

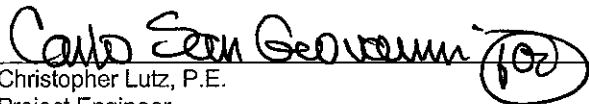
Northrop Grumman Systems Corporation

**Final Design Report
Operable Unit 3
Groundwater Interim Remedial Measure**

Former Grumman Settling Ponds,
Bethpage, New York
Site # 1-30-003A

August 2008

ARCADIS



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1. Introduction

This Operable Unit 3 (OU3) Groundwater Interim Remedial Measure (Groundwater IRM) Final Design Report (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), has been termed the "Former Grumman Settling Ponds Area" and designated as OU3, by the NYSDEC. The Park has been owned and operated by the Town of Oyster Bay since 1962. The term Site, as used herein, refers to the Park and the former Grumman Plant 24 Access Road (which is located south and west of the Park).

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 elected to implement two IRMs; a soil gas mitigation system (soil gas IRM), which has been operational since February 2008, and a groundwater containment system (Groundwater IRM). This report presents the final design for the Groundwater IRM. Included in this report is a brief project background, objectives of the groundwater IRM, design criteria of the Groundwater IRM, descriptions and theory of major system components, and a set of turnkey (Construction-by-Engineer) drawings (Contract Drawings).

This report is organized into the following sections:

- Section 2 provides a brief project background.
- Section 3 summarizes the project objectives and design criteria.
- Section 4 provides a description of the Groundwater IRM system components and some theory of how the technology works.
- Section 5 provides a description of the construction site controls that will be implemented during construction to protect human health and the environment.
- Section 6 presents a summary of the Operation, Maintenance, and Monitoring (OM&M) program and objectives.

- Section 7 discusses permit and/or permit equivalent requirements.
- Section 8 summarizes the permanent site security measures that will be implemented following construction completion.

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 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 silt, 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.

2.3 Environmental Investigations and Remedial Activities

An extensive remedial investigation (RI) of the OU3 site was performed by ARCADIS and D&B on behalf of Northrop Grumman. The RI results are presented in the February 2008 Remedial Investigation Report (Site Area), Operable Unit 3 Former Grumman Settling Ponds), Bethpage, New York, prepared by ARCADIS.

As noted, Northrop Grumman elected to implement two IRMs. This reports documents the design associated with the groundwater IRM. The other IRM, the soil gas IRM has been operational since February 2008. The soil gas IRM design is provided in the September 2007 95% Design Report, Operable Unit 2, Soil Gas Interim Measure, Former Grumman Settling Ponds, Bethpage, New York, prepared by ARCADIS.

3. Project Objectives and Design Criteria

This section presents the Groundwater IRM remedial objectives and design criteria.

3.1 Remedial Objectives

The specific remedial objectives of the Groundwater IRM are:

- To mitigate the off-Site migration of dissolved-phase volatile organic compounds (VOCs) through the implementation of a groundwater pump-and-treat system that will extract groundwater along the former Plant 24 Access Road property, south of the Park. Specifically the Groundwater IRM will address: (a) groundwater that has TVOC concentrations greater than 5 micrograms per liter (ug/L) in the upper twenty feet of the surficial aquifer across the 1,200-foot wide lateral extent of the Site boundary and (b) groundwater below the upper 20 feet of the surficial aquifer that has TVOC concentrations above 50 ug/L.
- To comply with applicable NYSDEC Standards, Criteria, and Guidelines (SCGs) for the various effluents (i.e. treated water and the air stripper off-gas).

A secondary benefit of the Groundwater IRM will be to create a clean-water front atop the downgradient groundwater, thereby minimizing the potential for vapor intrusion issues associated with groundwater downgradient of the site.

3.2 Design Criteria

This section presents the design criteria for the following parts of the proposed Groundwater IRM: pumping rates, predicted influent groundwater concentrations, treated water effluent requirements, predicted air stripper off-gas concentrations, and air effluent requirements.

3.2.1 Pumping Rates

A comprehensive groundwater flow and contaminant transport model for the site was developed by ARCADIS. The model is based on data collected for Operable Unit 2 (OU2) and OU3. Based on a series of model simulations run for the Groundwater IRM, a total system flow rate of 210 gallons per minute (gpm) from four recovery wells is predicted to be needed to achieve the hydraulic containment objective. A summary of the modeling performed along with the model output is provided in Appendix A. The approximate locations of the recovery wells are shown on Figure 2.

For design purposes, the individual system components are designed with a safety factor of an additional 10 gpm per well, resulting in a design flow rate of 250 gpm.

To confirm many of the Groundwater IRM design parameters, Remedial Well RW-2 was installed and a pumping test was performed. The results of the pumping test are summarized in Appendix B. In summary, the pumping test results validated the modeling results, thereby confirming/finalizing the Groundwater IRM design parameters. However, the performance of RW-2 during the pumping test was adversely impacted by bio-fouling that occurred at an abnormally rapid rate. ARCADIS is currently investigating the cause of this rapid bio-fouling and will be developing preventative measures and/or engineering controls. To date, no allowances have been made within the design to accommodate the potential remedial, or engineering controls, to address the bio-fouling, if it is determined that something is needed.

