND SEDIMENT CONTROL PLAN, DETAILS AND NOTES

PROJECT MANAGER	DEPARTMENT MANAGER	LEAD DESIGN PROF.	CHECKED BY
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		TASK/PHASE NUMBER	DRAWN BY
		00004	A. SANCHEZ
		PROJECT NUMBER	DRAWING NUMBER
		NY001464.1407	2

GENERAL NOTES

1. ALL PRESSURE INDICATORS, FLOW INDICATORS, TEMPERATURE INDICATORS, AND NUMBERED VALVES SHALL BE TAGGED (DOG TAG STYLE) IN FIELD AS SHOWN BELOW WITH METHOD APPROVED BY THE ENGINEER.
2. UNLESS MAKE AND/OR MODEL OF EQUIPMENT IS SHOWN, CONTRACTOR IS RESPONSIBLE FOR SPECIFYING EQUIPMENT WHICH MEETS LISTED CRITERIA AS DESCRIBED BELOW. CONTRACTOR SHALL SUBMIT TO ENGINEER SHOP DRAWINGS AND TECHNICAL SPECIFICATIONS OF ALL PROPOSED EQUIPMENT.
3. UNLESS NOTED OTHERWISE, ALL PIPING, VALVES, AND FITTINGS SHALL BE SCH. 80 PVC OR APPROVED EQUIVALENT.
4. ALL WATER SAMPLE PORTS SHALL BE COMPRISED OF ONE 1/4" NIPPLE, ONE 1/4" BALL VALVE AND ONE 1/4" COPPER TUBING.
5. ALL AIR SAMPLE PORTS SHALL BE COMPRISED OF 1/4" O.D. COPPER TUBING WITH END CONNECTION OF 1/4" I.D. FERRUL AND 1/4" SWAGELOCK NUT.
6. FLOW ELEMENT ACCESS SHALL CONSIST OF 1/4" THREADED HOLE CAPPED WITH A 1/4" STEEL PLUG.
7. UNIONS SHALL BE INSTALLED AS DIRECTED BY ENGINEER TO ALLOW FULL DISCONNECTION OF PIPING\EQUIPMENT DURING MAINTENANCE ACTIVITY.
8. SEE APPENDIX B OF THE 95–PERCENT ENGINEERING REPORT FOR INDIVIDUAL LINE SIZES OF BELOW GRADE PIPE.
9. EQUIPMENT INLET/OUTLET SIZES NOT SHOWN. CONTRACTOR TO PROVIDE REDUCERS/EXPANSIONS AS NECESSARY TO MAKE CONNECTIONS. MATERIALS OF CONSTRUCTION TO BE SIMILAR AS SHOWN HEREIN AND ARE SUBJECTED TO ENGINEERS APPROVAL.

PIPING SYMBOLS

- CONDENSATE LINE
- LIMITS OF TREATMENT BUILDING
- BALL VALVE (NORMALLY OPEN)
- BALL VALVE (NORMALLY CLOSED)
- CHECK VALVE
- BUTTERFLY VALVE (NORMALLY OPEN)
- BUTTERFLY VALVE (NORMALLY CLOSED)
- PROCESS VAPOR LINE
- UNION
- 10"x6" EXPANSION/REDUCER
- TEMPORARY CONNECTION
- SAMPLE PORT/DRAIN
- VACUUM BREAK
- FE FLOW ELEMENT ACCESS

INSTRUMENT SYMBOLS

- INLINE INSTRUMENT
- ISOLATED INSTRUMENT CONNECTED TO PROCESS LINE
- INSTRUMENT CONNECTED TO PROCESS LINE
- FIELD MOUNTED
- PRIMARY PANEL MOUNTED
- RUN INDICATOR LIGHT
- PLC INTERLOCK

PIPE IDENTIFICATION

LINE SIZE — PIPING SPECIFICATION (SEE PROCESS ABBREVIATIONS)

6"ø SCH. 80 PVC — DIRECTION OF FLOW

SOIL GAS SYSTEM PROCESS FLOW TABLE

LOCATION ON DRAWING	CORRESPONDING GAUGE ID	WELL ID	FLOW RATE (SCFM)	PRESSURE (IWC)	VACUUM (IWC)	DESIGN TVOC LOAD (ug/m³)	TEMPERATURE (°F)
A	VI-101	DW-7D	49	—	-1.4	86,751	65
B	VI-102	DW-3D	102	—	-2.6	149,941	65
C	VI-103	DW-5D	75	—	-33.5	50,092	65
D	VI-104	DW-6D	75	—	-33.5	84,388	65
E	VI-105	DW-1D	75	—	-33.5	696	65
F	VI-106	DW-4D	75	—	-33.5	1,609	65
G	VI-107	DW-2D	100	—	-5.0	1424	65
H	VI-108	DW-11S	66	—	-3.8	5260	65
I	VI-109	DW-10S	66	—	-3.8	1346	65
J	VI-110	DW-2S	66	—	-3.8	2007	65
K	VI-111	DW-9S	66	—	-3.8	1910	65
L	VI-112	DW-8S	66	—	-3.8	4942	65
M	VI-113	DW-4S	150	—	-3.9	1910	65
N	VI-114	DW-1S	150	—	-3.9	1018	65
O	VI-115	DW-6S	150	—	-3.9	10178	65
P	VI-116	DW-5S	150	—	-3.9	1037	65
Q	VI-117	DW-3S	79	—	-1.6	632	65
R	VI-118	DW-7S	45	—	-0.8	632	65
S	VI-119	---	716	—	-51.5	31,025	65
T	VI-120	---	685	—	-30.2	8,550	65
U	VI-121	---	685	—	-30.2	8,550	65
V	VI-122	---	716	—	-64.1	31,025	65
W	VI-123	---	685	—	-41.8	8,550	65
X	VI-124	---	685	—	-41.8	8,550	65
Y	PI-601	---	2086	17	---	16,265	150
Z	PI-602	---	2086	0	---	<AGC	100

EQUIPMENT DESCRIPTIONS

AIR FILTERS:
DESIGNATION: AF–200, AF–300 AND AF–400
MAKE: SOLBERG CSL–245P–500
TYPE: IN–LINE PARTICULATE

BLOWERS:
DESIGNATION: BL–200
MAKE: ROTRON EN14
TYPE: REGENERATIVE
SIZE: 30 HP, 3ø, 480V

BLOWERS:
DESIGNATION: BL–300 AND BL–400
MAKE: ROTRON EN979
TYPE: REGENERATIVE
SIZE: 20 HP, 3ø, 480V

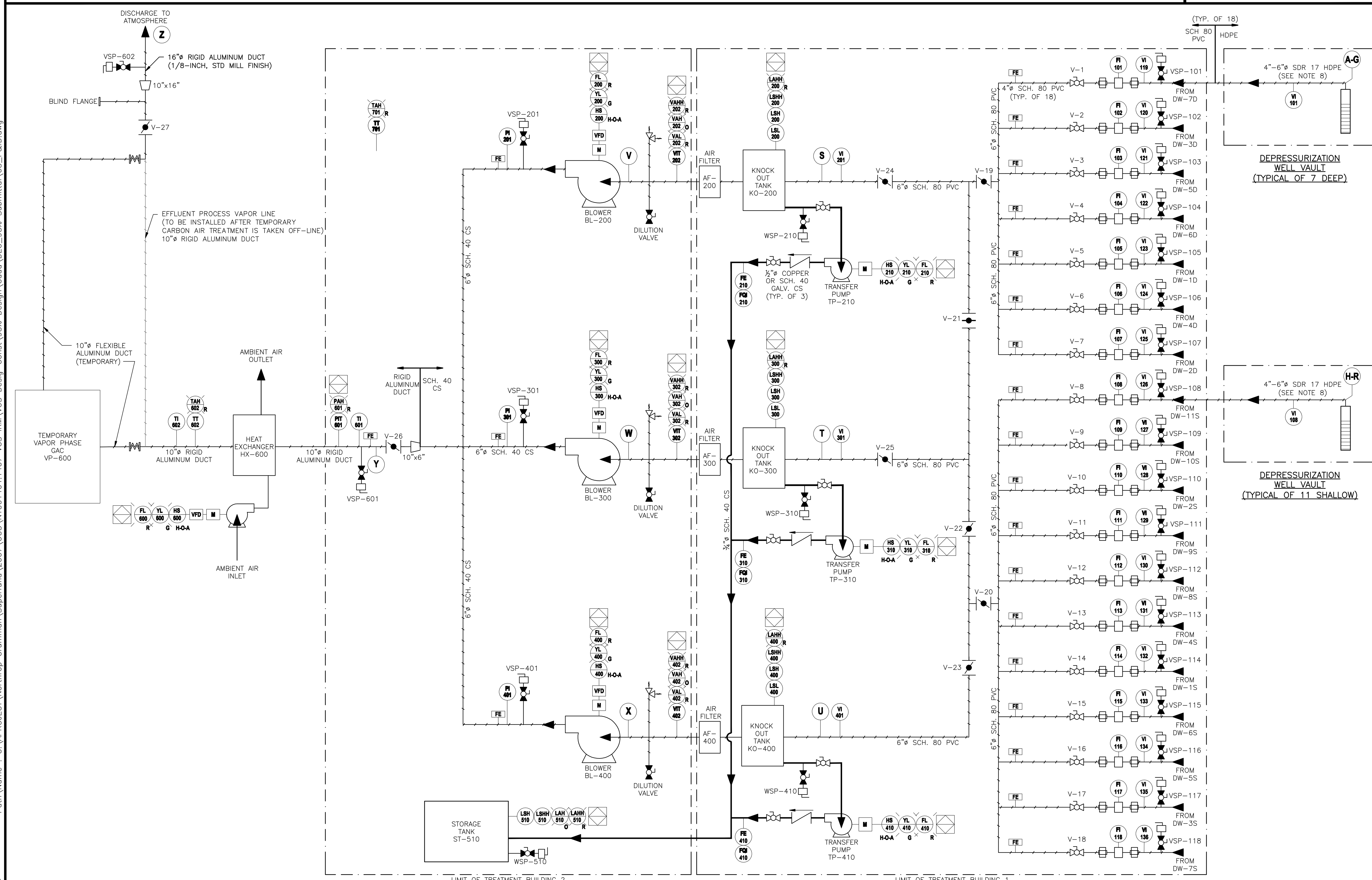
HEAT EXCHANGER:
DESIGNATION: HX–600
MAKE: XCHANGER AA–2750
TYPE: FAN FORCED AIR
SIZE: 2 HP, 3ø, 480 V

LIQUID KNOCKOUT TANKS:
DESIGNATION: KO–200, KO–300 AND KO–400
MAKE: GASHO GX–90
SIZE: 22' X 56"
CAPACITY: 90 GAL. TOTAL 30 GAL. STORAGE

STORAGE TANK:
DESIGNATION: ST–510
MAKE: NORWESCO
TYPE: FREESTANDING WATER TANK
SIZE: 400 GALLON

TRANSFER PUMPS:
DESIGNATION: TP–210, TP–310 AND TP–410
MAKE: OBERDORFER BRONZE GEAR 992R
TYPE: POSITIVE DISPLACMENT
SIZE: 0.5 HP, 3ø, 480V

TEMPORARY VAPOR PHASE GAC:
DESIGNATION: VP–600
MAKE: US FILTER RB–10 OR EQUAL
SIZE: 10,000 LB



PLC INTERLOCK DESCRIPTIONS

THE MAIN CONTROL PANEL WILL CONSIST OF A PROGRAMMABLE LOGIC CONTROLLER (PLC) AND SERVE AS THE CENTRAL CONTROL POINT FOR THE SYSTEM. NEGATIVE PRESSURE WILL BE MAINTAINED WITHIN THE SUBSURFACE THROUGH 18 EXTRACTION WELLS CONNECTED TO A DEPRESSURIZATION SYSTEM. THE DEPRESSURIZATION SYSTEM WILL CONSIST OF THREE (3) REGENERATIVE TYPE BLOWERS ARRANGED IN PARALLEL. ONE BLOWER (BL–200) WILL BE DEDICATED FOR DEEP EXTRACTION WELLS DW–1D THROUGH DW–7D. TWO ADDITIONAL BLOWERS (BL–300 AND BL–400) WILL BE DEDICATED FOR SHALLOW EXTRACTION WELLS DW–1S THROUGH DW–11S. HOWEVER, ALL BLOWERS WILL BE VALVED IN SUCH A WAY THAT THEY CAN BE USED AS BACKUPS IN CASE OF FAILURE OF ANY INDIVIDUAL BLOWER. MOISTURE WILL BE REMOVED FROM THE EXTRACTED SOIL GAS USING LIQUID KNOCKOUT TANKS KO–200, KO–300, AND KO–400. COLLECTED MOISTURE WILL BE AUTOMATICALLY TRANSFERRED TO STORAGE TANK ST–510 BY TRANSFER PUMPS TP–210, TP–310, AND TP–410. EXTRACTED SOIL GAS WILL BE TREATED USING A TEMPORARY VAPOR PHASE TREATEMENT SYSTEM (VP–600) UNTIL IT IS DEMONSTRATED THAT THE INFLUENT VAPOR CONCENTRATION IS BELOW APPLICABLE AIR STANDARDS (NYSDEC DAR–1 AGC/SGCs) AS ANTICIPATED. WATER COLLECTED IN STORAGE TANK ST–510 WILL INITIALLY BE TRANSFERRED TO THE LOCAL POTW THROUGH EXISTING AGREEMENT. THE SYSTEM WILL CONTAIN A SERIES OF ALARMS AND INTERLOCKS TO ENSURE PROPER OPERATION AND OPTIMIZE SYSTEM OPERATION TIME.

A DESCRIPTION OF THE ALARMS AND INTERLOCKS THAT WILL BE USED TO CONTROL THE SYSTEM IS DESCRIBED BELOW:

INTERLOCK ID	ALARM	DESCRIPTION	REASON	ALARM RANGE
A	FL–200	BLOWER MOTOR BL–200	BLOWER MOTOR BL–200 FAILURE	
B	FL–210	TRANSFER PUMP MOTOR TP–210	TRANSFER PUMP MOTOR TP–210 FAILURE	
A	LAHH–200	KNOCKOUT TANK HIGH HIGH LEVEL	TRANSFER PUMP MOTOR TP–210 FAILURE.	
B	VAH–202	BLOWER VACUUM HIGH LEVEL	AIR FILTER OR LINE OBSTRUCTION	–60 IWC
A	VAHH–202	BLOWER VACUUM HIGH HIGH LEVEL	AIR FILTER OR LINE OBSTRUCTION	–65 IWC
A	VAL–202	DEEP DEPRESSURIZATION WELL VACUUM LOW	RECOVERY LINE OR BLOWER FAILURE	–30 IWC
A	FL–300	BLOWER MOTOR BL–300	BLOWER MOTOR BL–300 FAILURE	
B	FL–310	TRANSFER PUMP MOTOR TP–310	TRANSFER PUMP MOTOR TP–310 FAILURE	
A	LAHH–300	KNOCKOUT TANK HIGH HIGH LEVEL	TRANSFER PUMP MOTOR TP–310 FAILURE.	
B	VAH–302	BLOWER VACUUM HIGH LEVEL	AIR FILTER OR LINE OBSTRUCTION	–30 IWC
A	VAHH–302	BLOWER VACUUM HIGH HIGH LEVEL	AIR FILTER OR LINE OBSTRUCTION	–40 IWC
A	VAL–302	SHALLOW DEPRESSURIZATION WELL VACUUM LOW	RECOVERY LINE OR BLOWER FAILURE	–15 IWC
A	FL–400	BLOWER MOTOR BL–400	BLOWER MOTOR BL–400 FAILURE	
B	FL–410	TRANSFER PUMP MOTOR TP–410	TRANSFER PUMP MOTOR TP–410 FAILURE	
A	LAHH–400	KNOCKOUT TANK HIGH HIGH LEVEL	TRANSFER PUMP MOTOR TP–410 FAILURE	
B	VAH–402	BLOWER VACUUM HIGH LEVEL	AIR FILTER OR LINE OBSTRUCTION	–30 IWC
A	VAHH–402	BLOWER VACUUM HIGH HIGH LEVEL	AIR FILTER OR LINE OBSTRUCTION	–40 IWC
A	VAL–402	SHALLOW DEPRESSURIZATION WELL VACUUM LOW	RECOVERY LINE OR BLOWER FAILURE	–15 IWC
B	LAH–510	STORAGE TANK HIGH LEVEL	STORAGE TANK ST–510 FULL	
A	LAHH–510	STORAGE TANK HIGH HIGH LEVEL	STORAGE TANK ST–510 OVER FILLED	
B	FL–600	HEAT EXCHANGER MOTOR HX–600	HX–600 MOTOR FAILURE	
A	PAH–601	EFFLUENT HIGH PRESSURE	PRESSURE HIGH ON DISCHARGE	+20 IWC
A	TAH–602	EFFLUENT HIGH TEMPERATURE	HEAT EXCHANGER FAILURE	130°F
A	TAH–701	TREATMENT BUILDING 2 HIGH TEMPERATURE	HIGH TEMPERATURE IN TREATMENT BUILDING 2	105°F

1. ALARM SETPOINTS SHOWN ARE APPROXIMATE. FINAL SETPOINTS TO BE FIELD DETERMINED DURING SYSTEM STARTUP.
2. ALL ALARM SETPOINTS SHALL BE OPERATOR ADJUSTABLE ON THE GRAPHICAL USER INTERFACE.
3. HEAT EXCHANGER HX–600 MOTOR SPEED TO BE CONROLLED BY THE TEMPERATURE FROM TT–602. DESIRED DISCHARGE TEMPERATUTRE TO BE AN OPERATOR INPUT ON THE GRAPHICAL USER INTERFACE.

A MAIN SYSTEM INTERLOCK–RESULTS IN SHUTDOWN OF ALL SYSTEM COMPONENTS.

B MINOR SYSTEM INTERLOCK–RESULTS IN CALLOUT OF THE AUTODIALER ONLY. IF ALARM IS NOT CLEARED MANUALLY WITHIN 24 HOURS, THE MAIN SYSTEM INTERLOCK WILL BE ENGAGED.