3.2.2 Predicted Influent Groundwater Concentrations

The predicted Groundwater IRM influent groundwater concentrations for the project compounds are provided in Table 1. The predicted influent concentrations are based

on results of sampling and modeling activities performed by ARCADIS during the OU3 remedial investigations and the pumping test, include a 50% safety factor for each of the project VOCs, and were used to design system components.

3.2.3 Treated Water Effluent Requirements

Prior to discharge to the former NWIRP recharge basins, the treated water needs to comply with applicable regulatory requirements, specifically the "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, per Division of Water Technical and Operation Guidance Series (1.1.1), reissued June 1998 for ambient water classification "GA – Source of Drinking Water (groundwater)". The applicable, regulatory discharge limit for the project compounds are provided in Table 1. As shown in Table 1, VOC concentrations in the extracted groundwater need to be reduced prior to discharge.

An air stripper will be used to reduce the concentration of VOCs to meet the regulatory limits. Specifically, the air stripper will be designed to reduce the influent design concentration of individual VOCs to one-half its regulatory limit. The design discharge values for the individual VOCs are also provided in Table 1.

3.2.4 Predicted Air Stripper Off-gas Concentrations

The predicted air stripper off-gas concentrations for the project compounds are provided in Table 2. The predicted influent vapor concentrations were calculated assuming that 100% of the VOCs in the influent groundwater are transferred from the groundwater to the air stripper off-gas. Also shown in Table 2, are the potential annual mass emissions, which are the amounts of the project VOCs that would be emitted if there were no treatment of the air stripper off-gas to reduce non-Freon VOCs.

3.2.5 Air Discharge Requirements

Prior to discharge to the atmosphere, the system vapor emission needs to comply with the applicable regulatory requirements, per the "Annual Guidance Criteria (AGC) and Short-Term Guidance Criteria (SGC) per the NYSDEC 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." The AGCs and SGCs for the project VOCs are presented in Table 2.

As shown in Table 2, vapor phase treatment is required since the potential annual emission of vinyl chloride (161 lbs) exceeds the allowable annual emission rate (51 lbs). However, since the predicted emissions are conservatively estimated and include a safety factor, treatment of the air stripper off-gas may not be needed to meet applicable SGCs or the AGCs. An emission control system will be constructed and operated to ensure compliance with applicable regulatory requirements but, in the future, depending on what the actual emissions are, Northrop Grumman may petition to eliminate or reduce the amount of vapor phase treatment. Initially, a series of emission control units (ECUs) with both vapor phase granular activated carbon (VPGAC) and potassium-permanganate impregnated zeolite (PPZ) will be used to reduce the VOC concentrations in the air stripper off-gas prior to discharge. The ECUs will be designed to meet applicable discharge requirements.

4. Groundwater IRM Design

The Groundwater IRM consists of the following major components:

- A groundwater extraction system, consisting of four remedial wells, located and designed to efficiently capture and contain VOC-impacted groundwater to be addressed by this IRM. The extraction system collects impacted groundwater at a constant pumping rate and delivers it to the air stripper system via four influent pipelines.
- An air stripper system designed to reduce the concentration of VOCs in the recovered groundwater to one-half of their respective regulatory limit prior to discharge to surface water located on the neighboring former Naval Weapons Industrial Reserve Property (NWIRP) property.
- ECUs containing VPGAC and PPZ to reduce the concentration of VOCs in the air stripper off-gas to less than their respective AGCs, and SGCs.
- Process controls to provide necessary safeties and interlocks to ensure that the Groundwater IRM operates efficiently, and safely, without unnecessary interruption.
- A treatment building to house the majority of the process equipment and a concrete foundation to stage the ECUs.
- Electric utility service to power the system.

The following subsections of this Design Report describe the primary components of the Groundwater IRM and include some discussion of key design considerations.

4.1 Recovery Wells, Pumps, and Influent Pipelines

The off-site remediation groundwater recovery system consists of four remedial wells (RW-1 through RW-4), four well pumps (P-100 through P-140), and the four dedicated influent pipelines.

4.1.1 Recovery Wells and Pumps

To develop and maintain the desired hydraulic containment along the former Plant 24 access road, groundwater will be extracted from the four, six-inch diameter, 105-foot deep, steel-cased, recovery wells (RW-1 through RW-4). The proposed well locations are shown on Figure 2 and Contract Drawing 1. Each well will be flush mounted, have a pitless adaptor located 3.5-feet below grade, and be completed with 20-feet of continuous slot, stainless steel screen. A typical recovery well detail is provided in Contract Drawing 8.

Submersible groundwater pumps, one in each of the four recovery wells, will be used to extract and convey the groundwater from the wells to the air stripper located in the treatment building. Based on groundwater modeling, in order to achieve the desired hydraulic containment, well pumps P-110 and P-140 will be located in recovery wells RW-1 and RW-4, respectively. Well pumps P-120 and P-130 will be located in recovery wells RW-2 and RW-3, respectively. Pumps P-110 and P-140 are 3 horsepower (HP), Grundfos Model No. 40S30-9, 460V, 3 phase motors capable of 40 gpm at a total dynamic head (TDH) of 200 feet. P-120 and P-130 are 7.5 HP, Grundfos Model No. 75S75-9, 460V, 3 phase motors capable of 85 gpm at a TDH of 220 feet. Head loss calculations were completed using standard equations for pipe friction and losses due to valves and fittings. The calculations are presented in Appendix C. Pump specifications are provided on Contract Drawing 11. Additional information associated with the pipe location, pipe size, and well head arrangement is provided on Contract Drawings 1, 2, and 8.

The RW-1 through RW-4 wellheads will be enclosed in a below-grade, locked vault along with associated piping and the electrical junction box. Well pumps (P-110, P-120, P-130, and P-140) will be connected to influent piping using a pitless adapter. The remaining flow controls (manual throttling valve), electrical devices (start/stop

switch, instrumentation, and interlocks), and accessories associated with the recovery wells will be housed in the treatment building.

4.1.2 Influent piping

The influent piping, used to convey the groundwater recovered via Recovery Wells RW-1 through RW-4 to the treatment building, consists of four individual pipelines. Each well has a dedicated, subsurface, high-density polyethylene (HDPE) pipeline to convey the extracted groundwater to the treatment building. Specifically, the pipelines from RW-1 and RW-4 consists of two 3-inch-diameter standard dimension ratio (SDR)-17 HDPE pipes and the pipelines from RW-2 and RW-3 consists of two 4-inch-diameter SDR-17 HDPE pipes. The majority of the influent piping was installed during the soil gas IRM construction. New influent piping required to be installed includes connections at the wells and piping from the soil gas IRM area to the treatment building. The existing and proposed influent piping is shown on Contract Drawings 1 and 2.

Valves and instrumentation on the influent pipes will be located within the treatment building. Upon entering the building, influent piping will transition from HDPE to schedule 80 polyvinyl chloride (PVC) and each influent pipe will be equipped with a low-pressure switch, pressure transmitter, globe valve, local pressure gauge, magnetic flowmeter with a bypass loop, sample tap, and a check valve. Influent pipes will then connect into a common 4-inch-diameter schedule 80 PVC header that will convey flow to the air stripper.

4.2 Groundwater Treatment System

The groundwater treatment system will consist of an air stripper to remove VOCs from the recovered groundwater followed by a bag filter system to remove particulate matter, which may be generated by aerating the influent groundwater, prior to discharge to the former NWIRP recharge basin. The groundwater treatment system is also designed with the flexibility to add a sequestering agent addition system in the future, if required, to control iron precipitation in the air stripper trays.

The following subsections include a description of the air stripper process, design criteria and parameters, and information on the system components (the air stripper, blower, discharge pump, bag filter system, discharge piping, sequestering agent addition system, and booster pump system).

4.2.1 Air Stripper Process Description

Air stripping is a mass transfer process. In a low-profile air stripper, air and water are run in a counter-flow arrangement through multiple aeration trays. The trays enhance air/liquid contact by producing microbubbles in the liquid and exposing a large amount of the liquid surface area to the counter-flowing air. This large amount of surface area allows efficient transfer of the VOCs out of the water into the passing air.

4.2.2 Air Stripper System Design Criteria and Parameters

The design criteria for the Groundwater IRM influent and effluent groundwater are listed below.

Maximum Water Flow Rate	250 gpm
Typical Water Flow Rate	210gpm
Minimum Water Temperature	40 degrees Fahrenheit
Influent VOC Concentrations	see Table 1
Effluent VOC Concentrations	50% of the regulatory limit (see Table 1)

Based on the above-listed design criteria, the resulting Groundwater IRM design parameters are:

Number of Air Strippers	1
Design Air to Water Ratio	54:1
Materials of Construction	316 Stainless Steel
Dimensions	12-feet long by 4-feet wide by 9 ½ -feet high
Removal Efficiency	>99.5%

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4.2.3 Air Stripper System Components

The air stripper (AS-400) will be a low-profile air stripper (NEEP Systems Model 31261) equipped with six aeration trays, an induced draft blower, a variable frequency drive (VFD)-controlled discharge pump, instrumentation, and a local control panel.

4.2.3.1 Air Stripper Blower

The air stripper blower (B-400) will have an induced draft configuration and is designed to pull ambient air from outside the treatment building through AS-400, and forces the exhaust through the ECUs.

An air stripper model was used to determine the design air flow rate. A series of modeling runs were performed for the project VOCs (i.e., cis-1,2-dichloroethene, trichloroethene, and vinyl chloride). Based on the model results, an air flow rate of 1,800 cubic feet per minute (CFM) is required to reduce the design concentration of cis-1,2-dichloroethene at 250 gpm to less than its' design effluent concentration of 2.5 micrograms per liter ($\mu\text{g/L}$). Similar modeling runs using 1,800 CFM were performed for the other VOCs and in each case the effluent concentration was calculated to be less than its respective design discharge concentration. A copy of the 1,800 CFM model results for cis 1,2-DCE is provided in Appendix D.

Pressure drop calculations were completed using standard equations for duct friction and minor losses due to valves and fittings. Total pressure drop for a conservative flow rate of 2,000 CFM was determined from these losses and the predicted pressure drop through the ECUs, which was provided by the ECU supplier. The calculations are presented in Appendix E. As shown, the total pressure drop through the system is approximately 40 inches of water gauge.