GENERAL ABBREVIATIONS

ø	DIAMETER	KO	KNOCKOUT TANK	SGC	SHORT–TERM GUIDANCE CRITERIA
AF	AIR FILTER	LAHH	LEVEL ALARM LIGHT HIGH HIGH	ST	STORAGE TANK
AGC	ANNUAL GUIDANCE CRITERIA	LSH	LEVEL SWITCH HIGH	TAH	TEMPERATURE ALARM HIGH
BL	BLOWER	LSHH	LEVEL SWITCH HIGH HIGH	TP	TRANSFER PUMP
CFM	CUBIC FEET PER MINUTE	LSL	LEVEL SWITCH LOW	TT	TEMPERATURE TRANSMITTER
CS	CARBON STEEL	M	MOTOR	V	VALVE
CV	CHECK VALVE	ug/m³	MICROGRAMS PER CUBIC METER	VAH	VACUUM ALARM HIGH
FE	FLOW MONITORING ELEMENT	O	ORANGE INDICATOR LIGHT	VAHH	VACUUM ALARM HIGH HIGH
FI	FLOW RATE INDICATOR	PAH	PRESSURE ALARM HIGH	VAL	VACUUM ALARM LOW
FL	FAULT LIGHT	PI	PRESSURE INDICATOR	VALL	VACUUM ALARM LOW LOW
FQI	FLOW TOTALIZER INDICATOR	PIT	PRESSURE INDICATING TRANSMITTER	VFD	VARIABLE FREQUENCY DRIVE
G	GREEN INDICATOR LIGHT	PLC	PROGRAMMABLE LOGIC CONTROLLER	VI	VACUUM INDICATOR
GAC	GRANULAR ACTIVATED CARBON	PSIG	POUNDS PER SQUARE INCH GAUGE	VIT	VACUUM INDICATING TRANSMITTER
GALV	GALVANIZED	PT	PRESSURE TRANSMITTER	VSP	VAPOR SAMPLE POINT
HDPE	HIGH DENSITY POLYETHYLENE	PVC	POLYVINYL CHLORIDE	VT	VACUUM TRANSMITTER
H–O–A	HAND–OFF–AUTO	R	RED INDICATOR LIGHT	WSP	WATER SAMPLE POINT
HS	HAND SWITCH	SCFM	STANDARD CUBIC FEET PER MINUTE	YL	INDICATING LIGHT
HX	HEAT EXCHANGER	SCH	SCHEDULE		
IWC	INCHES OF WATER COLUMN	SDR	STANDARD DIAMETER RATIO		

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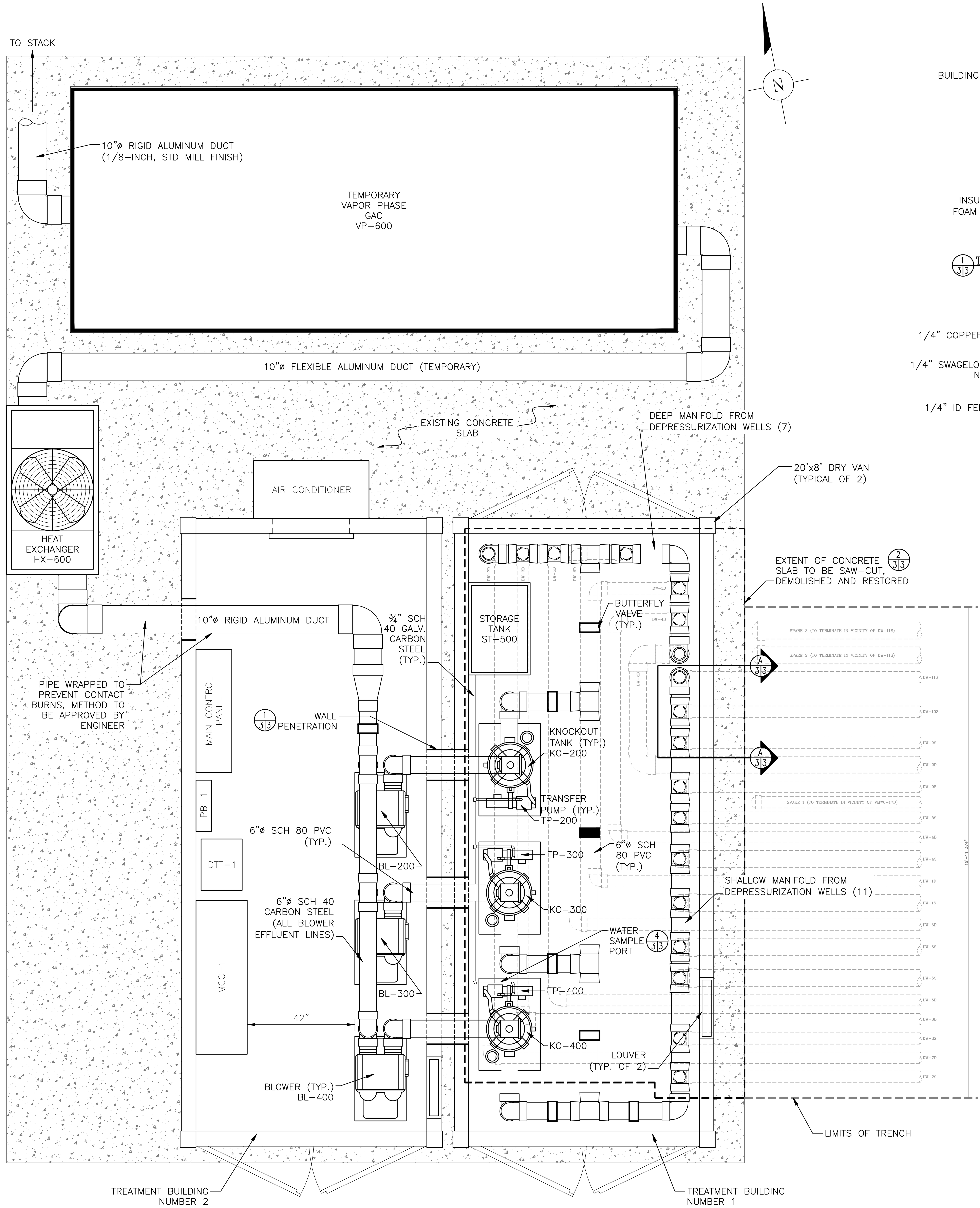
PROCESS AND INSTRUMENTATION DIAGRAM (P&ID)

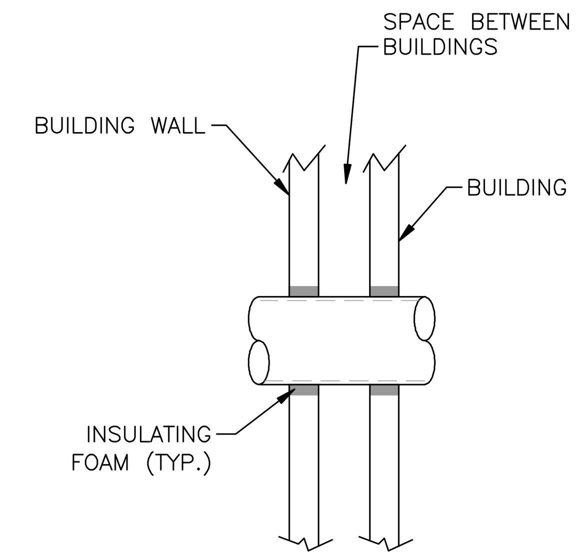
PROJECT MANAGER	DEPARTMENT MANAGER	LEAD DESIGN PROF.	CHECKED BY
C. SAN GIOVANNI	C. TUOHY	C. TUOHY	K. ZEGEL

TASK/PHASE NUMBER: 00004
DRAWN BY: A. SANCHEZ
PROJECT NUMBER: NY001464.1407
DRAWING NUMBER: 3



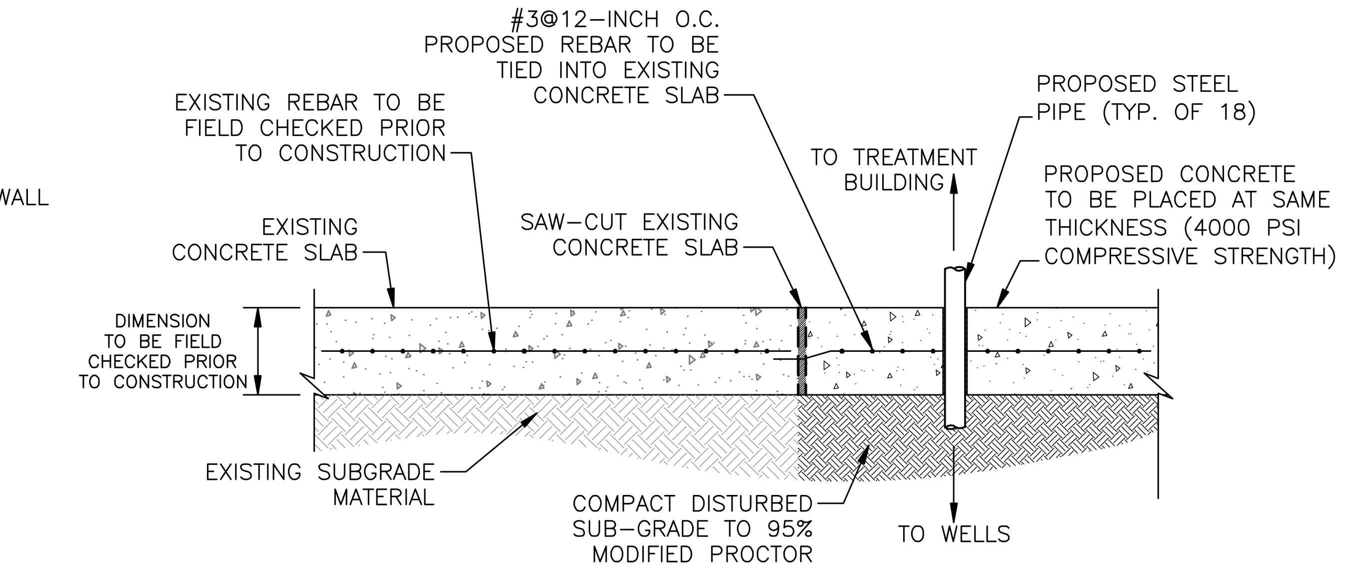
EQUIPMENT/BUILDING LAYOUT PLAN

SCALE: 1" = 2'-0"



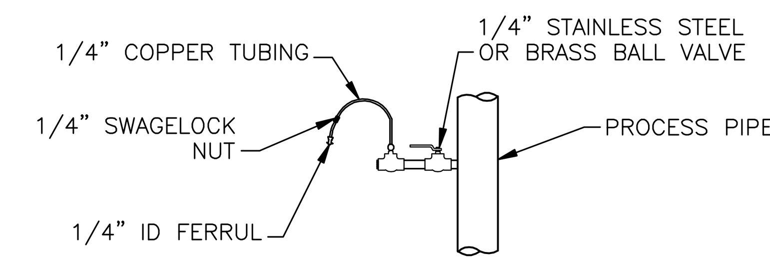
1 TYPICAL WALL PENETRATION

SCALE: N.T.S



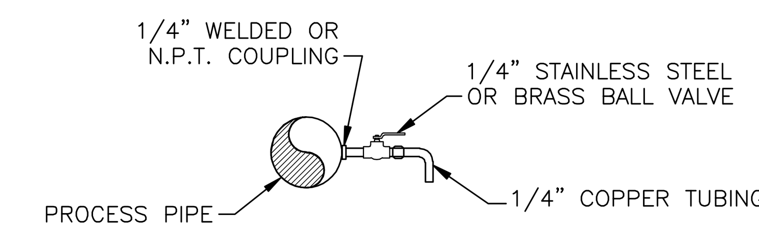
2 CONCRETE SLAB RESTORATION DETAIL

SCALE: N.T.S



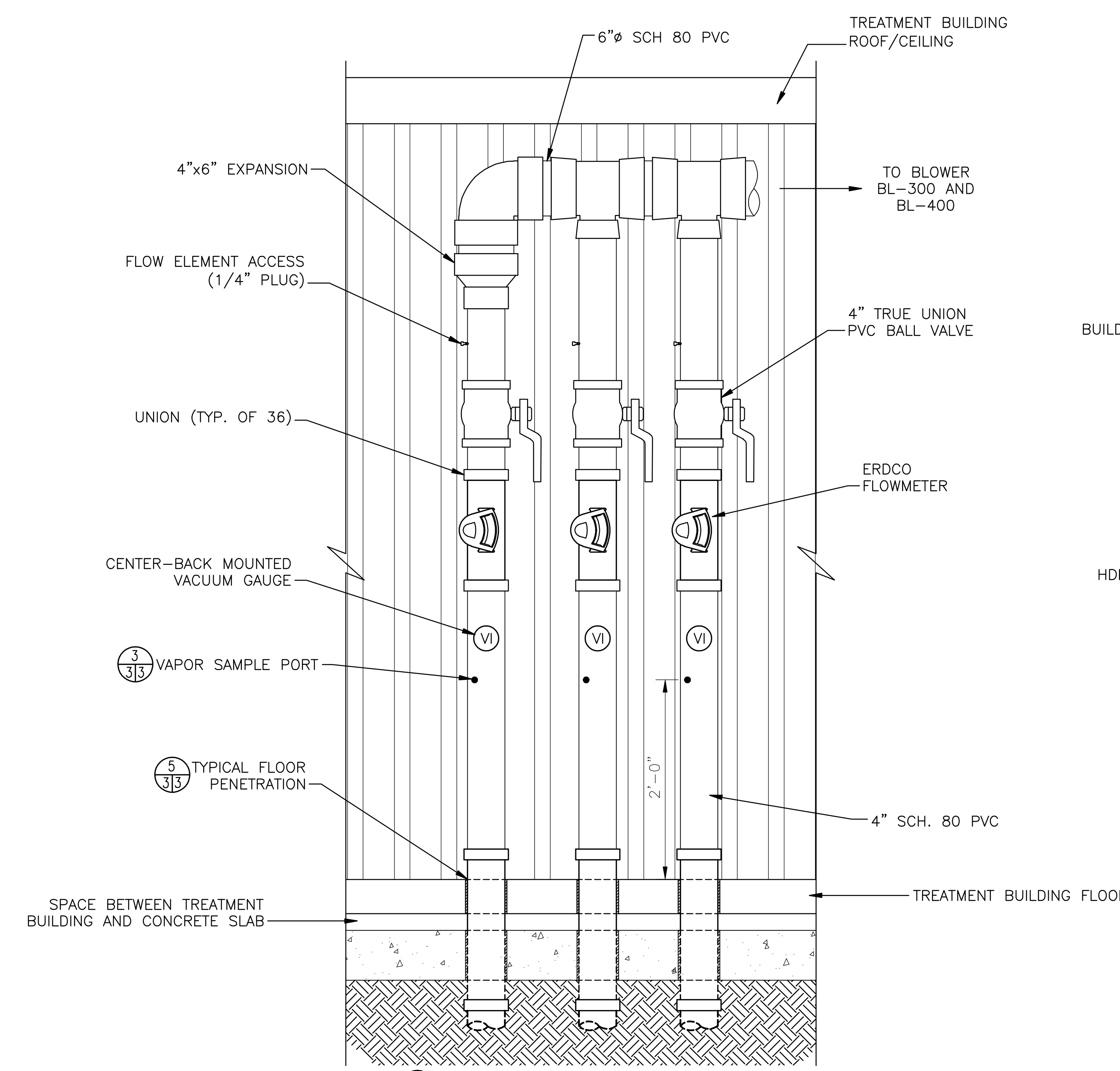
3 TYPICAL VAPOR SAMPLE PORT DETAIL

SCALE: N.T.S



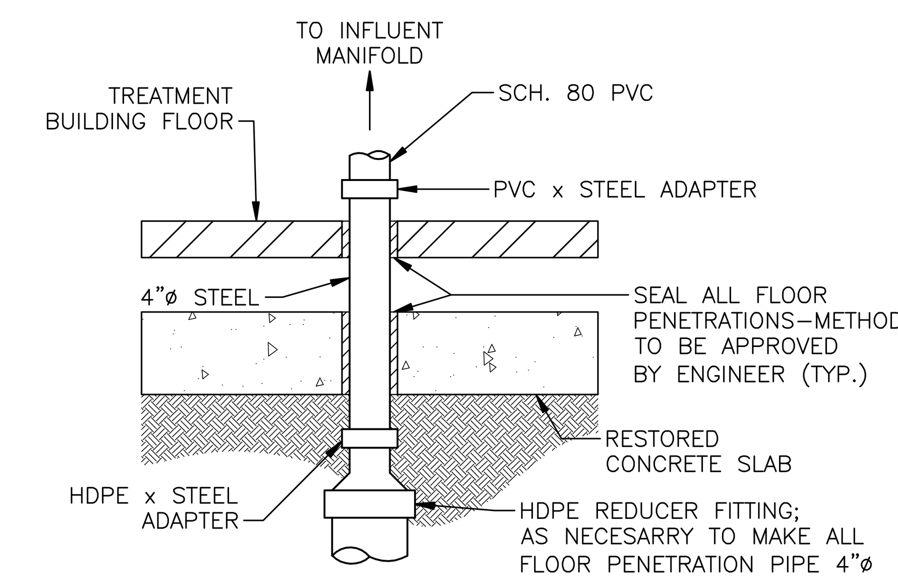
4 TYPICAL WATER SAMPLE PORT DETAIL

SCALE: N.T.S



A INFLUENT MANIFOLD ELEVATION

SCALE: N.T.S



5 TYPICAL FLOOR PENETRATION

SCALE: N.T.S

CONSTRUCTION NOTES:

1. PIPE ROUTING AND EQUIPMENT LAYOUT SHOWN FOR LAYOUT PURPOSES ONLY. CONTRACTOR TO FOLLOW PIPING AND INSTRUMENTATION DIAGRAM WHILE ASSEMBLING PIPING FOR VALVING, INSTRUMENTATION, AND REDUCTION REQUIREMENTS. PROVIDE LAYOUT/FABRICATION DRAWINGS FOR APPROVAL PRIOR TO CONSTRUCTION.
2. PLACEMENT OF VALVES TO BE SUCH THAT THEY ARE ACCESSIBLE AND OPERATE WITH EASE.
3. PLACEMENT OF INSTRUMENTATION TO BE SUCH THAT THEY ARE VISIBLE WITH GAUGES AND READOUTS CLEARLY IN VIEW AND ORIENTATED CORRECTLY.
4. ALL INSTRUMENTS, EQUIPMENT, AND VALVING TO BE INSTALLED PER MANUFACTURER'S REQUIREMENTS.
5. CONTRACTOR TO PROVIDE PIPE SUPPORTS AS REQUIRED. TYPE, PLACEMENT, AND NUMBER OF SUPPORTS ARE SUBJECT TO ENGINEER'S APPROVAL.
6. ALL EQUIPMENT, ELECTRICAL PANELS, AND PIPING OF CONSIDERABLE WEIGHT LOADING TO BE MOUNTED AND SUPPORTED AS FREESTANDING OR TO HAVE ADEQUATE FLOOR SUPPORTS.
7. NON-SHRINK GROUT OR OTHER APPROVED METHOD IS TO BE USED TO FILL ALL VOIDS AROUND PIPE PENETRATIONS IN CONCRETE.
8. INTERIOR PIPES SHALL BE LABELED WITH APPROPRIATE STICKERS INDICATING FLOW DIRECTION AND CONTENTS OF PIPE.
9. CONTRACTOR SHALL SUBMIT TO ENGINEER FOR APPROVAL SHOP DRAWINGS PRIOR TO CONSTRUCTION FOR ALL PROPOSED EQUIPMENT. PROPOSED TANK SHALL INCLUDE ALL PROPOSED LEVEL SWITCH LOCATIONS AND BULKHEAD FITTING FOR PIPE CONNECTIONS.
10. EQUIPMENT SHOULD BE PLACED IN LOCATIONS SPECIFIED, UNLESS APPROVED BY ENGINEER. ALL EQUIPMENT SHALL BE POSITIONED PRIOR TO MOUNTING (BOLTING) EQUIPMENT TO FLOOR. EXACT EQUIPMENT LOCATIONS MAY BE MODIFIED TO ALLOW FOR EASE OF MOVEMENT AND ACCESS BUT IS SUBJECT TO FIELD ENGINEERS APPROVAL.
11. ALL PIPING\ELECTRICAL CONDUITS SHALL BE ROUTED ALONG WALLS AND/OR OVERHEAD TO ALLOW EQUIPMENT ACCESS AND PREVENT TRIPPING HAZARDS. PIPING\ELECTRICAL CONDUITS SHALL NOT BE INSTALLED ALONG FLOORS UNLESS APPROVED BY THE ENGINEER.