Blower (B-400) is an American Fan backward inclined centrifugal fan, Model VP-5-08-26.5A with a 40 hp, 3,600 rpm, 460V motor rated for 2,000 standard cubic feet per minute (SCFM) at 53 inches static pressure.

4.2.3.2 Discharge Pump

The low-profile air stripper will be equipped with a discharge pump (P-400) to pump treated water from the air stripper sump through a bag filter system to the discharge pipeline which ultimately ties into Northrop Grumman's stormwater system. To maintain a constant, continuous flow through the bag filter system, the pump is

controlled using a VFD that adjusts the speed of the pump to maintain a constant liquid level in the air stripper sump.

Pump P-400 will be a Goulds Model SSH-27H, single-stage pump with a 7.5 HP, 460V, 1,800 revolutions per minute (rpm) motor rated for 250 gpm at 70 ft TDH. Head loss calculations were completed using standard equations for pipe friction and losses due to valves and fittings. Total head required for the design maximum flow rate (250 gpm) was determined from these losses, an assumed loss of 15 psi across any filter vessels that may be used, and the change in elevation. The calculations are presented in Appendix C. Additional information associated with pipe sizing, pipe layout, valve location and sizing is provided in the Contract Drawings.

4.2.3.3 Bag Filter System and Discharge Piping

Groundwater treated by the air stripper will be pumped through a bag filter system for solids removal prior to being discharged to the former NWIRP basins via Northrop Grumman's stormwater system.

Two, dual-bag filter systems (two housing units that contain one bag per unit) (Filtration Systems Model NC-223-V) with motor-actuated control valves will be used to remove particulate matter before discharge to surface water. The filter bags used will be 10 to 25 micron size. Only one bag filter system will be used at a time. The actuators are controlled based on the influent pressure to the bag filter unit. Once the influent pressure reaches the filter system changeover set point, an actuator opens the valve for the bag filter system which is on "stand-by" and at the same time initiates an advisory condition, then closes the valve for the unit which has been "in service," redirecting the flow into the fresh filter units. When the operator replaces the filter bags in the unit that was just taken off line with new filter bags, the unit is placed in stand-by mode by the operator acknowledging the advisory condition. Should the influent pressure reach the high set point without having a "stand-by" filter available, the entire system will automatically and immediately shutdown.

After filtration, treated groundwater will be discharge to the NWIRP former recharge basins via an underground discharge pipeline that will be connected to Northrop Grumman's existing stormwater system. The discharge pipeline will consist of the following four sections: (a) above-ground four-inch diameter, schedule 80 PVC pipe between the pump and the bag filters, (b) above- and below-ground, six-inch-diameter, SDR17 HDPE line, which will tie-into (c) an existing below-ground eight-inch diameter schedule 80 PVC line, and (d) another section of below-grade six-inch diameter pipe,

SDR 17 HDPE line between the existing six-inch diameter PVC line and the existing manhole, where the plant discharge will feed into Northrop Grumman's stormwater system, which ultimately discharges into the three recharge basins located on the former NWIRP property. Additional information and detail regarding the bag filter system, and discharge line is provided in the Contract Drawings.

4.2.3.4 Sequestering Agent Addition System

The treatment system has been designed with the flexibility to add a sequestering agent addition system in the future, if it is determined that excessive equipment fouling resulting from precipitating metals (iron), is occurring. Currently, the future sequestering agent system would consist of a 330 gallon chemical tote of sequestering agent (proprietary non-hazardous mixture that is soluble in water) and a chemical metering pump. The sequestering agent will be pumped directly into the combined influent header line feeding the air stripper system. The metering pump operation will be flow paced based on the total influent flow rate to the air stripper.

4.2.3.5 Booster Pump System

To support maintenance of the treatment building, piping and air stripper, the groundwater treatment system will be equipped with a 300-gallon HDPE tank and a booster pump system (Davey Model HS12-40HTI) to provide treated water to hose bibs installed inside the building.

4.3 Emission Control System

The emission control system is designed to reduce the concentration of non-Freon VOCs in the air stripper off-gas to less than their regulated limits prior to discharge to the atmosphere using VPGAC and PPZ. The following subsections include a description of the VPGAC and PPZ processes, design criteria and parameters, and information on the system components.

4.3.1 Emission Control System Process Description

VOCs are removed with VPGAC by the process of adsorption. VPGAC is manufactured to ensure an extensive natural surface area that is available for the adsorption process. The surface area of granular carbons can range up to 1,400 square meters per gram of material. The physical adsorption of VOCs on, and into VPGAC is concentration gradient driven. Thus, the adsorption capacity of the VPGAC

is dependent on the concentration of VOCs in the air stripper exhaust. For example, as VOC concentration increases, additional pounds of VOCs per pound of VPGAC can be adsorbed.

Due to the need for direct contact between the VOC molecule and the VPGAC surface, the presence of moisture in the air stream will impact the rate of adsorption. The capacity of the activated carbon declines rapidly as the relative humidity of the air increases above 60%. The air stripper blower will be installed after the air stripper and before the ECUs. As the air stripper off gas (100% relative humidity) passes through the induced draft blower, the air stream will be heated and the relative humidity will be reduced to less than 50% relative humidity. In order to ensure proper operation and efficient use of the carbon, the temperature of the air stream will be periodically monitored to ensure the temperature stays elevated and the relative humidity of the air stays low.

Due to its molecular structure, vinyl chloride is not effectively treated by VPGAC. Therefore, PPZ will be used to reduce concentration of vinyl chloride prior to discharge. Basically, the VPGAC will be used to reduce the concentration of the non-vinyl chloride VOCs. The VPGAC effluent will then be further treated to reduce vinyl chloride concentrations.

Both VPGAC and PPZ treatment trains will consist of two ECUs each, for a total of four ECUs. To improve overall treatment effectiveness, both sets of VPGAC and PPZ. ECUs will be operated in lead/lag process trains.

4.3.2 Emission Control System Design Criteria and Parameters

The emission control system design parameters are listed below:

Maximum Air Flow Rate	2,000 SCFM
Typical Air Flow Rate	1,800 SFCM
VOC loading	See Tables 1 and 2, assumes 100% of VOCs are stripped from recovered groundwater
Relative Humidity	100% at the blower inlet, 40% at the blower outlet

Influent (raw) Temperature	55 degrees Fahrenheit
Effluent VOC Annual Emission Rate	See Table 2
Changeout Frequency	43 days or greater (per manufacture)
Expected PPZ Changeout Frequency	107 days or greater (per manufacture)

4.3.3 Emission Control System Components

4.3.3.1 Emission Control Units

The sizing and configuration of the VPGAC and PPZ ECUs were determined based on expected air flow rates, VOC characteristics and loadings. In summary, the ECUs beds and the media were selected to allow for a minimum changeout frequency of 43 days based on the maximum groundwater design flow rate of 250 gpm and the design concentrations (see Table 1). The following ECUs with VPGAC type, PPZ type, and mass media loadings were selected:

- Primary Units: Two (2) TIGG Model NB-8 ECUs, each filled with 7,000 pounds (lbs) of TIGG 5CC 6X12 virgin vapor-phase coconut shell carbon (for a total of 14,000 pounds of VPGAC) or equivalent; and
- Secondary Units: Two (2) T1GG Model NB-8 ECUs, each filled with 10,000 lbs of Hydrosil 600 PPZ.

The ECUs will be configured in a series arrangement, with the air stripper gas passing through the VPGAC-filled ECUs first, then into the two PPZ-filled ECUs.

All four of the ECUs will be insulated with 2-inch thick, rigid Styrofoam boards to help maintain desired temperature and relative humidity conditions throughout the vapor-phase treatment system. The insulation is finished with stucco embossed aluminum jacketing. The insulation is applied to the top of the ECUs to withstand mild personnel traffic. The ECUs will have safety railings, sampling ports, and access ladders.

4.3.3.2 Duct and Insulation

The duct will be 16-inch-diameter, schedule 10 (~1/8-inch thick), aluminum. The duct was sized to balance cost and pressure drop requirements. The exterior duct has a 2-

inch thick, 370 Melamine foam insulation with brown PVC coating. Condensate traps will be installed in duct low points to collect condensation from various locations in the duct. Condensate will be collected and disposed on an as-needed basis by operating personnel. Additional information about duct work sizing, configuration and process instrumentation is provided in the Contract Drawings.

4.4 Process Controls and Operation

The process control system is designed to provide the necessary safeties and interlocks to ensure that the recovery wells, piping, and treatment system operate smoothly, efficiently, and as one unit. Additionally, the system includes the capability of allowing local or remote operator(s) to observe and control the operation of the system from a single computer workstation. Initially, the system will be constructed without an external communication network that would allow remote monitoring of the system.

Controls and instrumentation will be interconnected via a main control panel (MCP). The MCP, located in the control room of the treatment plant, includes a programmable logic controller (PLC) which monitors and integrates the operation of the remedial wells, air stripping system, emission control system, the bag filter system, and the treatment system interlocks. This panel serves as the node through which communication with the control system takes place. The PLC is integrated with an operator interface station. The control system also utilizes fail-safe logic to automatically and immediately shut down the entire treatment system in the event of a critical alarm input or a failure of the PLC. An alarm light located within the treatment building notifies the operator of any critical alarms. If operating personnel are not on-site, project team members will be alerted of the shut down by a dedicated cellular autodialer. The dedicated autodialer will also notify project team members of power loss.

The power supply for the PLC, system instrumentation, and process control devices are protected with transient voltage surge suppression (TVSS) systems to limit voltage spikes to the systems. The PLC, system instrumentation, and process control devices are also protected by separate uninterruptible power supplies (UPS) that maintain power to these devices in case of a power outage.

4.4.1 Operation and Programmable Logic Controller

Operation of the Groundwater IRM is controlled and integrated through the PLC located in the system's MCP. The PLC provides the necessary control logic to coordinate signals from the remote switches and instrumentation throughout the treatment system. These interlocks ensure proper operating conditions are maintained within the treatment system.