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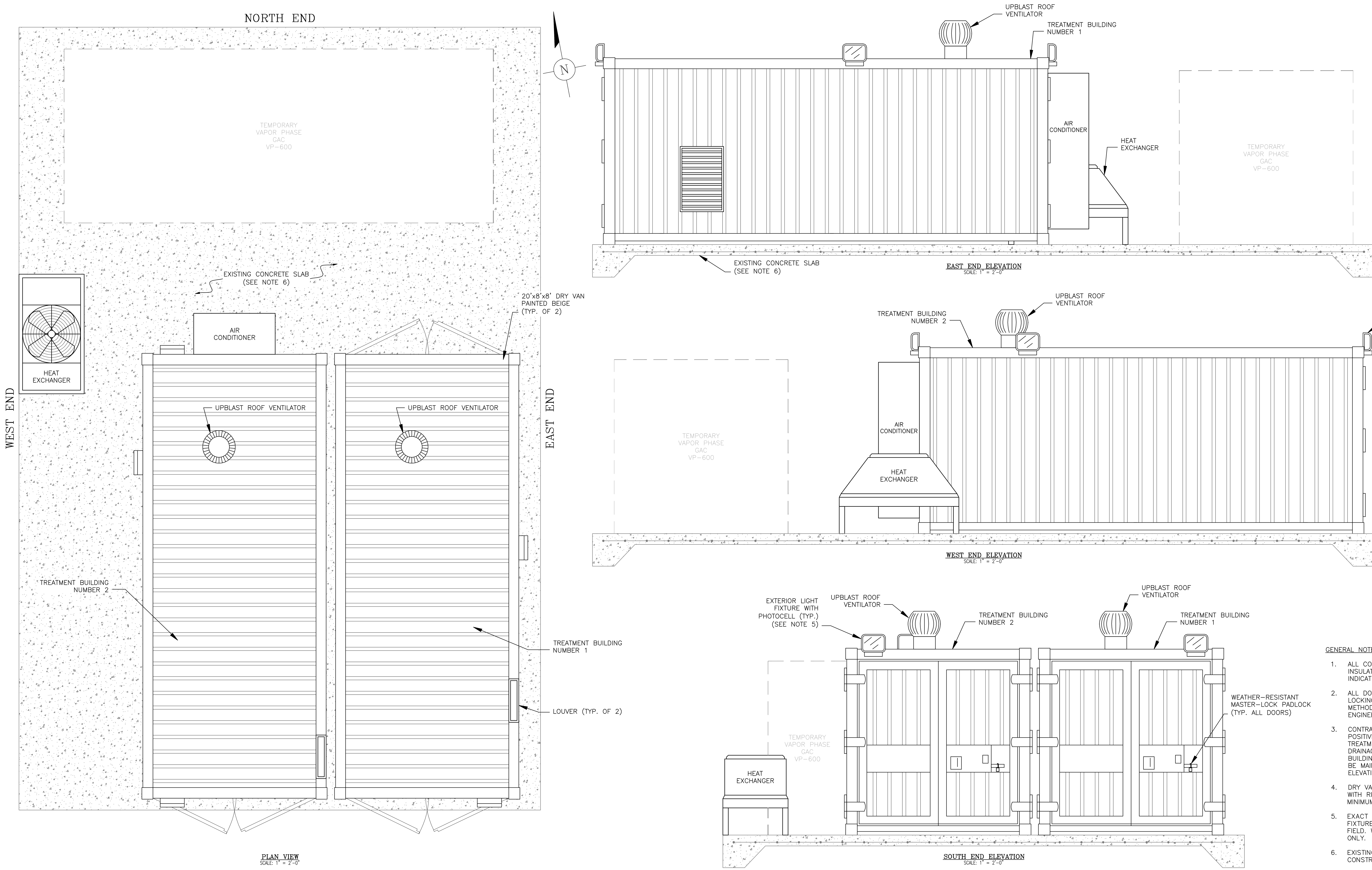
BUILDING LAYOUT AND DETAILS

PROJECT MANAGER	DEPARTMENT MANAGER	LEAD DESIGN PROF.	CHECKED BY
C. SAN GIOVANNI	C. TUOHY	C. TUOHY	K. ZEGEL
		TASK/PHASE NUMBER: 00004	DRAWN BY: A. SANCHEZ
		PROJECT NUMBER: NY001464.1407	DRAWING NUMBER: 4



GENERAL NOTES:

1. ALL CONTAINERS SHALL HAVE INSULATED DOUBLE DOORS WHERE INDICATED.
2. ALL DOUBLE DOORS SHALL HAVE LOCKING MECHANISM. LOCKING METHOD TO BE APPROVED BY ENGINEER PRIOR TO CONSTRUCTION.
3. CONTRACTOR SHALL MAINTAIN A POSITIVE SLOPE AWAY FROM THE TREATMENT BUILDINGS TO PROMOTE DRAINAGE OF STORMWATER. BUILDING SLAB-ON-GRADE SHALL BE MAINTAINED AT A CONSTANT ELEVATION + OR − 0.5%.
4. DRY VAN INTERIORS TO BE INSULATED WITH RIGID FOAM INSULATION WITH A MINIMUM RATING OF R-12.
5. EXACT LOCATION OF EXTERIOR LIGHT FIXTURES TO BE DETERMINED IN THE FIELD. WIRING TO BE RUN INSIDE ONLY.
6. EXISTING CONCRETE SLAB CONSTRUCTION TO BE FIELD VERIFIED.

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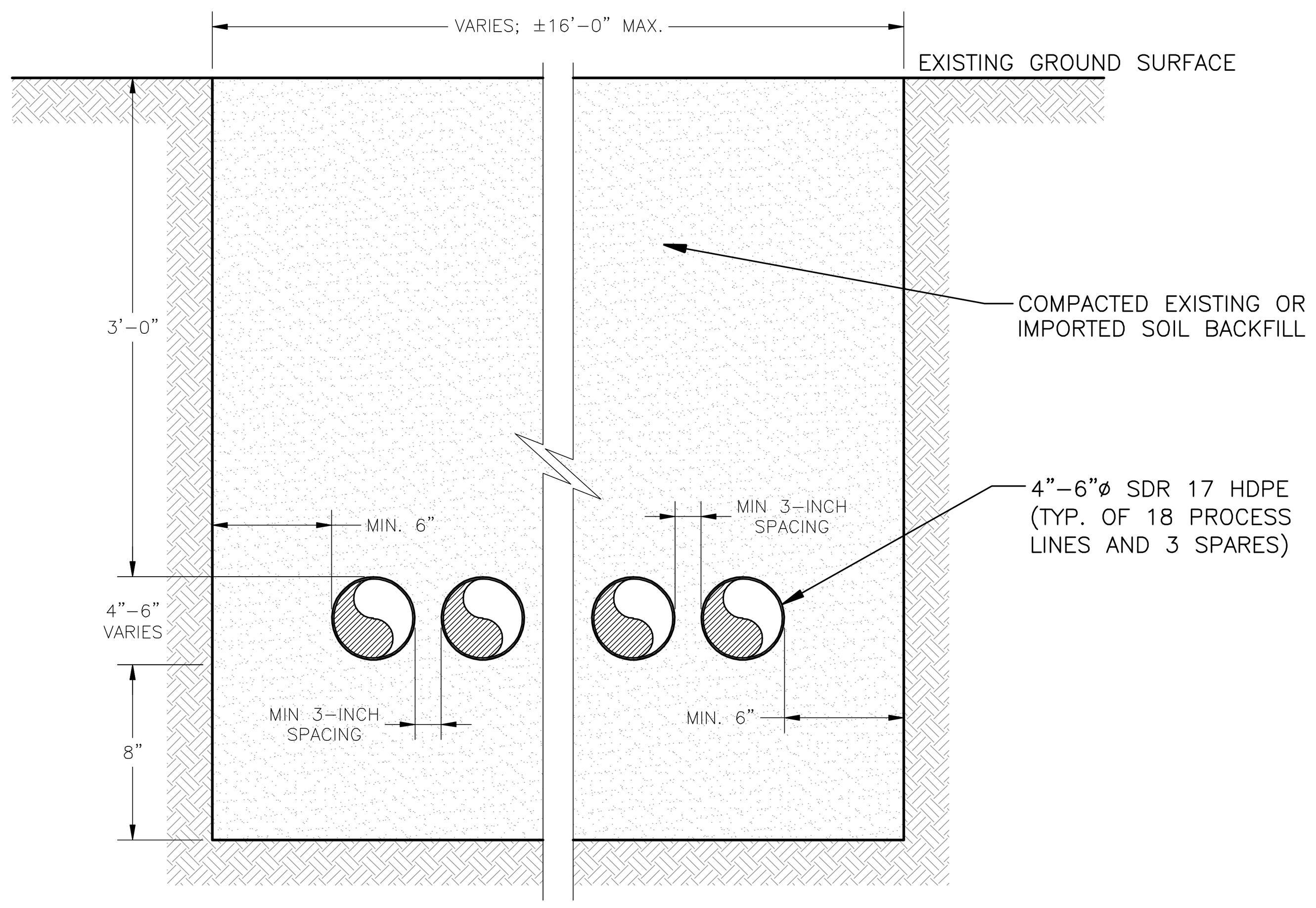
BUILDING ELEVATIONS AND DETAILS



1/6 TRENCH DETAIL
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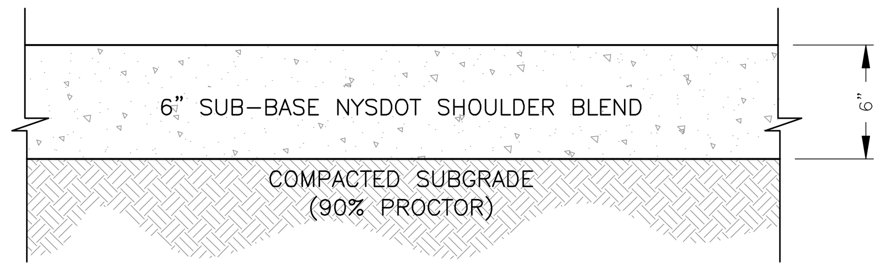
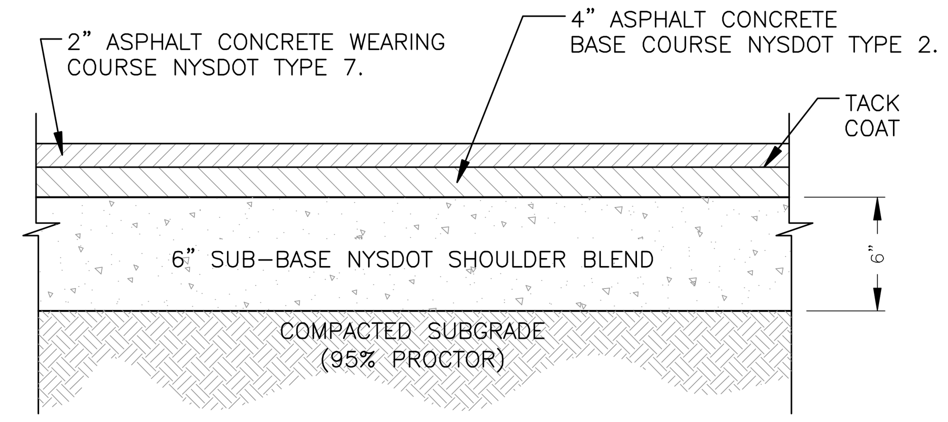


2/6 SECTION – PROPOSED COMPACTED AGGREGATE DETAIL
SCALE: N.T.S.

NOTES:

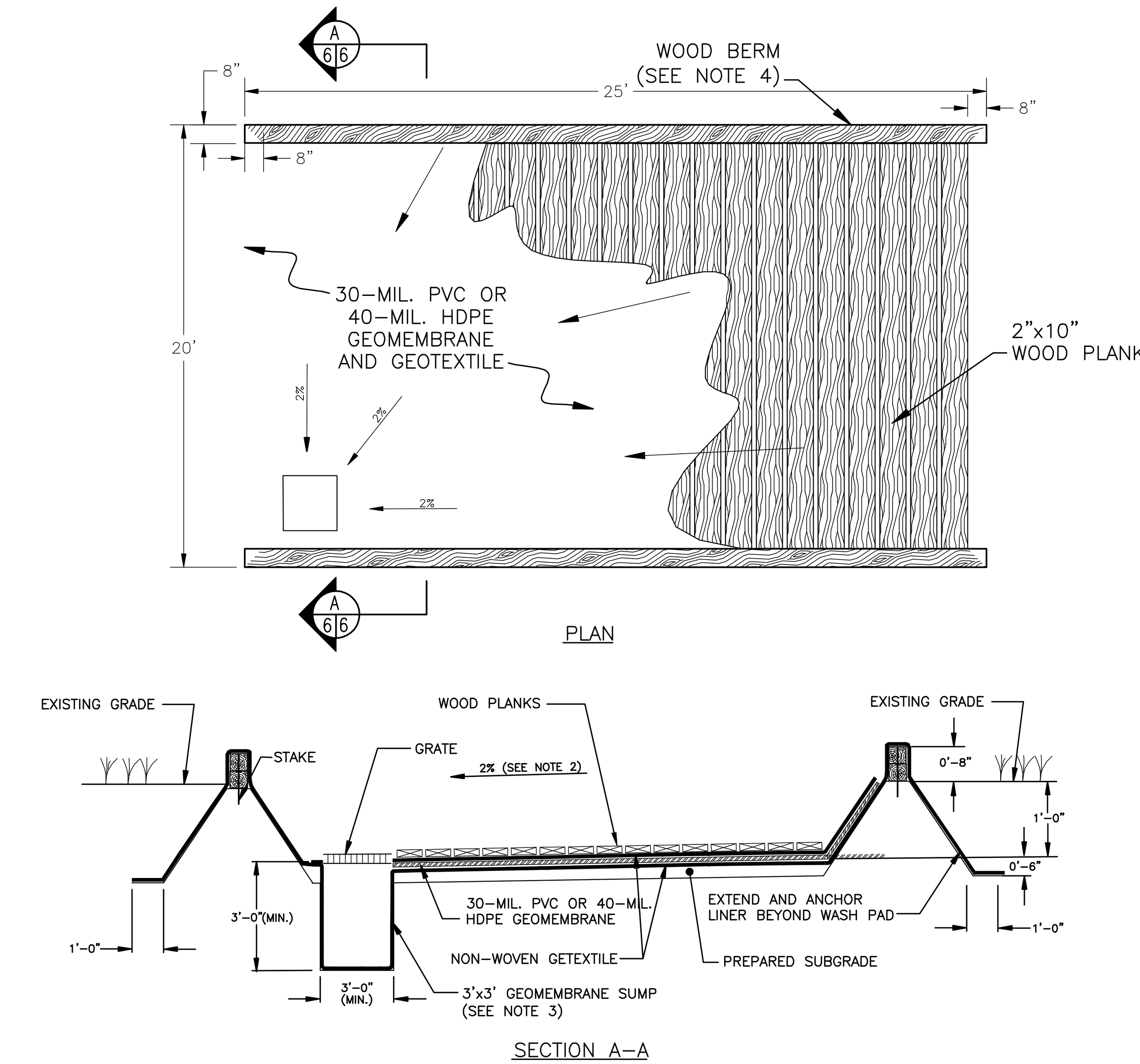
1. EXISTING WELLS SHALL BE LOCATED AND PROTECTED PRIOR TO BEGINNING EARTHWORK.
2. EXCAVATE THE SURFACE OF THE AREA TO BE IMPROVED TO THE PROPOSED SUBGRADE ELEVATION, COMPACT THE SUBGRADE SURFACE WITH A SMOOTH-DRUM ROLLER.
3. PROOF ROLL THE EXPOSED SUBGRADE WITH A LOADED TRIAXLE DUMP TRUCK OR SIMILAR EQUIPMENT. UNDER THE OBSERVATION OF THE ENGINEER. IF THE EXPOSED SURFACE IS DETERMINED TO BE UNSTABLE, REMOVE THE UNSTABLE MATERIAL BY UNDERCUTTING TO A MINIMUM DEPTH OF 8 INCHES AND BACKFILL WITH COMPACTED NYSDOT SHOULDER BLEND.
4. PLACE AND COMPACT 6 INCH LAYER OF AGGREGATE BASE. USE DENSE GRADED AGGREGATE MEETING NYSDOT TYPE 2. AGGREGATE BASE SHALL BE COMPACTED WITH A SMOOTH-DRUM VIBRATORY ROLLER. SURFACE OF AGGREGATE BASE SHALL BE GRADED TO PROVIDE POSITIVE DRAINAGE OFF ROAD.



3/6 SECTION – ASPHALT PAVEMENT RESTORATION DETAIL
SCALE: N.T.S.

NOTES:

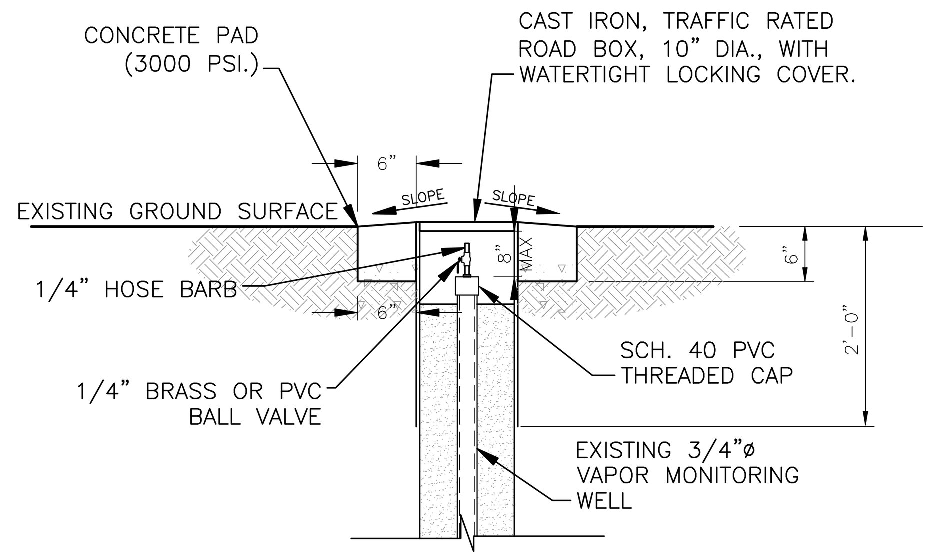
1. EXCAVATE THE EXISTING PAVEMENT.
2. PROOF ROLL THE EXPOSED SUBGRADE WITH A LOADED TRIAXLE DUMP TRUCK ORSIMILAR EQUIPMENT TO 90% PROCTOR. REMOVE UNSTABLE SUBGRADE BY UNDERCUTTING TO A MINIMUM DEPTH OF 8 INCHES AND BACKFILL WITH COMPACTED NYSDOT SHOULDER BLEND.
3. PLACE 6 INCH LAYER OF AGGREGATE BASE AND COMPACT. (NYSDOT TYPE 2) COMPACT PRIOR TO ASPHALT PLACEMENT WITH A SMOOTH-DRUM VIBRATORY ROLLER. PROVIDE GRADING OF AGGREGATE BASE SURFACE TO PROVIDE POSITIVE DRAINAGE OFF ROAD.



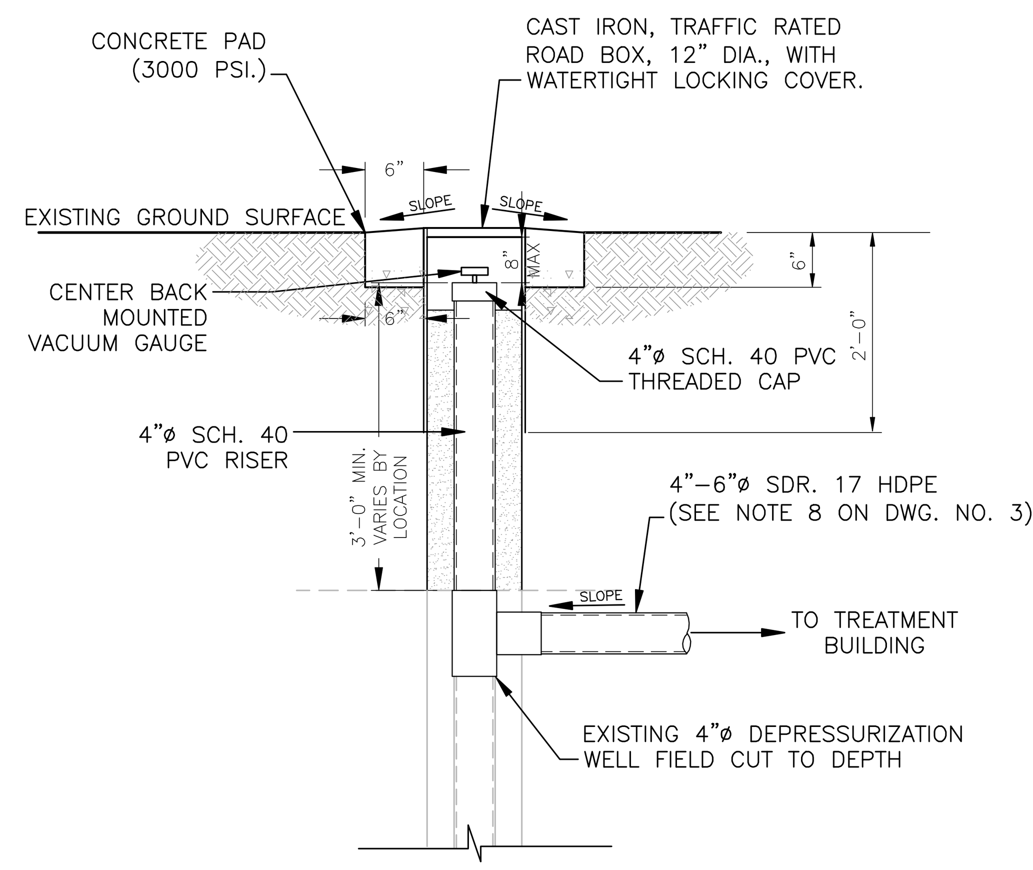
8/6 TYPICAL WASHDOWN PAD DETAIL
SCALE: N.T.S.