Under normal operating conditions, the control system has the following functions:

- Provides run indication signals and elapsed run-time for each extraction well
- Monitors the line pressure on the influent pipelines to ensure that the pipes maintain structural integrity and there are no leaks;
- Monitors the groundwater flow rate from each recovery well to ensure that there is no degradation in flow produced by each well or loss of flow due to leakage of the influent piping;
- Monitors combined groundwater flow rate to the air stripper to ensure that air stripper influent flow rate is within design conditions
- Monitors air stripper system pressure and level alarms via dry contacts provided at the local air stripper control panel
- Provides run indication signals for air stripper blower and discharge pump
- Monitors the air stream discharge flow rate, pressure, and temperature from the air stripper blower to ensure that they are within design conditions
- Monitors bag filter system influent pressure which controls the bag filter sequencing
- Monitors groundwater flow rate discharging from the air stripper through the bag filter system to discharge
- Monitors groundwater treatment building temperature to ensure that building heating and ventilation system is functioning

- Maintains fail-safes and alarm interlocks to maintain safe and effective operation of the system. Fail-safes and alarm interlocks are described in the Section 4.4.2, including calling project team members when plant shut downs occur; and
- Ensures that once the system is shut down, regardless of whether it is due to a power failure or an alarm condition, the system does not automatically restart. The system will have to be manually restarted. Manual restart is required so that the cause of the alarm is investigated and the problem can be addressed prior to restart.

Major instrument operational controls are listed below.

- The recovery well pumps (P-110, -120, -130, -140) are operated with start/stop switches mounted at the MCP. The recovery well pumps will not operate unless permitted by the PLC interlocks and fail-safe interlocks.
- The air stripper system, which has it's own local control panel, will not operate unless permitted by the PLC interlocks and fail-safe interlocks.
- Influent pressure to the bag filter system is continuously monitored. Once the influent pressure measured reaches the high set point value, the PLC opens the valve for the stand-by unit, activates an advisory, and then closes the valve for the previously operating filter unit. Upon switching to the stand-by unit, an advisory is sent out to the project team members alerting them that a bag filter change out is required. If this advisory is not cleared, which can only be done manually at the site, before the influent pressure reaches the high-high set point value, the entire system will be automatically and immediately shut down.

4.4.2 Alarms and Interlocks

The recovery well, air stripping, emission control, and treated water discharge systems are interlocked and alarmed to ensure that water and air are properly treated, and for efficient system operation. Three types of interlocks and alarms are incorporated into the treatment system to prevent water from being discharged from the air stripper system in the event that an air stripper blower is not operating, a leak in either the influent conveyance lines, or flooding conditions in the air stripper or building sump. The three types of alarms and interlocks used are: primary alarms, fail-safe alarms, and advisories. Each type of alarm/interlock, including the fail-safe circuitry, is

described below. A list of the proposed alarms and advisories is provided on Contract Drawing 6 and Tables 3, 4, and 5.

Primary alarms are alarms that are processed by the PLC to shut the system down. The PLC is constantly receiving signals from the instrumentation listed below and shown on Contract Drawing 3, 4, 5 and 6. When the PLC detects an alarm condition from one of these instruments, the PLC automatically and immediately sends a signal to relays which causes the starter coils for the extraction wells and air stripper system (blower and discharge pump) to open, thus causing all the equipment to shut down. The one exception is that there is a delay on the air stripper blower and discharge pump to allow for additional treatment of the water remaining within the air stripper when the alarm condition occurs. A complete list of the primary alarms is provided in Table 3. The PLC will alert project team members of the shut down via cell phone when there is a primary alarm.

Secondary, or critical, alarms are used to back-up key primary alarms or to shut the system down in the event of a PLC failure. If a primary alarm instrument fails to appropriately respond to an alarm condition (or the PLC fails), a hard-wired fail-safe circuit switch will open a remote relay contact, thus shutting down the process equipment automatically and immediately. Relay contacts will also send inputs to the PLC and the autodialer as advisories.

Fail-safe circuitry means the normal condition of a circuit is energized. If for some reason (e.g., loss of power, a broken wire or a relay burns out) the "switch" becomes de-energized and opens, the circuit is broken, which immediately cuts power to other devices on the circuit. These systems will be implemented to make sure (fail-safe) that a circuit does not close, or remain closed, when the circuit/switch is de-energized. At the Groundwater IRM, this system shuts the treatment process down once the circuit is broken by any of the hard-wired switches (the secondary alarms), and ensures that if there is a power failure or a key system component loses power, switches will open causing the entire system to shut down. For example, the fail-safe circuitry act as a permissive signal in that it is wired in series with the starter coils associated with all the process equipment (well pumps and air stripper) such that if a critical, hard-wired switch (i.e., a critical alarm) opens, the failsafe circuitry will cause the output relays to all process equipment to de-energize, thus shutting all the process equipment down. The failsafe circuitry is wired such that it has to be manually reset in the field before the process can be restarted and to prevent unwanted automatic restart.

A complete list of the critical fail safe alarms is provided in Table 4. Critical alarms also send a signal to the autodialer to call project team members.