NOTES:

1. A 10oz. NON-WOVEN GEOTEXTILE FABRIC SHALL BE INSTALLED BETWEEN THE GEOMEMBRANE AND WOODEN PLANKS AND BETWEEN THE PREPARED SUBGRADE AND GEOMEMBRANE. LINER SHALL WRAP OVER THE WOODEN BERM AND BE ANCHORED A MINIMUM 6-INCHES BELOW THE GROUND SURFACE. THE GEOMEMBRANE SHALL BE PROPERLY SEAMED TO FORM A LEAK-PROOF LINER. THE MATERIALS AND INSTALLATION METHODS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
2. SURFACE OF THE DECONTAMINATION PAD SHALL BE GRADED AT A MINIMUM 2 PERCENT SLOPE TOWARD THE SUMP.
3. THE SUMP SHALL BE OF SIMILAR MATERIAL AS THE GEOMEMBRANE AND SHALL BE WELDED TO THE GEOMEMBRANE. CONTRACTOR SHALL BE RESPONSIBLE FOR TESTING WELDED SEAMS FOR LEAKS. SUMP SHALL BE PROVIDED WITH A STRUCTURAL GRATE AT SURFACE.
4. STAKES SHALL BE USED TO SECURE THE WOODEN BERMS TO THE FOUNDATION SUBBASE. STAKES SHALL BE EMBEDDED A MINIMUM OF 6 INCHES BELOW THE GROUND SURFACE. BERMS SHALL CONSIST OF AN EARTHEN BERM AND, 8"x8" WOODEN TIES, PLACED AROUND THE PERIMETER OF THE PAD.
5. DECONTAMINATION WATER COLLECTED IN THE SUMP SHALL BE CONVEYED VIA PUMPING OR OTHER METHODS APPROVED BY THE ENGINEER, AND STORED ON SITE IN TANKS OR EQUIVALENT. THE CONTRACTOR SHALL ARRANGE FOR TESTING AND DISPOSAL. CONTRACTOR SHALL DISPOSE ALL WATER AT AN APPROVED OFF-SITE FACILITY.
6. THE SUBGRADE SHALL BE SMOOTH WITHOUT STONES OR OTHER OBJECTS THAT COULD PUNCTURE THE GEOMEMBRANE. THE SUBGRADE SHALL BE PROOF-ROLLED WITH A LOADED TANDEM, AND ANY SOFT, SPONGY OR PUMPING SOIL SHALL BE REMOVED, REPLACED AND RECOMPACTED.
7. CONTRACTOR SHALL MAINTAIN AND REPAIR THE DECONTAMINATION PAD, AS NECESSARY. TIRE RUTS SHALL BE REPAIRED AND WOOD PLANKS SHALL BE MAINTAINED TO PROHIBIT CLOGGING AND ALLOW FOR THE INFILTRATION OF WATER. WOOD PLANKS THAT ARE REMOVED SHALL BE DISPOSED AT AN APPROVED OFF-SITE FACILITY.
8. EXCAVATED NATIVE SOIL SHALL BE TEMPORARILY STOCKPILED AND EMPLACED AT THE DECONTAMINATION PAD LOCATION DURING SITE RESTORATION.
9. ENTRANCE AND EXIT OF THE DECONTAMINATION PAD SHALL BE MADE WITH A SMOOTH TRANSITION TO THE EXISTING GRADE.



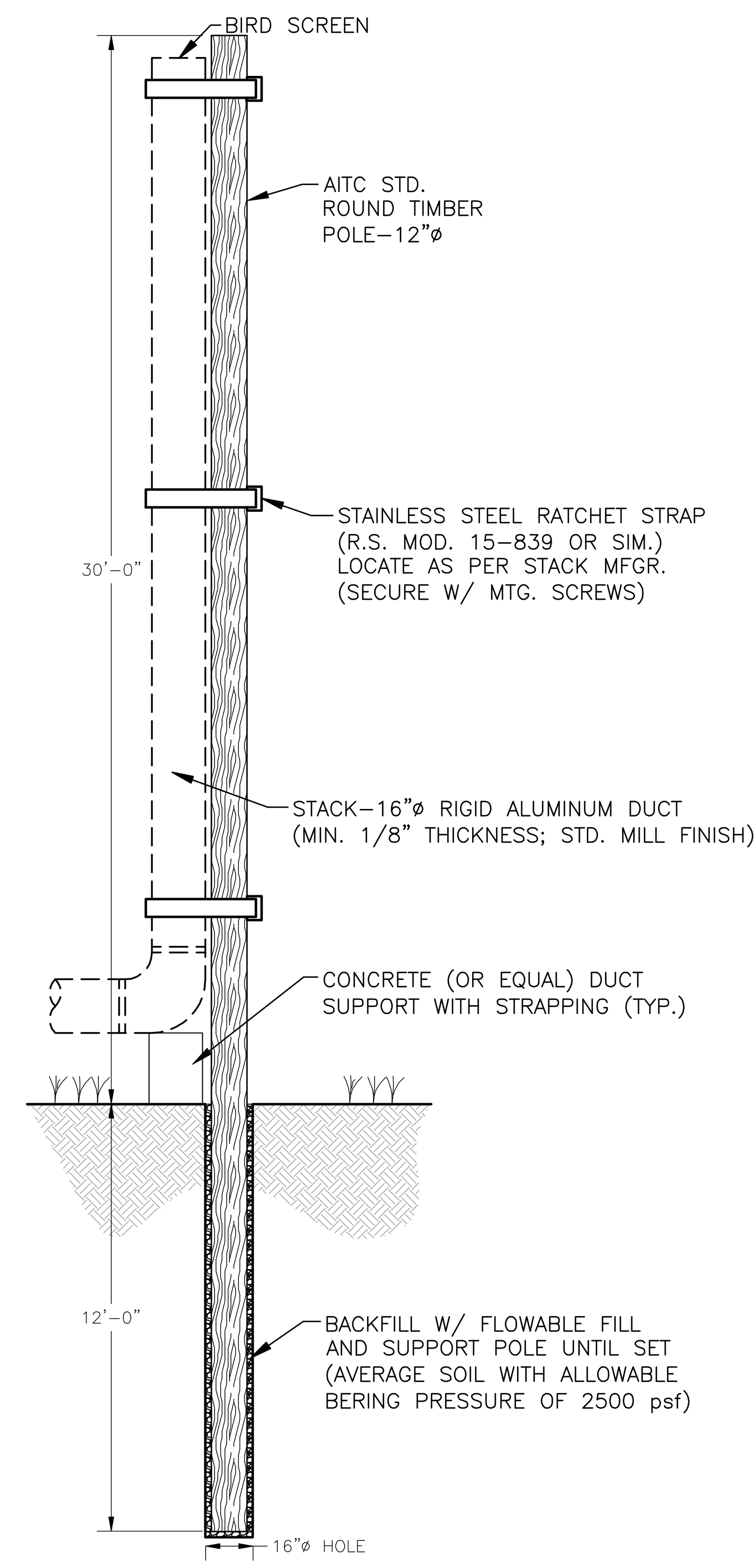
4/6 VAPOR MONITORING WELL DETAIL
SCALE: N.T.S.



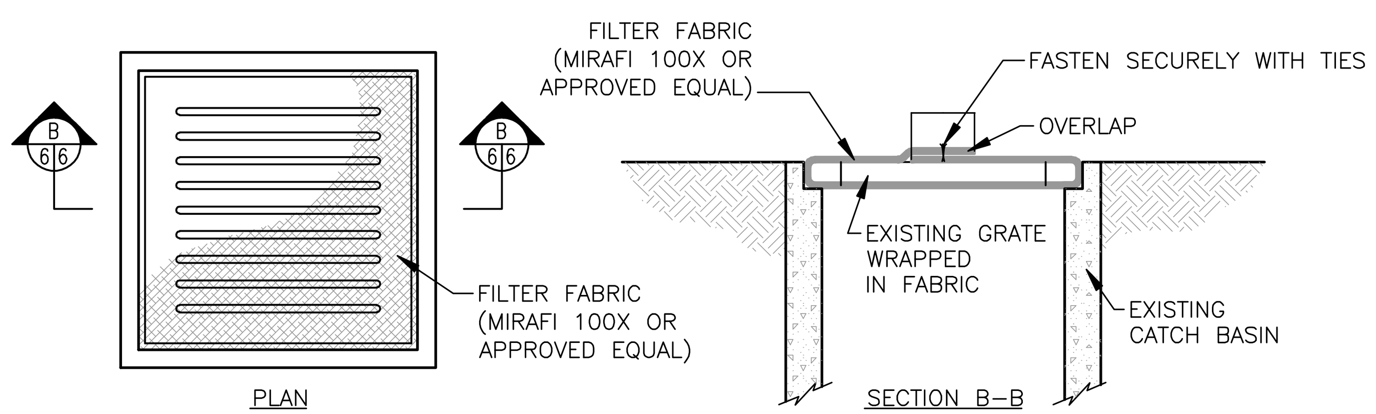
5/6 DEPRESSURIZATION WELL DETAIL
SCALE: N.T.S.

NOTES:

1. CONTRACTOR TO REVISE EXISTING ROAD BOXES FOR DEPRESSURIZATION WELLS.
2. ALL HDPE RECOVERY LINES TO BE SLOPED TOWARDS WELL (MINIMUM 0.5%).



7/6 STACK DETAIL
SCALE: 1/4" = 1'-0"



6/6 TYPICAL CATCH BASIN & SEDIMENT TRAP DETAIL
SCALE: N.T.S.

NOTES:

1. MINIMUM CONCRETE STRENGTH 4,000 PSI AT 28 DAYS.
2. STEEL REINFORCEMENT TO MEET A.S.T.M. C-478 SPECIFICATIONS.
3. MANHOLE COVER GRATE AND FRAME TO BE CAMBELL FOUNDRY COMPANY R-2500 OR EQUIVALENT.

NO.	ISSUED DATE	REVISION DESCRIPTION	BY/CKD
0	9/2007	95% DESIGN SUBMITTAL	AS/KZ

KEYPLAN

SEAL

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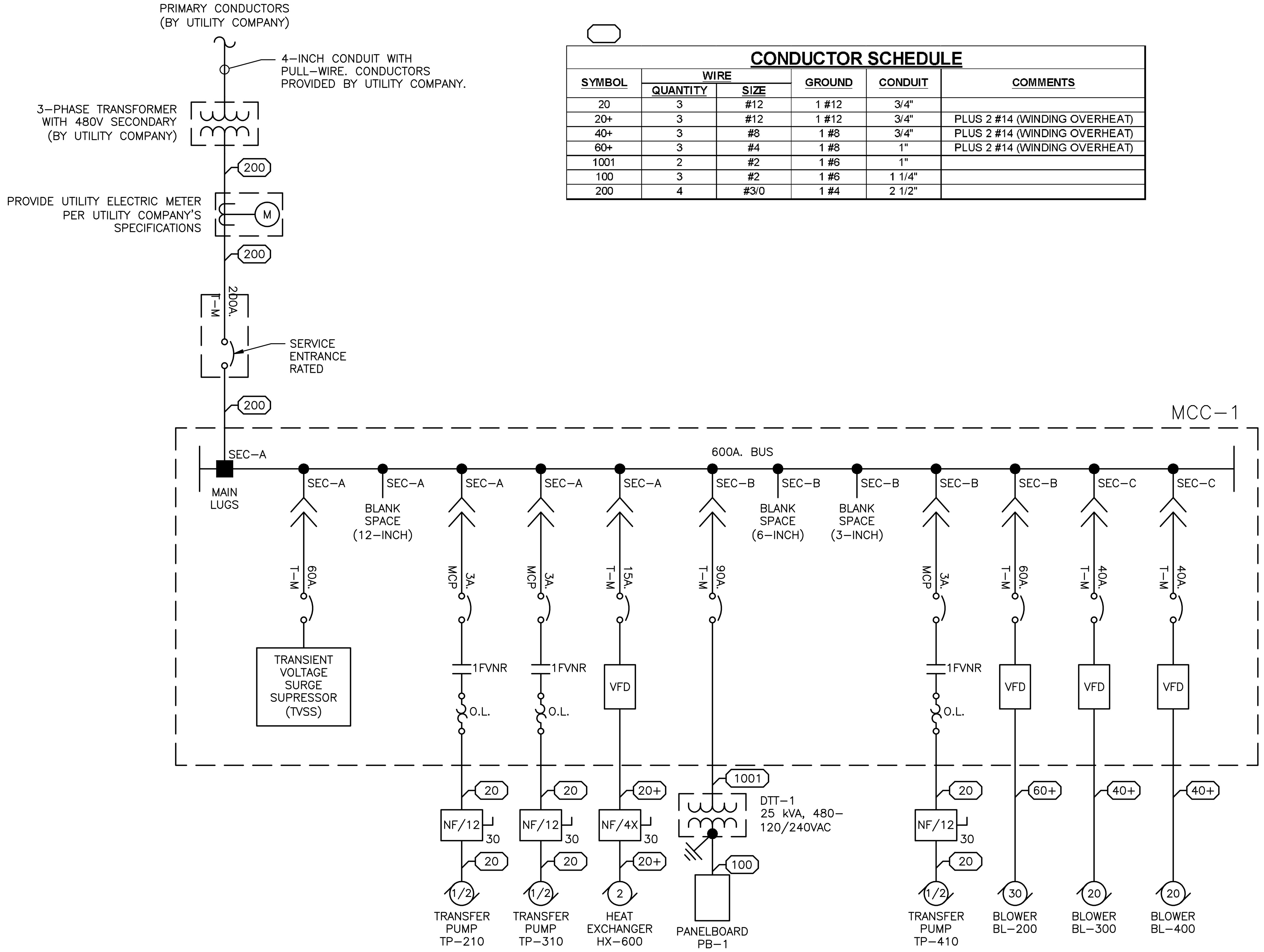
PROJECT TITLE

NORTHROP GRUMMAN OPERABLE UNIT 3
SOIL GAS INTERIM REMEDIAL MEASURE
FORMER GRUMMAN SETTLING PONDS
BETHPAGE, NEW YORK

PROJECT MANAGER	DEPARTMENT MANAGER	LEAD DESIGN PROF.	CHECKED BY
C. SAN GIOVANNI	C. TUOHY	C. TUOHY	K. ZEGEL
SHEET TITLE		TASK/PHASE NUMBER	DRAWN BY
MISCELLANEOUS DETAILS AND NOTES		00004	A. SANCHEZ
		PROJECT NUMBER	DRAWING NUMBER
		NY001464.1407	6



CONDUCTOR SCHEDULE

SYMBOL	WIRE QUANTITY	WIRE SIZE	GROUND	CONDUIT	COMMENTS
20	3	#12	1 #12	3/4"	
20+	3	#12	1 #12	3/4"	PLUS 2 #14 (WINDING OVERHEAT)
40+	3	#8	1 #8	3/4"	PLUS 2 #14 (WINDING OVERHEAT)
60+	3	#4	1 #8	1"	PLUS 2 #14 (WINDING OVERHEAT)
1001	2	#2	1 #6	1"	
100	3	#2	1 #6	1 1/4"	
200	4	#3/0	1 #4	2 1/2"	

ABBREVIATIONS

1FVNR	FULL VOLTAGE, NON-REVERSING (SIZE 1) STARTER
A.F.F.	ABOVE FINISHED FLOOR
A	AMPERES
DTT	DRY TYPE TRANSFORMER
FIT	FLOW INDICATING TRANSMITTER
FS	FLOW SWITCH
HP	HORSEPOWER
kVA	KILOVOLT-AMPS
kW	KILOWATT
LSH	LEVEL SWITCH HIGH
LSHH	LEVEL SWITCH HIGH HIGH
LSL	LEVEL SWITCH LOW
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR CIRCUIT BREAKER
O.L.	OVERLOAD
PB	PANELBOARD
PS	PRESSURE SWITCH
T-M	THERMAL MAGNETIC CIRCUIT BREAKER
UH	UNIT HEATER
V	VOLTS
VAC	VOLTS AC
VFD	VARIABLE FREQUENCY DRIVE
VF	VENTILATION FAN

LEGEND

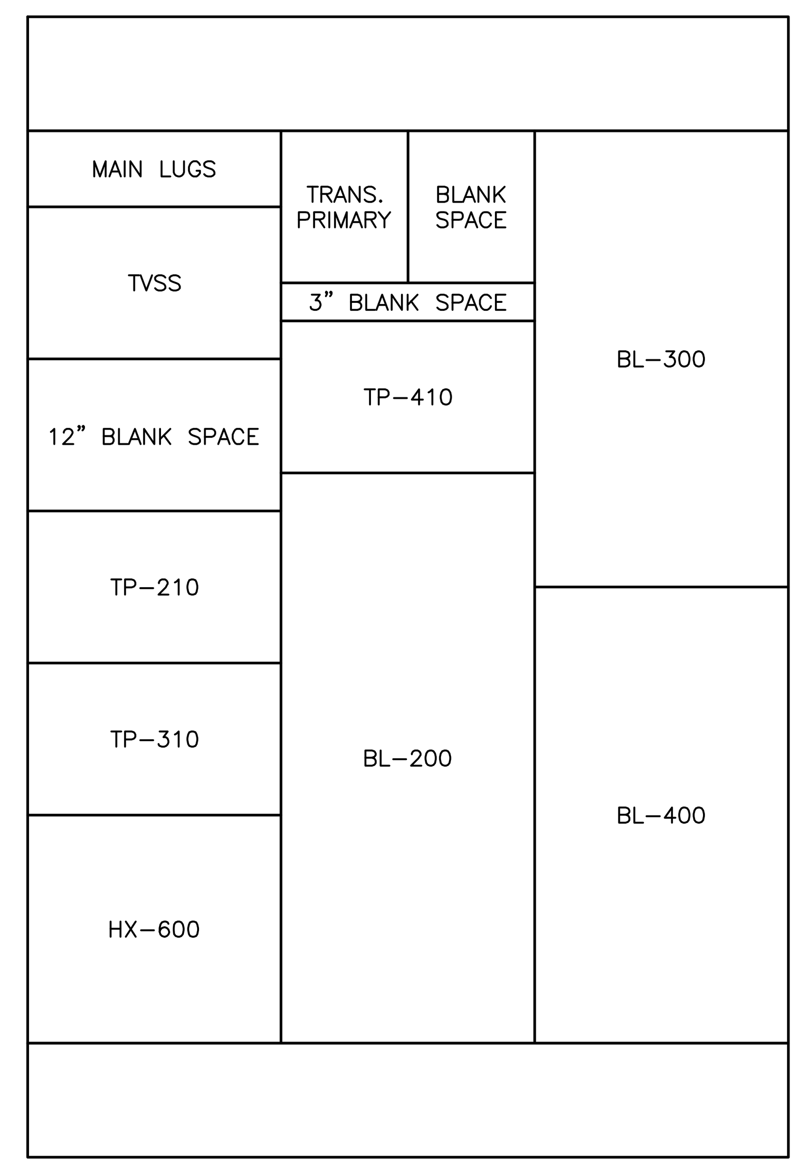
- ENCLOSURE LIMITS
- MOTOR STARTER, FVNR-TYPE EQUIPPED WITH THERMAL OVERLOADS (FULL VOLTAGE, NON-REVERSING)
- # MOTOR, # DENOTES H.P.
- EARTH GROUND
- TRANSFORMER, POWER
- MOLDED CASE CIRCUIT BREAKER
- DUPLEX RECEPTACLE, 120 VAC
- $ SINGLE POLE LIGHT SWITCH, 120 VAC
- M ELECTRIC UTILITY METER CABINET
- T THERMOSTAT
- NF/XX ZZ ENCLOSED SWITCH
  - NF = NON-FUSIBLE
  - XX = NEMA RATING
  - ZZ = AMPACITY RATING
- XX ENCLOSED MOTOR CONTROLLER
  - XX = NEMA RATING
- TELEPHONE OUTLET

PANEL PB-1 ENCLOSURE: NEMA TYPE 1, CABINET MOUNTING: SURFACE

VOLTS: 120 / 240, PHASE: 1, WIRE: 3W, 10,000 AIC, 100A. C/B, FEED: TOP

LOAD SERVED	LOAD (KVA) A	LOAD (KVA) B	BREAKER AMP	BREAKER POLE	CKT	PH	CKT	BREAKER POLE	BREAKER AMP	LOAD (KVA) A	LOAD (KVA) B	LOAD SERVED
UH-1	2.0		30	2	1	A	2	1	20	0.6		RECEPTACLES - BUILDING 1
		2.0			3	B	4	1	20		0.6	RECEPTACLES - BUILDING 2
UH-2	2.0		30	2	5	A	6	1	20	0.8		RECEPTACLES - OUTDOOR
		2.0			7	B	8	1	20		0.2	LIGHTS - BUILDING 1
UH-3	2.0		30	2	9	A	10	1	20	0.2		LIGHTS - BUILDING 2
		2.0			11	B	12	1	20		0.3	LIGHTS - OUTDOOR
AC-1	3.5		40	2	13	A	14	1	20	0.3		EXIT LIGHTS
		3.5			15	B	16	1	20			SPARE
VF-2	0.3		20	1	17	A	18	1	20			SPARE
VF-2		0.3	20	1	19	B	20	1	20			SPARE
MAIN CONTROL PANEL	1.0		20	1	21	A	22	1	20			SPARE
SPARE			20	1	23	B	24	1	20			SPARE
BLANK			20	1	25	A	26	1	20			BLANK
BLANK			20	1	27	B	28	1	20			BLANK
BLANK			20	1	29	A	30	1	20			BLANK
TOTAL	10.8	9.8								1.9	1.1	
TOTAL CONNECTED KVA:									A:	12.7		
									B:	10.9		
									TOTAL	23.5		

NOTE:
PROVIDE 2 #12, 1 #12 GROUND -3/4"C. FOR EACH LIGHTING AND RECEPTACLE CIRCUIT, UNLESS OTHERWISE NOTED.



ELEVATION
MCC-1

NOTE:
VFD SECTIONS SHALL BE VENTILATED.

SCALE VERIFICATION
THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING:
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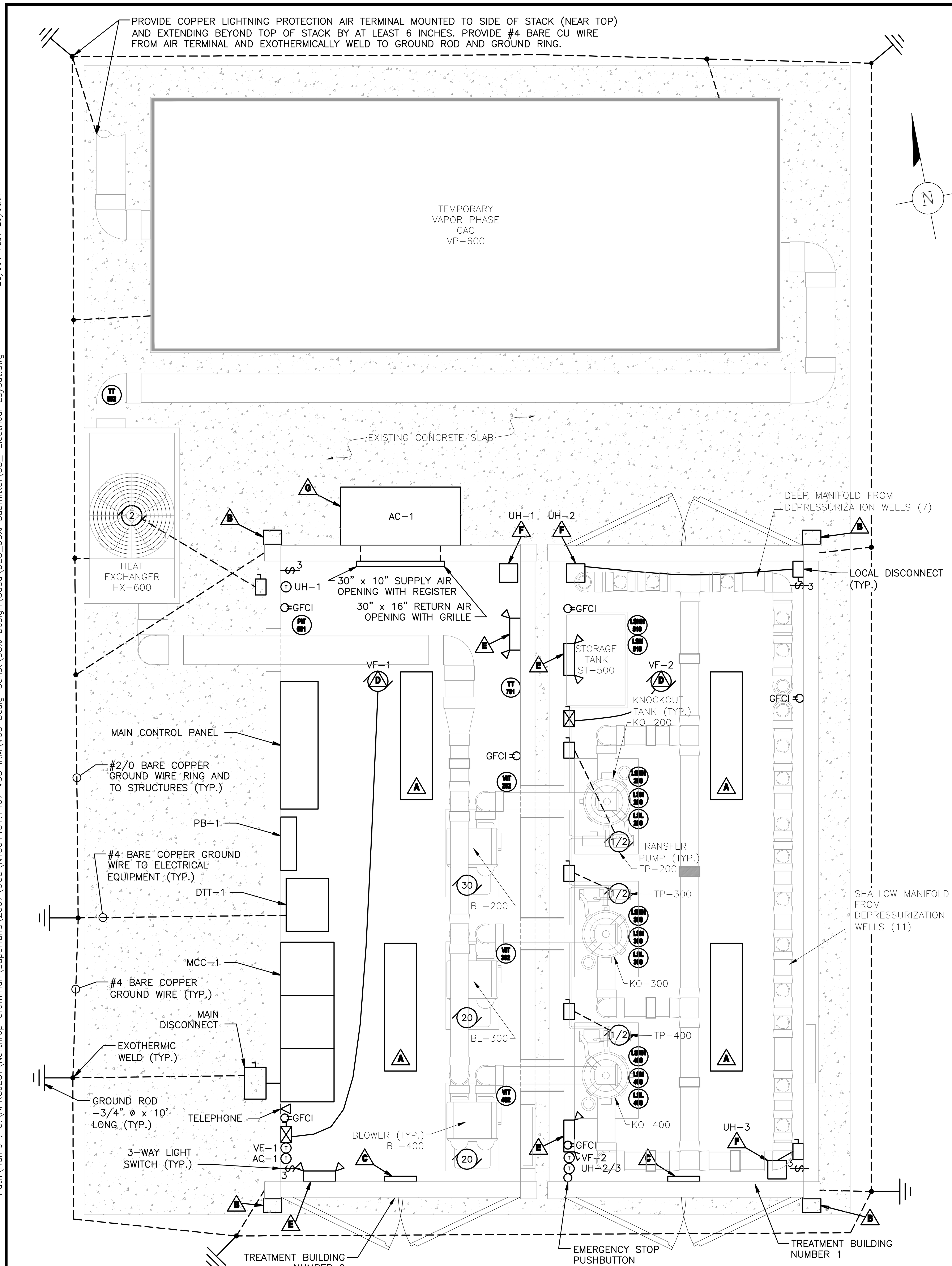
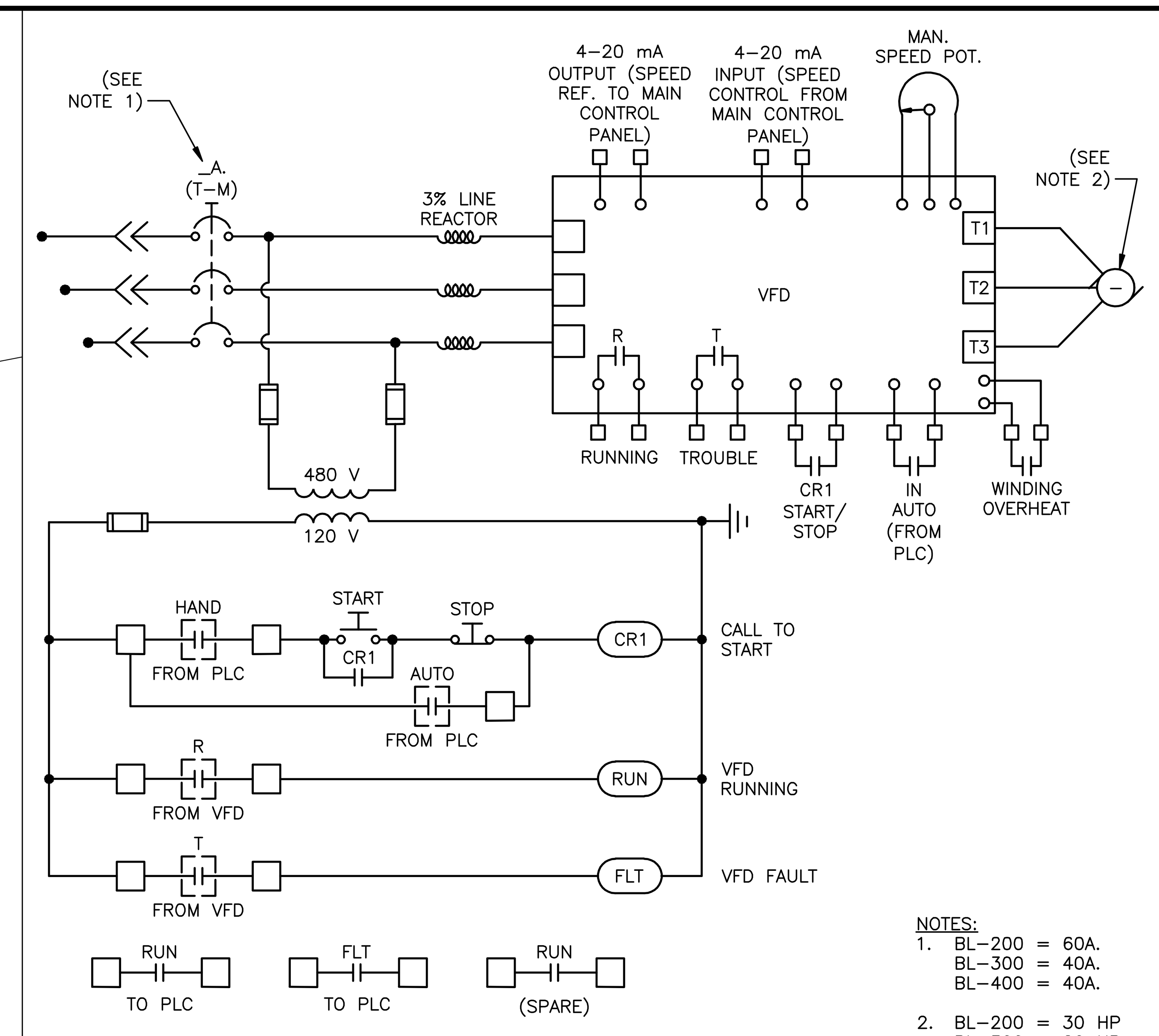
NORTHROP GRUMMAN OPERABLE UNIT 3
SOIL GAS INTERIM REMEDIAL MEASURE
FORMER GRUMMAN SETTLING PONDS
BETHPAGE, NEW YORK

PROJECT MANAGER: C. SAN GIOVANNI	DEPARTMENT MANAGER: D. OBERLE	LEAD DESIGN PROF.: T. ARMSTRONG	CHECKED BY: D. OBERLE
		TASK/PHASE NUMBER: T0001	DRAWN BY: T. ARMSTRONG
ELECTRICAL ONE-LINE DIAGRAM		PROJECT NUMBER: NY001464.1407	DRAWING NUMBER: 7



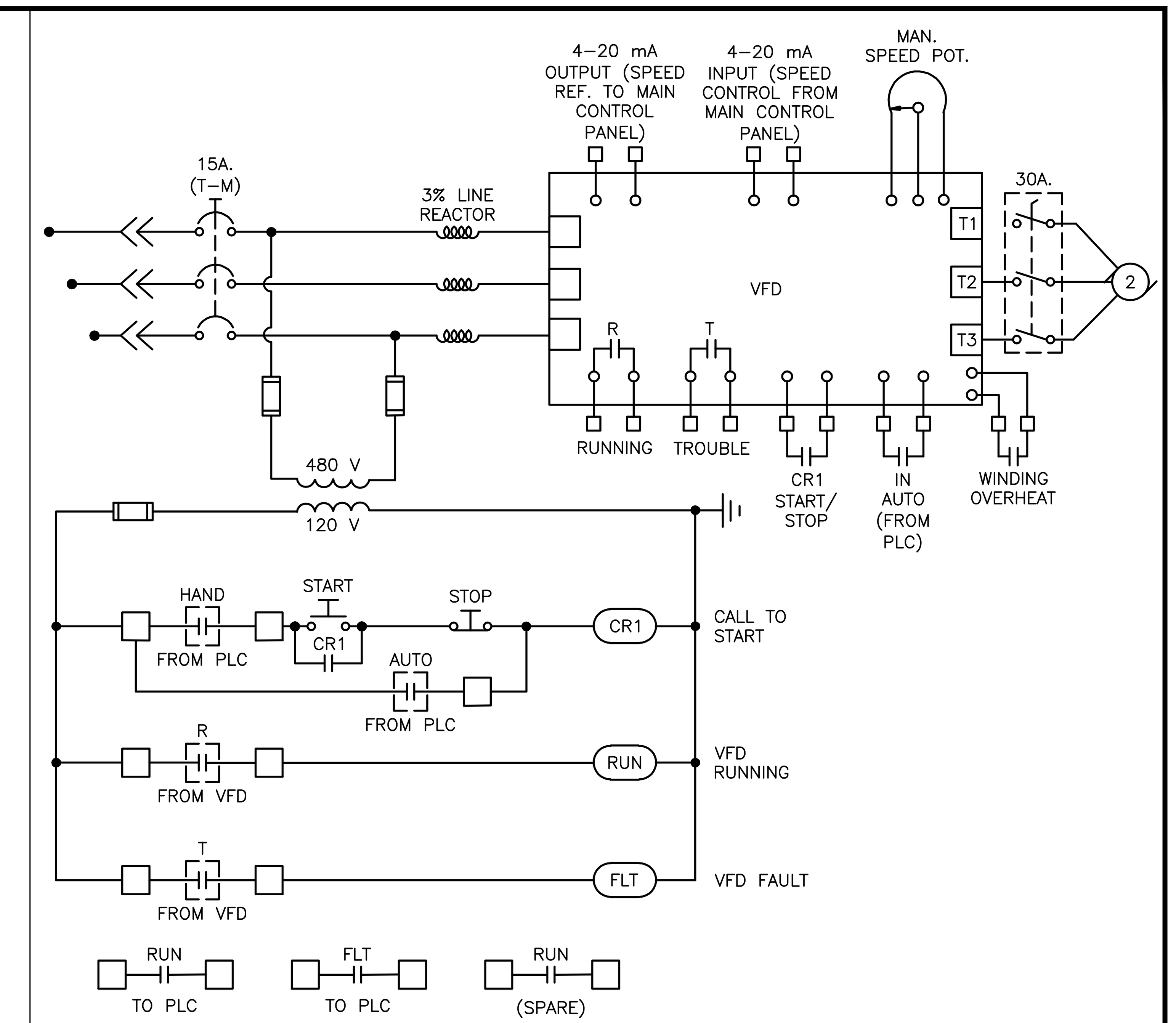
ELECTRICAL CONSTRUCTION NOTES:

1. EMERGENCY LIGHTS SHALL BE CONNECTED TO THE SAME CIRCUIT AS THE FLUORSCENT FIXTURES IN THE AREA.
2. MAINTAIN ELECTRICAL WORKING SPACE CLEARANCE IN FRONT OF ALL ELECTRICAL PANELS/ENCLOSURES PER NEC.

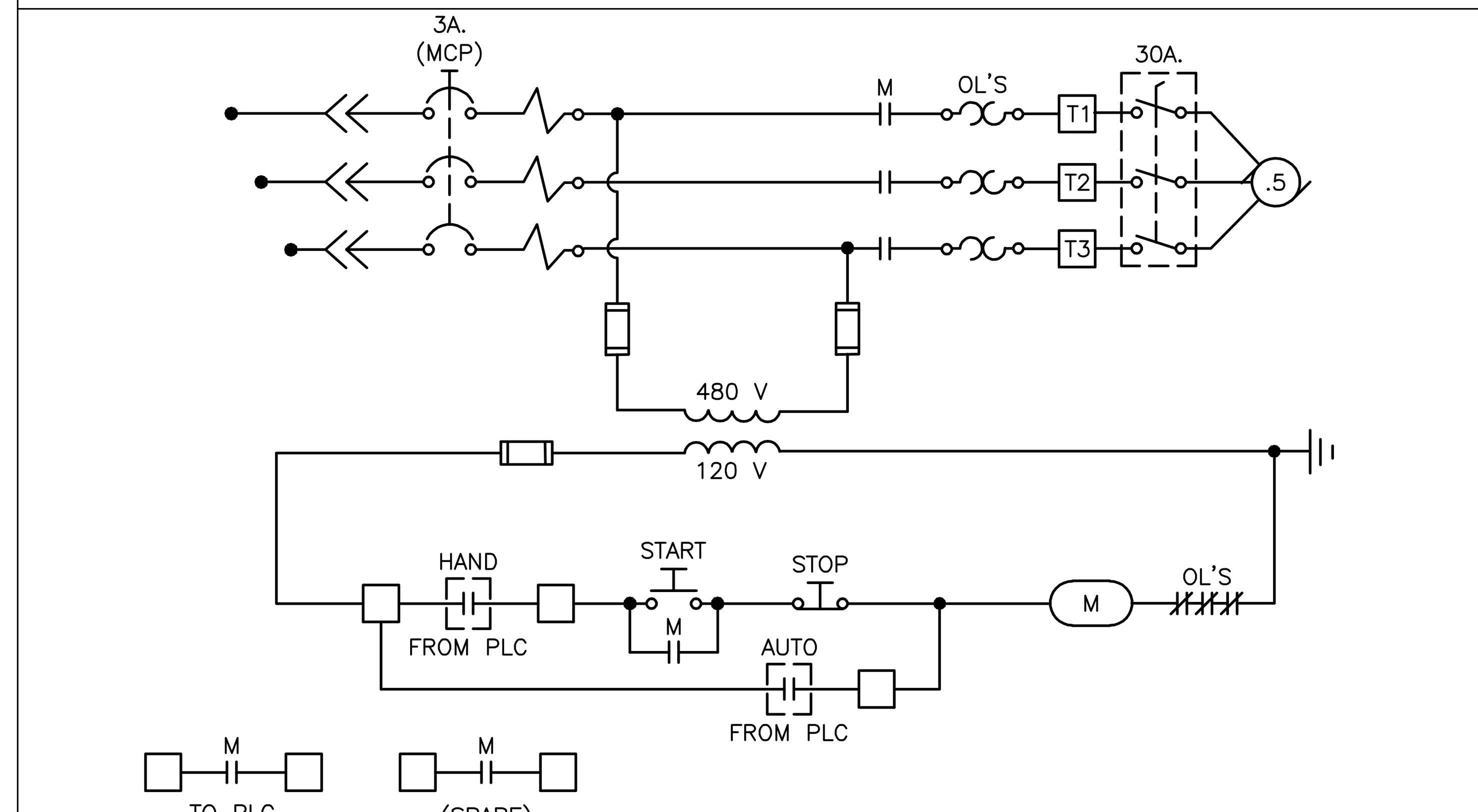


SCHEMATIC – BL-200

(BL-300 AND BL-400 ARE SIMILAR)

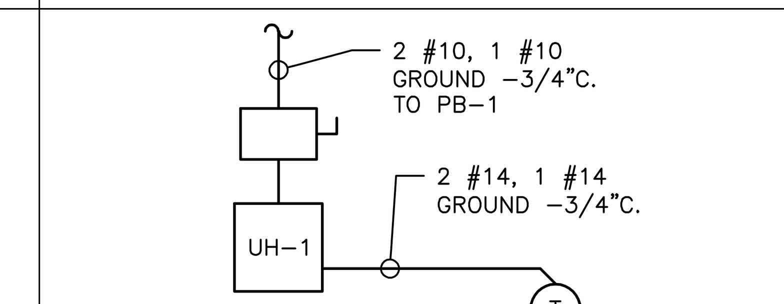


SCHEMATIC – HX-600

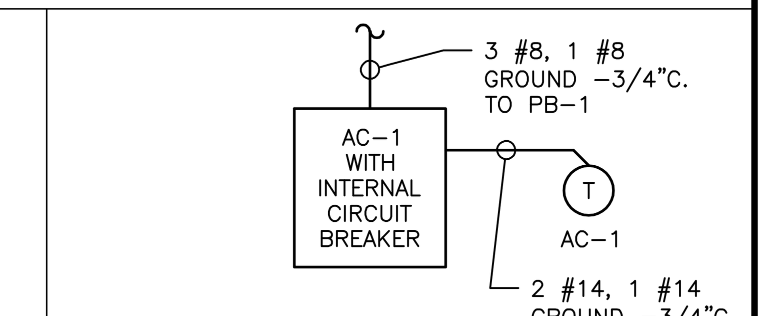


SCHEMATIC – TP-210

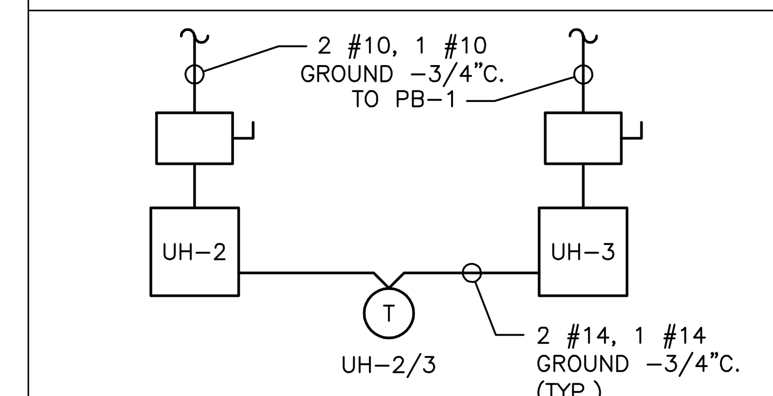
(TP-310 AND TP-410 ARE SIMILAR)



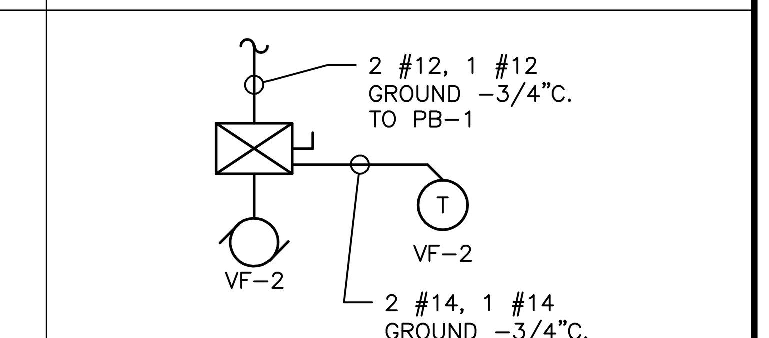
RISER UH-1



RISER AC-1



RISER UH-2 AND UH-3



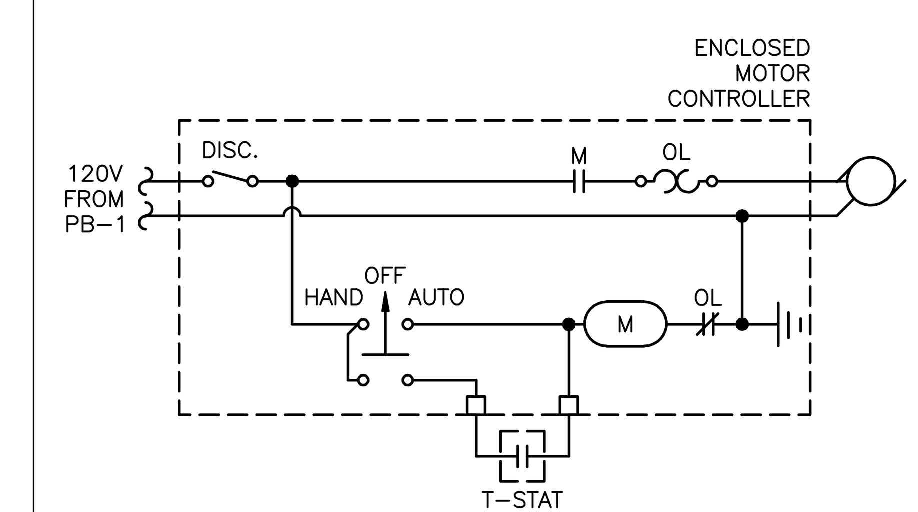
RISER VF-1

(VF-2 IS SIMILAR)

HVAC AND LIGHTING SCHEDULE

Item	Description	Mounting	Manufacturer & Part Number	Quantity	Remarks	Misc.
A	LIGHT FIXTURE, 3-LAMP FLUORESCENT, OPEN-TYPE	SURFACE	DAY-BRITE, CAT. #: 1F332PP120	4	120 VAC, 48-INCH T8 LAMPS, SURFACE MOUNT TO CEILING	
B	LIGHT FIXTURE, WALL PACK, HPS	WALL	DAY-BRITE, CAT. #: NWP070S12-LP	4	120 VAC, 70 WATT HPS LAMP, MOUNT 7'-6" ABOVE GRADE	
C	EXIT SIGN, ILLUMINATED	WALL	DAY-BRITE, CAT. #: VERW	4	SINGLE FACE, RED LED LETTERS, MOUNT 7'-2" A.F.F.	
D	VENTILATOR, ROOF-MOUNTED, UPBLAST	ROOF	Dayton 4HZ41	2	120 VAC, WITH THERMOSTAT	
E	EMERGENCY LIGHTS	WALL	DAY-BRITE, CAT. #: VU6	4	MOUNT 7'-2" A.F.F.	
F	UNIT HEATER, FORCED AIR, RESISTIVE	CEILING	CHROMALOX LUH-04-23-34	3	240 VAC, SINGLE PHASE, W/REMOTE THERMOSTAT	SEE NOTE
G	AIR CONDITIONER (AC-1)	WALL	MARVAIR COMPAC I, AVP42ACA00NU	1	240 VAC, SINGLE PHASE, W/REMOTE THERMOSTAT #50123, AND CIRCUIT BREAKER	

NOTE:
UH-2 AND UH-3 SHARE A T-STAT. PROVIDE A CONTACT FOR EACH HEATER.



SCHEMATIC VF-1

(VF-2 IS SIMILAR)

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1/2"=1'-0"

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BETHPAGE, NEW YORK

ELECTRICAL LAYOUT, SCHEMATICS, AND RISER DIAGRAMS

PROJECT MANAGER	DEPARTMENT MANAGER	LEAD DESIGN PROF.	CHECKED BY
C. SAN GIOVANNI	D. OBERLE	T. ARMSTRONG	D. OBERLE
		TASK/PHASE NUMBER: T0001	DRAWN BY: T. ARMSTRONG
		PROJECT NUMBER: NY001464.1407	DRAWING NUMBER: 8

DISCRETE INPUT				
RACK:	1			
SLOT:	2			
	PID TAG			
ADDRESS	ID	LOOP	SOURCE	DESCRIPTION
00	N/A	N/A	CTRL. PNL. PB	ALARM RESET PUSHBUTTON
01	N/A	N/A	CTRL. PNL. PB	E-STOP PUSHBUTTON
02	N/A	N/A	BLDG 1 PB	E-STOP PUSHBUTTON
03	YL	200	MCC	BL-200 "RUNNING"
04	FL	200	MCC	BL-200 "FAULT" - VFD
05	YL	300	MCC	BL-300 "RUNNING"
06	FL	300	MCC	BL-300 "FAULT" - VFD
07	YL	400	MCC	BL-400 "RUNNING"
08	FL	400	MCC	BL-400 "FAULT" - VFD
09	YL	210	MCC	TP-210 "RUNNING"
10	YL	310	MCC	TP-310 "RUNNING"
11	YL	410	MCC	TP-410 "RUNNING"
12	YL	600	MCC	HX-600 "RUNNING"
13	FL	600	MCC	HX-600 "FAULT" - VFD
14				<SPARE>
15				<SPARE>

DISCRETE INPUT				
RACK:	1			
SLOT:	3			
	PID TAG			
ADDRESS	ID	LOOP	SOURCE	DESCRIPTION
00	LSHH	200	LEVEL SW.	KO-200 LEVEL SWITCH HIGH HIGH
01	LSH	200	LEVEL SW.	KO-200 LEVEL SWITCH HIGH
02	LSL	200	LEVEL SW.	KO-200 LEVEL SWITCH LOW
03	LSHH	300	LEVEL SW.	KO-300 LEVEL SWITCH HIGH HIGH
04	LSH	300	LEVEL SW.	KO-300 LEVEL SWITCH HIGH
05	LSL	300	LEVEL SW.	KO-300 LEVEL SWITCH LOW
06	LSHH	400	LEVEL SW.	KO-400 LEVEL SWITCH HIGH HIGH
07	LSH	400	LEVEL SW.	KO-400 LEVEL SWITCH HIGH
08	LSL	400	LEVEL SW.	KO-400 LEVEL SWITCH LOW
09	LSHH	510	LEVEL SW.	ST-510 LEVEL SWITCH HIGH HIGH
10	LSH	510	LEVEL SW.	ST-510 LEVEL SWITCH HIGH
11				<SPARE>
12				<SPARE>
13				<SPARE>
14				<SPARE>
15				<SPARE>

DISCRETE OUTPUT			
RACK:	1		
SLOT:	4		
	PID TAG		
ADDRESS	ID	LOOP	DESCRIPTION
00	N/A	AD	AUTODIALER CALL RELAY
01	N/A	200	BL-200 MOTOR CALL TO RUN RELAY
02	N/A	300	BL-300 MOTOR CALL TO RUN RELAY
03	N/A	400	BL-400 MOTOR CALL TO RUN RELAY
04	N/A	210	TP-210 MOTOR CALL TO RUN RELAY
05	N/A	310	TP-310 MOTOR CALL TO RUN RELAY
06	N/A	410	TP-410 MOTOR CALL TO RUN RELAY
07	N/A	600	HX-600 MOTOR CALL TO RUN RELAY
08	N/A	200	BL-200 IN HAND
09	N/A	300	BL-300 IN HAND
10	N/A	400	BL-400 IN HAND
11	N/A	210	TP-210 IN HAND
12	N/A	310	TP-310 IN HAND
13	N/A	410	TP-410 IN HAND
14	N/A	600	HX-600 IN HAND
15			<SPARE>

DISCRETE OUTPUT			
RACK:	1		
SLOT:	5		
	PID TAG		
ADDRESS	ID	LOOP	DESCRIPTION
00	N/A	200	BL-200 IN AUTO (SEE NOTE 12)
01	N/A	300	BL-300 IN AUTO (SEE NOTE 12)
02	N/A	400	BL-400 IN AUTO (SEE NOTE 12)
03	N/A	210	TP-210 IN AUTO
04	N/A	310	TP-310 IN AUTO
05	N/A	410	TP-410 IN AUTO
06	N/A	600	HX-600 IN AUTO (SEE NOTE 12)
07			<SPARE>
08			<SPARE>
09			<SPARE>
10			<SPARE>
11			<SPARE>
12			<SPARE>
13			<SPARE>
14			<SPARE>
15			<SPARE>

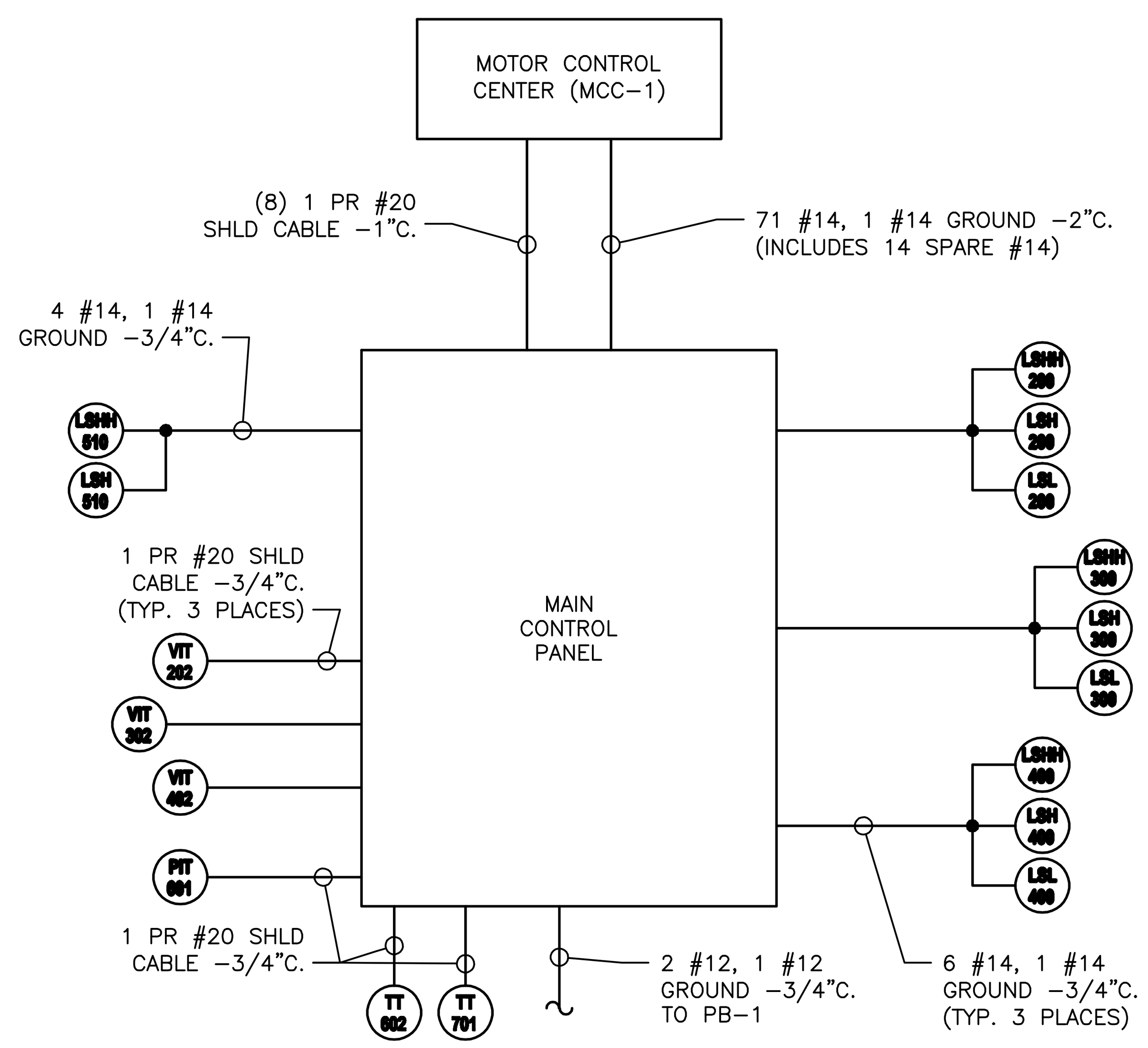
ANALOG INPUT				
RACK:	1			
SLOT:	6			
	PID TAG			
ADDRESS	ID	LOOP	RANGE	DESCRIPTION
00	VIT	202		BL-200 SUCTION VACCUUM
01	VIT	302		BL-300 SUCTION VACCUUM
02	VIT	402		BL-400 SUCTION VACCUUM
03	PIT	601		BLOWER DISCHARGE PRESSURE
04	TT	602		HX-600 DISCHARGE TEMPERATURE
05	TT	701		BUILDING NO. 2 ROOM TEMPERATURE
06				<SPARE>
07				<SPARE>

ANALOG INPUT				
RACK:	1			
SLOT:	7			
	PID TAG			
ADDRESS	ID	LOOP	RANGE	DESCRIPTION
00	N/A	200	0 - 100%	BL-200 VFD SPEED FEEDBACK
01	N/A	300	0 - 100%	BL-300 VFD SPEED FEEDBACK
02	N/A	400	0 - 100%	BL-400 VFD SPEED FEEDBACK
03	N/A	600	0 - 100%	HX-600 VFD SPEED FEEDBACK
04				<SPARE>
05				<SPARE>
06				<SPARE>
07				<SPARE>

ANALOG OUTPUT				
RACK:	1			
SLOT:	8			
	PID TAG			
ADDRESS	ID	LOOP	RANGE	DESCRIPTION
00	N/A	200	0 - 100%	BL-200 VFD SPEED SETPOINT
01	N/A	300	0 - 100%	BL-300 VFD SPEED SETPOINT
02	N/A	400	0 - 100%	BL-400 VFD SPEED SETPOINT
03	N/A	600	0 - 100%	HX-600 VFD SPEED SETPOINT

PROGRAMMING			
NO.	EQUIPMENT	INDUSTRIAL COMPUTER FUNCTION	PLC FUNCTION
1	BL-200	HAND - OFF - AUTO SELECTION	VIRTUAL DISCRETE INPUT FROM COMPUTER - ENERGIZE RESPECTIVE OUTPUT
2	BL-200	RUNNING INDICATION LIGHT (GREEN)	DISCRETE INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER
3	BL-200	FAULT INDICATION LIGHT (RED)	DISCRETE INPUT or NO RUNNING FEEDBACK AFTER MOTOR CALL - ACTIVATE VIRTUAL OUTPUT TO COMPUTER **
4	BL-200	DISPLAY BLOWER SPEED (0 - 100%)	ANALOG INPUT - DISPLAY VIRTUAL OUTPUT TO COMPUTER
5	BL-200	BLOWER SPEED SETPOINT (0 - 100%)	VIRTUAL ANALOG INPUT FROM COMPUTER - OUTPUT VALUE TO VFD IF HOA IS IN "AUTO"
6	BL-300	HAND - OFF - AUTO SELECTION	VIRTUAL DISCRETE INPUT FROM COMPUTER - ENERGIZE RESPECTIVE OUTPUT
7	BL-300	RUNNING INDICATION LIGHT (GREEN)	DISCRETE INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER
8	BL-300	FAULT INDICATION LIGHT (RED)	DISCRETE INPUT or NO RUNNING FEEDBACK AFTER MOTOR CALL - ACTIVATE VIRTUAL OUTPUT TO COMPUTER **
9	BL-300	DISPLAY BLOWER SPEED (0 - 100%)	ANALOG INPUT - DISPLAY VIRTUAL OUTPUT TO COMPUTER
10	BL-300	BLOWER SPEED SETPOINT (0 - 100%)	VIRTUAL ANALOG INPUT FROM COMPUTER - OUTPUT VALUE TO VFD IF HOA IS IN "AUTO"
11	BL-400	HAND - OFF - AUTO SELECTION	VIRTUAL DISCRETE INPUT FROM COMPUTER - ENERGIZE RESPECTIVE OUTPUT
12	BL-400	RUNNING INDICATION LIGHT (GREEN)	DISCRETE INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER
13	BL-400	FAULT INDICATION LIGHT (RED)	DISCRETE INPUT or NO RUNNING FEEDBACK AFTER MOTOR CALL - ACTIVATE VIRTUAL OUTPUT TO COMPUTER **
14	BL-400	DISPLAY BLOWER SPEED (0 - 100%)	ANALOG INPUT - DISPLAY VIRTUAL OUTPUT TO COMPUTER
15	BL-400	BLOWER SPEED SETPOINT (0 - 100%)	VIRTUAL ANALOG INPUT FROM COMPUTER - OUTPUT VALUE TO VFD IF HOA IS IN "AUTO"
16	HX-600	HAND - OFF - AUTO SELECTION	VIRTUAL DISCRETE INPUT FROM COMPUTER - ENERGIZE RESPECTIVE OUTPUT
17	HX-600	RUNNING INDICATION LIGHT (GREEN)	DISCRETE INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER
18	HX-600	FAULT INDICATION LIGHT (RED)	DISCRETE INPUT or NO RUNNING FEEDBACK AFTER MOTOR CALL - ACTIVATE VIRTUAL OUTPUT TO COMPUTER **
19	HX-600	DISPLAY MOTOR SPEED (0 - 100%)	ANALOG INPUT - DISPLAY VIRTUAL OUTPUT TO COMPUTER
20	HX-600	TEMPERATURE SETPOINT (50 - 150 DEG F)	VIRTUAL ANALOG INPUT FROM COMPUTER - PROVIDE PID CONTROL LOOP BASED ON SETPOINT AND TT-602 ANALOG INPUT - OUTPUT ANALOG VALUE TO VFD IF HOA IS IN "AUTO" TO MAINTAIN TEMPERATURE BASED ON SETPOINT
21	TP-210	HAND - OFF - AUTO SELECTION	VIRTUAL DISCRETE INPUT FROM COMPUTER - ENERGIZE RESPECTIVE OUTPUT
22	TP-210	RUNNING INDICATION LIGHT (GREEN)	DISCRETE INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER
23	TP-210	FAULT INDICATION LIGHT (RED)	DISCRETE INPUT or NO RUNNING FEEDBACK AFTER MOTOR CALL - ACTIVATE VIRTUAL OUTPUT TO COMPUTER **
24	TP-310	HAND - OFF - AUTO SELECTION	VIRTUAL DISCRETE INPUT FROM COMPUTER - ENERGIZE RESPECTIVE OUTPUT
25	TP-310	RUNNING INDICATION LIGHT (GREEN)	DISCRETE INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER
26	TP-310	FAULT INDICATION LIGHT (RED)	DISCRETE INPUT or NO RUNNING FEEDBACK AFTER MOTOR CALL - ACTIVATE VIRTUAL OUTPUT TO COMPUTER **
27	TP-410	HAND - OFF - AUTO SELECTION	VIRTUAL DISCRETE INPUT FROM COMPUTER - ENERGIZE RESPECTIVE OUTPUT
28	TP-410	RUNNING INDICATION LIGHT (GREEN)	DISCRETE INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER
29	TP-410	FAULT INDICATION LIGHT (RED)	DISCRETE INPUT or NO RUNNING FEEDBACK AFTER MOTOR CALL - ACTIVATE VIRTUAL OUTPUT TO COMPUTER **
30	LSHH-200	KO-200 HIGH-HIGH LEVEL INDICATION LIGHT (RED)	DISCRETE INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS **
31	LSHH-300	KO-300 HIGH-HIGH LEVEL INDICATION LIGHT (RED)	DISCRETE INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS **
32	LSHH-400	KO-400 HIGH-HIGH LEVEL INDICATION LIGHT (RED)	DISCRETE INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS **
33	LSH-510	ST-510 HIGH LEVEL INDICATION LIGHT (ORANGE)	DISCRETE INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS **
34	LSHH-510	ST-510 HIGH-HIGH LEVEL INDICATION LIGHT (RED)	DISCRETE INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS **
35	VIT-202	BL-200 SUCTION VACCUUM LOW INDICATION LIGHT (RED)	ANALOG INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS OF VALUE LESSER OR EQUAL TO USER SETPOINT **
36	VIT-202	BL-200 SUCTION VACCUUM HIGH INDICATION LIGHT (ORANGE)	ANALOG INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS OF VALUE GREATER OR EQUAL TO USER SETPOINT **
37	VIT-202	BL-200 SUCTION VACCUUM HIGH-HIGH INDICATION LIGHT (RED)	ANALOG INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS OF VALUE GREATER OR EQUAL TO USER SETPOINT **
38	VIT-302	BL-300 SUCTION VACCUUM LOW INDICATION LIGHT (RED)	ANALOG INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS OF VALUE LESSER OR EQUAL TO USER SETPOINT **
39	VIT-302	BL-300 SUCTION VACCUUM HIGH INDICATION LIGHT (ORANGE)	ANALOG INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS OF VALUE GREATER OR EQUAL TO USER SETPOINT **
40	VIT-302	BL-300 SUCTION VACCUUM HIGH-HIGH INDICATION LIGHT (RED)	ANALOG INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS OF VALUE GREATER OR EQUAL TO USER SETPOINT **
41	VIT-402	BL-400 SUCTION VACCUUM LOW INDICATION LIGHT (RED)	ANALOG INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS OF VALUE LESSER OR EQUAL TO USER SETPOINT **
42	VIT-402	BL-400 SUCTION VACCUUM HIGH INDICATION LIGHT (ORANGE)	ANALOG INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS OF VALUE GREATER OR EQUAL TO USER SETPOINT **
43	VIT-402	BL-400 SUCTION VACCUUM HIGH-HIGH INDICATION LIGHT (RED)	ANALOG INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS OF VALUE GREATER OR EQUAL TO USER SETPOINT **
44	PIT-601	HX-600 SUCTION PRESSURE HIGH INDICATION LIGHT (RED)	ANALOG INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS OF VALUE GREATER OR EQUAL TO USER SETPOINT **
45	TT-602	HX-600 DISCHARGE TEMPERATURE HIGH INDICATION LIGHT (RED)	ANALOG INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS OF VALUE GREATER OR EQUAL TO USER SETPOINT **
46	TT-701	BUILDING NO. 2 ROOM TEMPERATURE HIGH INDICATION LIGHT (RED)	ANALOG INPUT - ACTIVATE VIRTUAL OUTPUT TO COMPUTER AFTER 5 SECONDS OF VALUE GREATER OR EQUAL TO USER SETPOINT **

** – REFER TO PLC INTERLOCK DESCRIPTIONS ON DRAWING 3



RISER
MAIN CONTROL PANEL

NOTES:

1. THIS DRAWING INCLUDES INPUT AND OUTPUT SIGNALS TO THE NEW PLC PROVIDED WITHIN THE MAIN CONTROL PANEL.
2. PROVIDE A SLC 5/04 PROCESSOR WITH EPROM IN RACK 1, SLOT 1 OF THIS PLC.
3. RACK 1 SHALL BE 10-SLOT RACK.
4. PROVIDE ALLEN-BRADLEY 1747-P4 POWER SUPPLY.
5. SLOTS 9 AND 10 OF RACK 1 SHALL BE BLANK FOR FUTURE USE.
6. PROVIDE 120 VAC POWER DISTRIBUTION, CIRCUIT BREAKER(S), RELAYS, 24 VOLT POWER SUPPLY, AND ANCILLARY EQUIPMENT WITHIN THE MAIN CONTROL PANEL AS REQUIRED. PROVIDE AN INTERPOSING RELAY FOR EACH DISCRETE OUTPUT (INCLUDING SPARES).
7. PROVIDE AN INDUSTRIAL FLAT PANEL COMPUTER WITH TOUCH SCREEN CONTROLS ON FRONT DOOR OF MAIN CONTROL PANEL. INDUSTRIAL COMPUTER SHALL INCLUDE:
   A. OPERATOR INTERFACE SOFTWARE PROGRAMMED TO INCLUDE THE FUNCTIONS LISTED ON THIS DRAWING;
   B. ETHERNET PORT FOR FUTURE CONNECTION TO REMOTE SCADA SYSTEM.
   C. DATA STORAGE CAPABILITY.
8. PLC SHALL BE PROGRAMMED TO INCLUDE THE FUNCTIONS LISTED ON DRAWING 3 AND THIS DRAWING.
9. MAIN CONTROL PANEL ENCLOSURE SHALL BE NEMA 12 HOFFMAN OR EQUAL SIZED TO INCLUDE COMPONENTS LISTED ON THIS DRAWING PLUS 20% SPARE SPACE. PANEL WIDTH SHALL NOT EXCEED 48 INCHES.
10. PANEL BUILDER SHALL PROVIDE DETAILED SHOP DRAWINGS OF THE MAIN CONTROL PANEL FOR ENGINEER APPROVAL PRIOR TO CONSTRUCTION.
11. PANEL BUILDER SHALL PROVIDE ACCURATE AS-BUILT DRAWINGS UPON DELIVERY OF THE MAIN CONTROL PANEL.
12. PROVIDE INTERPOSING RELAY WITH MINIMUM OF 2 NORMALLY OPEN CONTACTS. REFER TO SCHEMATICS ON DRAWING 8.

NO.	ISSUED DATE	REVISION DESCRIPTION	BY/CKD
0	9/2007	95% DESIGN SUBMITTAL	TA/TA

KYRIACOS PIERIDES, PH.D., P.E.
N.Y. LIC. NO. 073670

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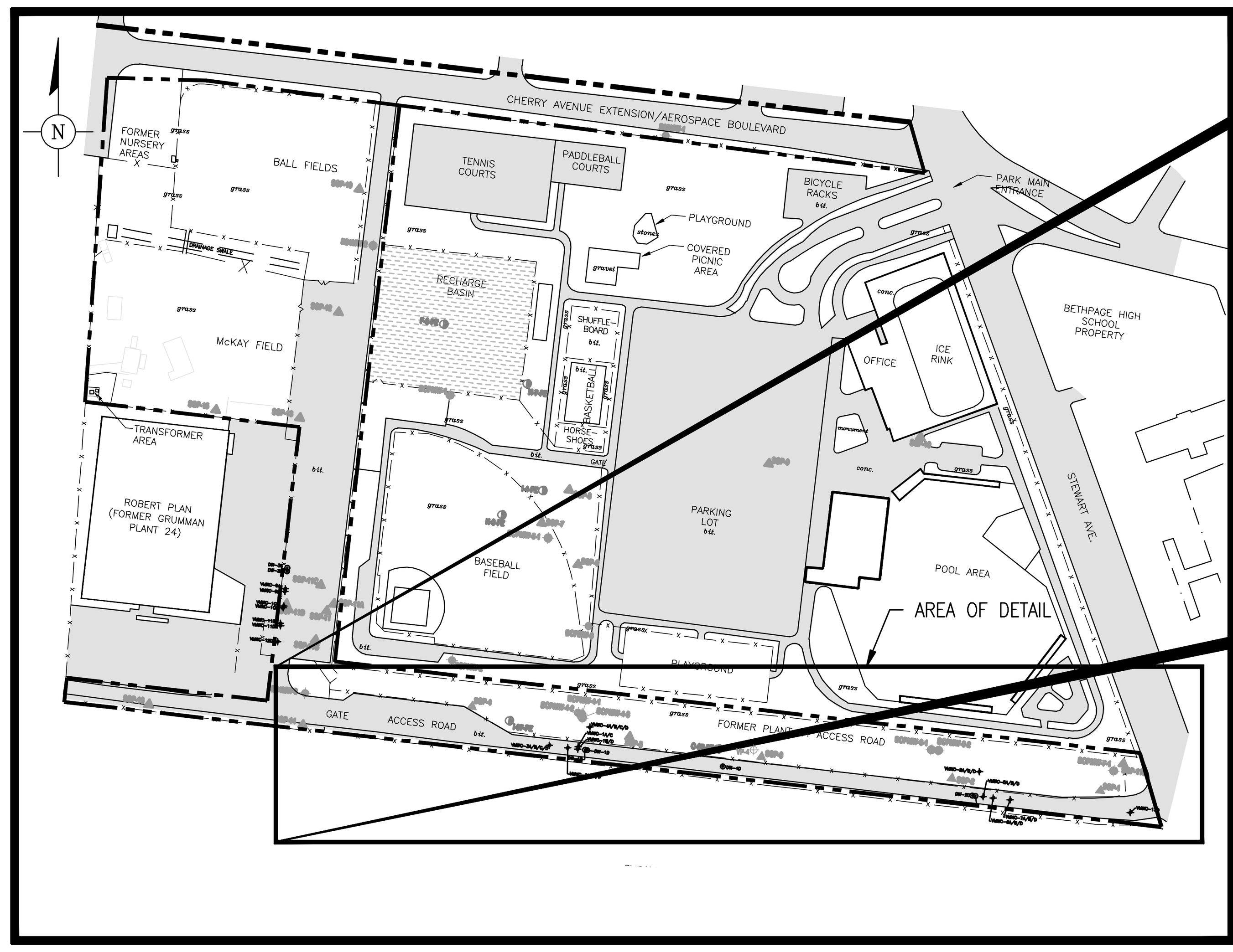
NORTHROP GRUMMAN OPERABLE UNIT 3
SOIL GAS INTERIM REMEDIAL MEASURE
FORMER GRUMMAN SETTLING PONDS
BETHPAGE, NEW YORK

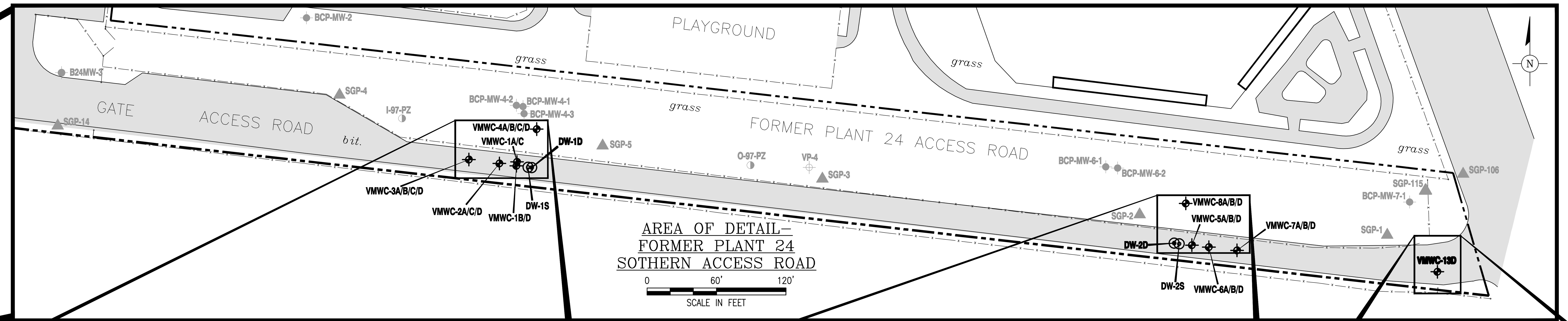
ELECTRICAL SIGNAL LIST AND RISER DIAGRAM

PROJECT MANAGER	DEPARTMENT MANAGER	LEAD DESIGN PROF.	CHECKED BY
C. SAN GIOVANNI	D. OBERLE	T. ARMSTRONG	D. OBERLE
		TASK/PHASE NUMBER: T0001	DRAWN BY: T. ARMSTRONG
		PROJECT NUMBER: NY001464.1407	DRAWING NUMBER: 9



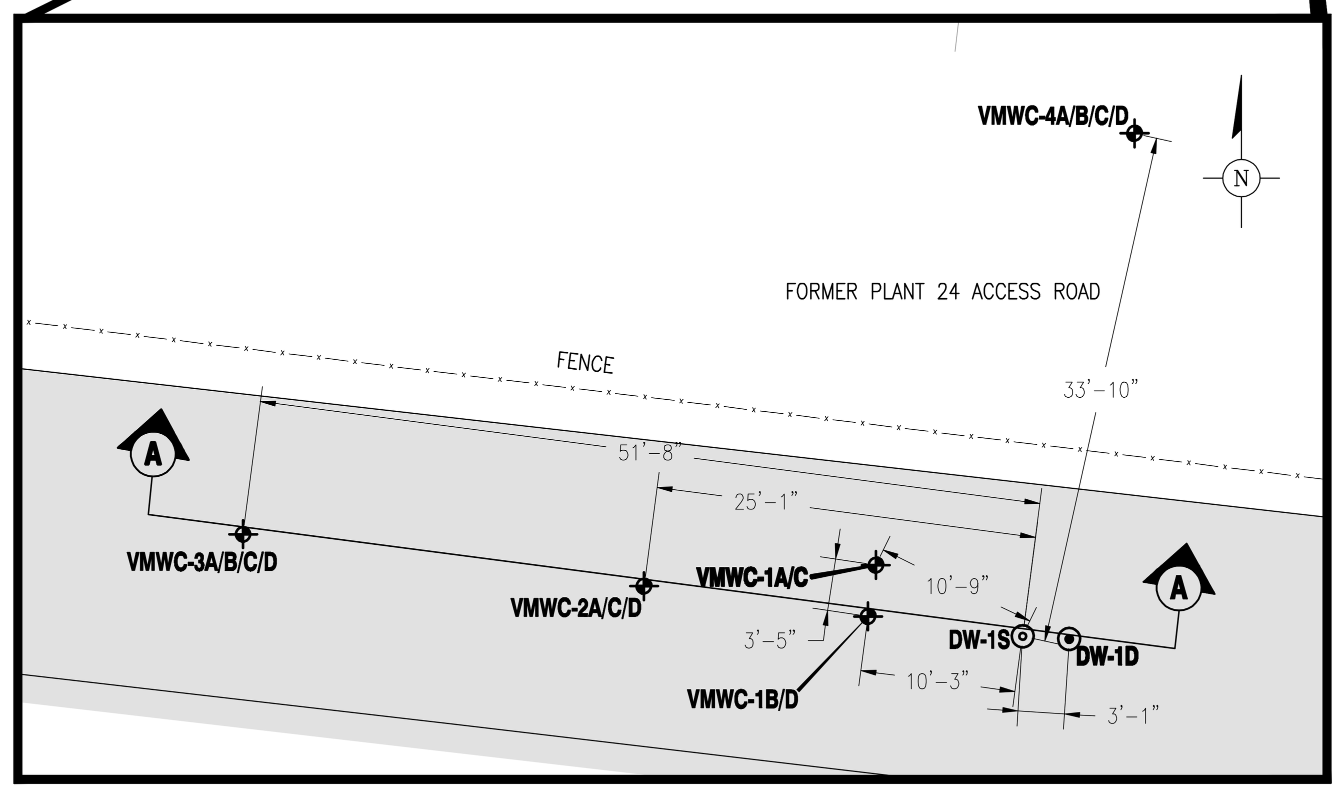
SITE PLAN

0 200' 400'
SCALE IN FEET



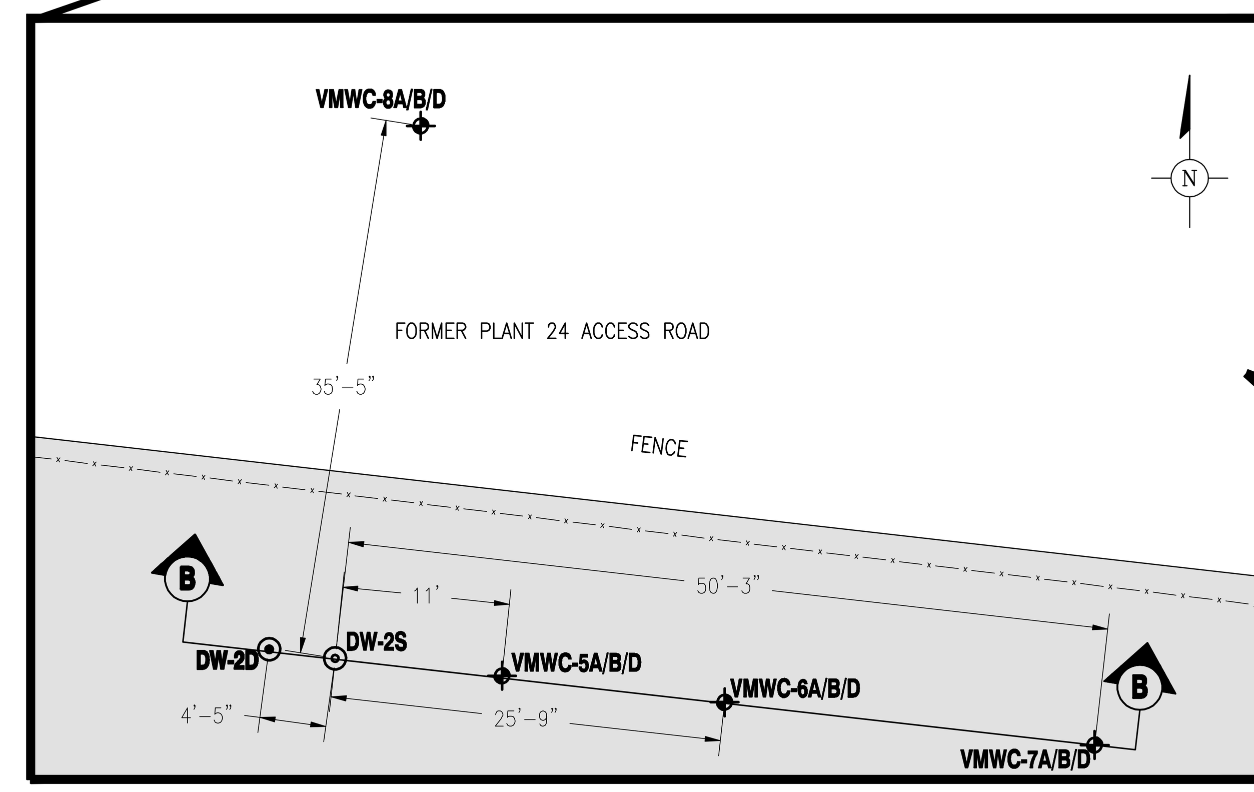
AREA OF DETAIL–
FORMER PLANT 24
SOTHERN ACCESS ROAD

0 60' 120'
SCALE IN FEET



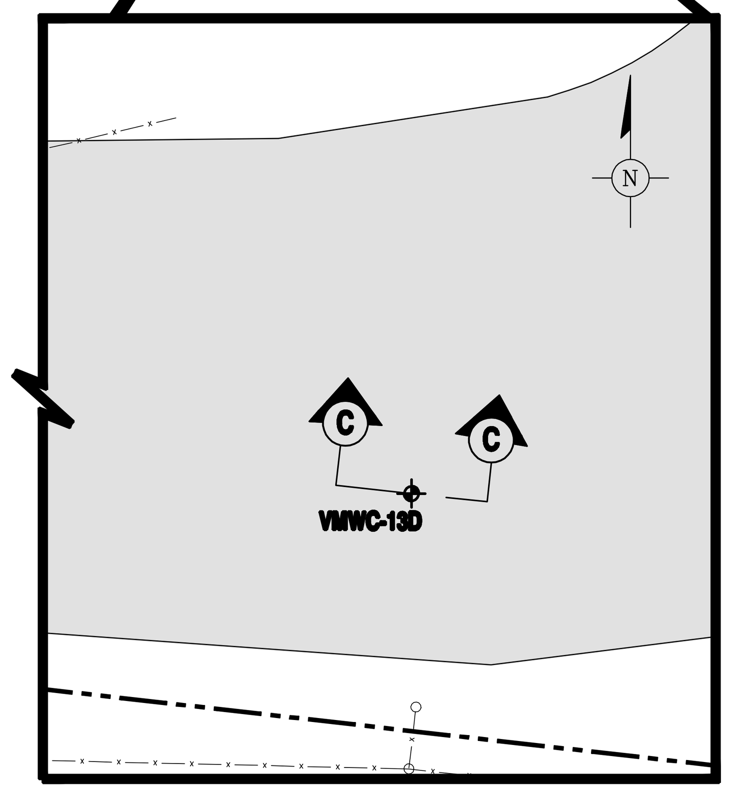
DEPRESSURIZATION WELLS DW–1S & DW–1D WITH ASSOCIATED
VACUUM MONITORING WELL CLUSTERS (VMWC)

0 10' 20'
SCALE IN FEET



DEPRESSURIZATION WELLS DW–2S & DW–2D WITH ASSOCIATED
VACUUM MONITORING WELL CLUSTERS (VMWC)

0 10' 20'
SCALE IN FEET



ASSOCIATED VACUUM MONITORING
WELL VMWC–13D

0 10' 20'
SCALE IN FEET

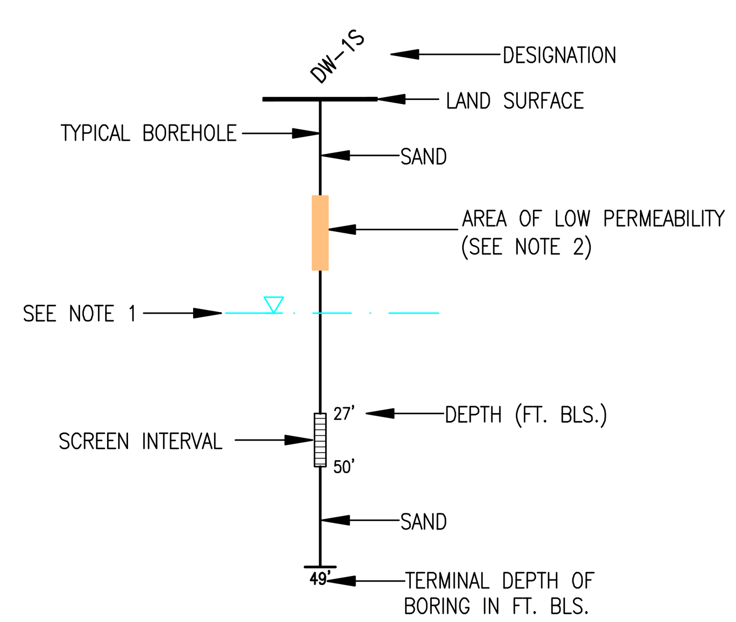
LEGEND:

—·—·—	NORTHROP GRUMMAN PROPERTY LINE
—x—x—	FENCE
—·—·—	LIMITS OF BETHPAGE HIGH SCHOOL MAIN BUILDING
bit.	BITUMINOUS PAVEMENT
SGP-11	TEMPORARY SOIL GAS POINT INSTALLED DURING OU-3 REMEDIAL INVESTIGATION
BCP-MW-4-2	MONITORING WELLS
0-97-PZ	PIEZOMETER
VP-4	VERTICAL PROFILE BORING (VP)
DW-2S	SHALLOW DEPRESSURIZATION WELL (DW-S)
DW-2D	DEEP DEPRESSURIZATION WELL (DW-D)
VMWC-1A/C	VACUUM MONITORING WELL CLUSTER (VMWC)

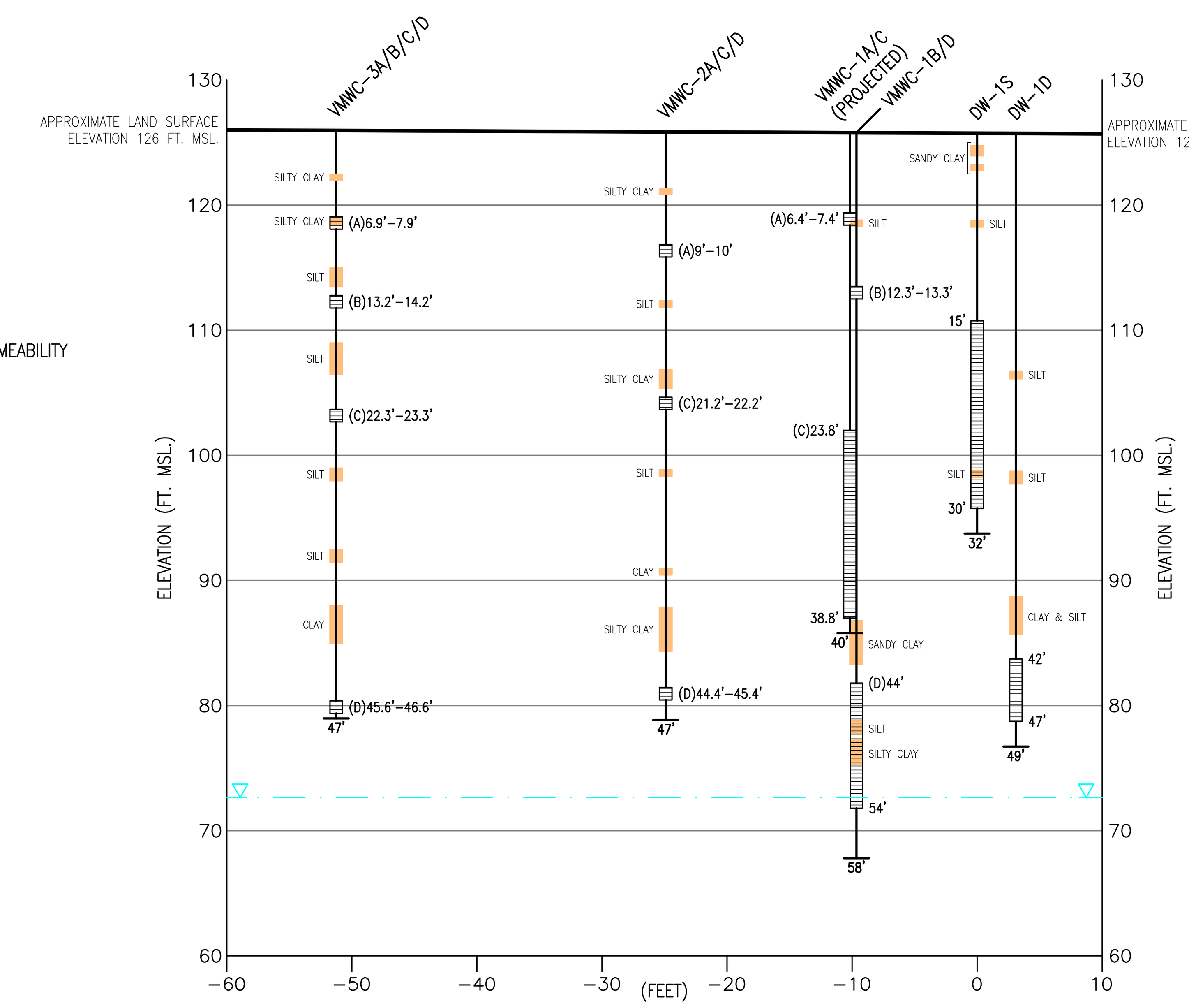
NOTES:

1. WATER TABLE ESTIMATE WAS OBTAINED DURING PNEUMATIC CONDUCTIVITY TEST FROM LOCATIONS VMWC-1D AND VMWC-5D ON MARCH 22, 2007.
2. LOW PERMEABILITY ZONES (CLAY, SILT, SILTY CLAY AND SANDY CLAY) WITH A THICKNESS GREATER THAN 6-INCHES ARE SHOWN.
3. TEMPORARY SOIL GAS LOCATIONS ARE BASED ON FIELD MEASUREMENTS AND ARE APPROXIMATE.
4. LOCATION OF MONITORING WELLS, PIEZOMETERS, DEPRESSURIZATION WELLS AND VACUUM MONITORING WELLS BASED ON MULTIPLE SURVEYS PROVIDED BY NELSON & POPE ENGINEERS AND SURVEYORS.

EXPLANATION

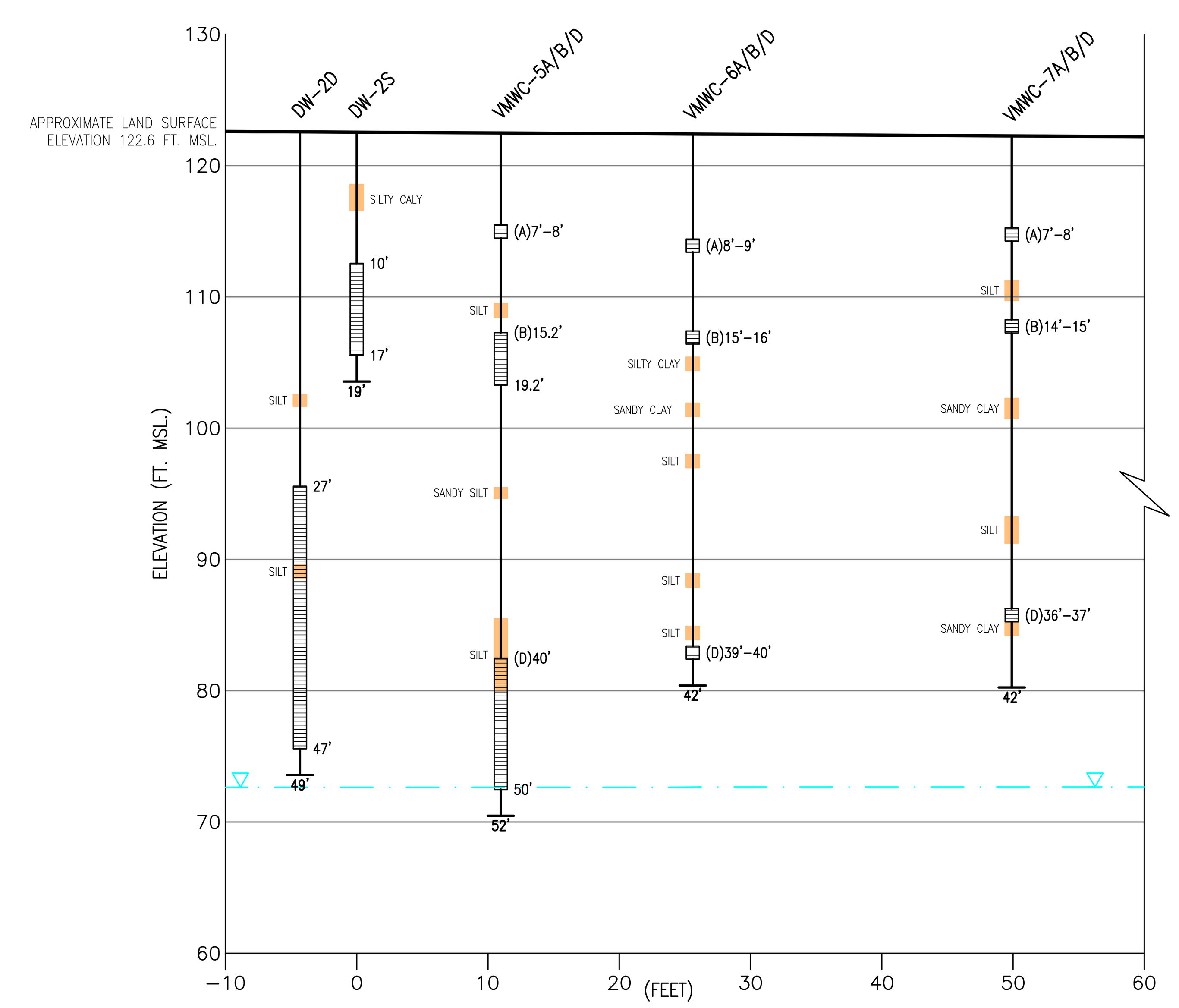


DEFINITIONS:
FT. BLS. – FEET BELOW LAND SURFACE



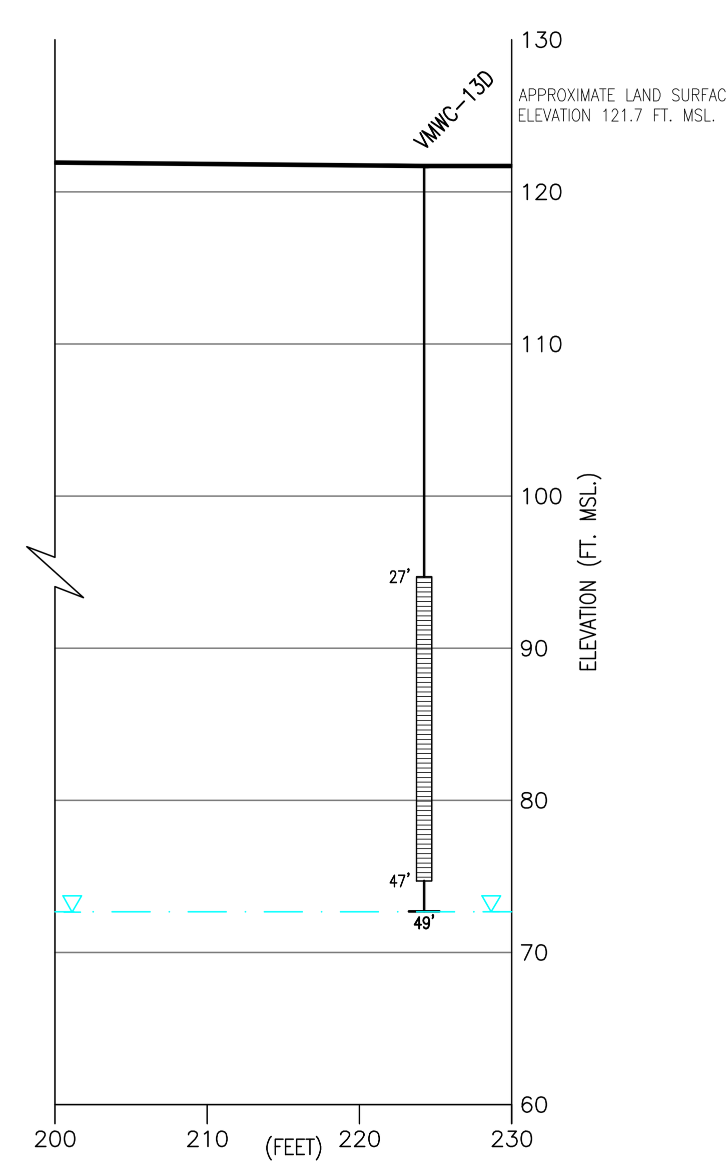
CROSS–SECTION A–A

HORIZONTAL SCALE: 1"=10'
VERTICAL SCALE: 1"= 10'



CROSS–SECTION B–B

HORIZONTAL SCALE: 1"=10'
VERTICAL SCALE: 1"= 10'



CROSS–SECTION C–C

HORIZONTAL SCALE: 1"=10'
VERTICAL SCALE: 1"= 10'

NO.	ISSUED DATE	REVISION DESCRIPTION	BY/CKD
0	9/2007	95% DESIGN SUBMITTAL	PR

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NORTHROP GRUMMAN OPERABLE UNIT 3
SOIL GAS REMEDIAL MEASURE
FORMER GRUMMAN SETTLING PONDS
BETHPAGE, NEW YORK

PROJECT MANAGER: C. SAN GIOVANNI	DEPARTMENT MANAGER: M. WOLFERT
LEAD DESIGN PROF.: C. TUOHY	CHECKED BY: K. ZEGEL
TASK/PHASE NUMBER: 00002	DRAWN BY: A. SANCHEZ
PROJECT NUMBER: NY001464.1407	DRAWING NUMBER: A-1

FORMER PLANT 24
SOUTHERN ACCESS ROAD
PNEUMATIC CONDUCTIVITY TEST
LOCATIONS AND WELL CONFIGURATIONS

Current Plotstyle : ByColor
Layout Tab: Layout1
Date\Time : Fri, 07 Sep 2007 – 3:51pm
Path\Name : G:\APROJECT\Northrop Grumman\Superfund\2007\OU3\NY001464.1407 VCS IRM\VCS Desig–Const\95% Design\Cadd\DEC_95% Submittal\APDX A–1_S Access Rd.dwg
Acad Version : R17.0s (LMS Tech)
User Name : alsanchez

We expect that the soil gas IRM will begin operation in late October 2007. The duration of operation will depend on several factors and is currently unknown. However, it is anticipated that the soil gas IRM will operate for several years. We request that DPW issue written authorization for us to proceed with disposal of water to the Nassau County POTW, as described above. Should the system generate more condensate than currently anticipated, we will contact you promptly for a revision to the approval requested herein. If you have any questions or comments regarding the content of this letter, please contact David Stern of ARCADIS at (631) 391-5284.

Sincerely,

John Cofman
Lead Engineer

cc: David Stern, ARCADIS of New York