Advisory conditions occur when process variables are outside of their desired range, but do not require immediate shut down of the Treatment Plant. An advisory is programmed to allow operators to get an advanced warning of a possible problem. The advisories that are incorporated into the system are listed in Table 5.

4.5 Treatment Building

A 26-foot by 32-foot pre engineered, metal building located near the Soil Gas IRM treatment equipment near McKay Field will be used to house the Groundwater IRM air stripper system, bag filter system, and the majority of the instrumentation, controls, and electrical components. The treatment building will be installed on concrete slab with 6-inch high secondary containment curb. The concrete foundation and treatment building specifications are included on Contract Drawings 18 through 22.

4.6 Utility Services

The Groundwater IRM will require an electrical utility connection. Electrical power will be obtained from an existing 400 amp disconnect installed as part of the soil gas IRM. A cellular autodialer will be used to eliminate the need for telephone services at the present time. Cable, telephone, or natural gas utilities may be required at a later date.

5. 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.

5.1 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 until all intrusive work in this area is completed.

- 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.

5.2 Erosion and Sediment Controls

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.
- Existing drainage structures; and,
- 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, 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 Contract Drawing 12.

5.3 Traffic Control

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 Contract Drawings 1, the primary recovery trench was 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.

5.4 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 5.3.
 - 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 5.2 above; and,
 - Implementation of dust suppression and air monitoring activities as listed in Section 5.5 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 dependent on the anticipated depth of trenching in that particular location. It is anticipated that a minimum of one sample 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 managed in accordance with the hazardous waste

generator requirements contained in 6NYCRR Part 372.2. The Contractor shall notify the engineer and Northrop Grumman's ESH&M department when a hazardous waste is discovered or, if possible, prior to generation to a hazardous waste. The Contractor shall provide a hazardous waste profile to ESH&M and follow ESH&M direction regarding location of hazardous waste accumulation areas, installation of secondary containment, containers to be used for hazardous waste accumulation, marking, labeling, and dating of hazardous containers, etc. Hazardous waste accumulation containers must be in good condition, i.e., free from leaks or major denting.

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 Contract Drawing 12. 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.

5.5 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 downwind of 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.

6. 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:

- Operate and maintain the Groundwater 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 Groundwater IRM by:
 - Assessing compliance with the air permit equivalent limits.
 - Assessing achievement of the Groundwater 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 groundwater IRM to meet the project objectives described herein.

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.

7. Permitting

The proposed facility can be exempt from air registration and treated effluent discharge requirements pursuant to 6 NYCRR Part 201-3.3(c)(29). Regardless permit equivalencies are required. Therefore, a completed NYSDEC Minor Facility Air Registration form is included as Appendix F and a completed State Pollutant Discharge Elimination System (SPDES) permit application is provided in Appendix G.

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

8. Security

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

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

If vandalism were to occur that affects operation of the system, the proposed alarm and interlock system be triggered and will most likely 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.

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Table 1. Predicted influent, regulatory discharge, and design discharge water concentrations, Groundwater IRM, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

PARAMETER (1)	BASIS OF DESIGN CONCENTRATIONS - WATER (ug/L)		
	Predicted Influent (2)	Regulatory Standard (3)	Design Effluent (4)
Trichloroethene	46	5	<2.5
cis-1,2 Dichloroethene	780	5	<2.5
Vinyl Chloride	147	2	<1

NOTES

1. The three primary project compounds; Trichloroethene, cis 1,2 Dichloroethene, and vinyl chloride are listed.
2. Predicted influent concentrations are based on data collected during the remedial investigation, projected pumping rates, and include a 50% factor of safety.
3. Regulatory concentration per "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, per Division of Water Technical and Operational Guidance Series (1.1.1), reissued June 1998 for ambient water classification 'GA - Source Drinking Water (groundwater)'".
4. The design effluent concentrations calculated by dividing the regulatory levels of VOCs by 2 for a safety factor.

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Table 2. Predicted influent, regulatory discharge, and design discharge vapor concentrations, Groundwater IRM, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

PARAMETER (1)	BASIS OF DESIGN CONCENTRATIONS - VAPOR (ug/m3)			MASS EMISSIONS - VAPOR	
	Predicted Influent (2)	Regulatory Standards (3,4)		Potential Annual Emission (lbs)	
		AGC	SGC	Predicted (5)	Allowable (6)
Trichloroethene	855	0.5	54,000	51	233
cis-1,2 Dichloroethene	14,498	1,900	190,000	854	884,172
Vinyl Chloride	2,732	0.11	180,000	161	51

NOTES

1. There are three primary project compounds: Trichloroethene, cis 1,2 Dichloroethene, and vinyl chloride.
2. Predicted vapor influent concentrations calculated by multiplying the design influent (water) concentration by the design pumping rate (250 gpm) and dividing by the projected air flow rate (1,800 CFM).
3. Regulatory concentration per "New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 Edition and DAR-1 AGC/SGC Tables, dated December 22, 2003".
4. AGC refers to Annual Guidance Concentration.
SGC refers to Short-term Guidance Concentration.
5. The predicted potential (uncontrolled) annual mass emissions were calculated by multiplying the influent (vapor) concentrations by the expected flow rate of 1,800 CFM and assuming a continuous discharge for the entire year.
6. The allowable mass that can be emitted by the system was calculated using the Screen 3 Air Dispersion Model developed by the United States Environmental Protection Agency (EPA) using the following project information:

Stack Height (ft)	18
Stack Diameter (ft)	1.5
Stack Gas Temp (K)	283.7
Receptor Height (ft)	5.8
Bldg (ECU) Height (ft)	8.5
Bldg Width (ft)	26
Bldg Length (ft)	32

Table 3. Primary Shut Down Alarms in Main PLC, Groundwater IRM, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

ALARM DESCRIPTION (ALARM SCREEN ON HMI)	TAG NO.	DEVICE TYPE	LOCATION
EMERGENCY STOP ENGAGED	-	PUSH BUTTON/TOUCH SCREEN	3 IN FIELD, 1 ON MCP AND 1 ON TOUCH SCREEN
TREATMENT PLANT INFLUENT LOW PRESSURE (SET POINT)	PT-110	PRESSURE TRANSMITTER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT HIGH PRESSURE (SET POINT)	PT-110	PRESSURE TRANSMITTER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE (SET POINT)	PT-120	PRESSURE TRANSMITTER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT HIGH PRESSURE (SET POINT)	PT-120	PRESSURE TRANSMITTER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE (SET POINT)	PT-130	PRESSURE TRANSMITTER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT HIGH PRESSURE (SET POINT)	PT-130	PRESSURE TRANSMITTER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE (SET POINT)	PT-140	PRESSURE TRANSMITTER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT HIGH PRESSURE (SET POINT)	PT-140	PRESSURE TRANSMITTER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW FLOW RATE (SET POINT)	FIT-110	FLOW METER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW FLOW RATE (SET POINT)	FIT-120	FLOW METER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW FLOW RATE (SET POINT)	FIT-130	FLOW METER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW FLOW RATE (SET POINT)	FIT-140	FLOW METER	INFLUENT LINE IN BUILDING
AIR STRIPPER INFLUENT LOW FLOW RATE (SET POINT)	FI-200	COMPUTER FUNCTION	PLC

Table 3. Primary Shut Down Alarms in Main PLC, Groundwater IRM, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

ALARM DESCRIPTION (ALARM SCREEN ON HMI)	TAG NO.	DEVICE TYPE	LOCATION
AIR STRIPPER INFLUENT HIGH FLOW RATE (SET POINT)	FI-200	COMPUTER FUNCTION	PLC
AIR STRIPPER HIGH AIR FLOW RATE (SET POINT)	FIT-500	FLOW INDICATING TRANSMITTER	AIR STRIPPER DISCHARGE DUCTING
AIR STRIPPER LOW AIR FLOW RATE (SET POINT)	FIT-500	FLOW INDICATING TRANSMITTER	AIR STRIPPER DISCHARGE DUCTING
AIR STRIPPER HIGH AIR PRESSURE (SET POINT)	PT-500	PRESSURE TRANSMITTER	AIR STRIPPER DISCHARGE DUCTING
AIR STRIPPER LOW AIR PRESSURE (SET POINT)	PT-500	PRESSURE TRANSMITTER	AIR STRIPPER DISCHARGE DUCTING
AIR STRIPPER LOW AIR TEMPERATURE (SET POINT)	TT-500	TEMPERATURE TRANSMITTER	AIR STRIPPER DISCHARGE DUCTING
BAG FILTER HIGH INFLUENT PRESSURE	PT-700	PRESSURE TRANSMITTER	BAG FILTER INFLUENT PIPING
TREATMENT BUILDING SUMP HIGH LEVEL	LSH-900	FLOAT SWITCH	TREATMENT BUILDING SUMP
TREATMENT BUILDING LOW TEMPERATURE (SET POINT)	TT-900	TEMPERATURE TRANSMITTER	TREATMENT BUILDING WALL
AIR STRIPPER DISCHARGE PUMP VFD FAULT	VFD FAULT CONTACT	PUMP P-400 VFD FAULT CONTACT	AIR STRIPPER CONTROL PANEL
TREATMENT PLANT INFLUENT LOW PRESSURE	PSL-111	PRESSURE SWITCH	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE	PSL-121	PRESSURE SWITCH	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE	PSL-131	PRESSURE SWITCH	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE	PSL-141	PRESSURE SWITCH	INFLUENT LINE IN BUILDING

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Table 3. Primary Shut Down Alarms in Main PLC, Groundwater IRM, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

ALARM DESCRIPTION (ALARM SCREEN ON HMI)	TAG NO.	DEVICE TYPE	LOCATION
AIR STRIPPER LOW AIR PRESSURE	PSL-AS	PRESSURE SWITCH	AIR STRIPPER CONTROL PANEL (DRY CONTACT)
AIR STRIPPER HIGH AIR PRESSURE	PSH-AS	PRESSURE SWITCH	AIR STRIPPER CONTROL PANEL (DRY CONTACT)
AIR STRIPPER SUMP HIGH WATER LEVEL	LSH-AS	LEVEL SWITCH	AIR STRIPPER CONTROL PANEL (DRY CONTACT)

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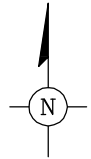
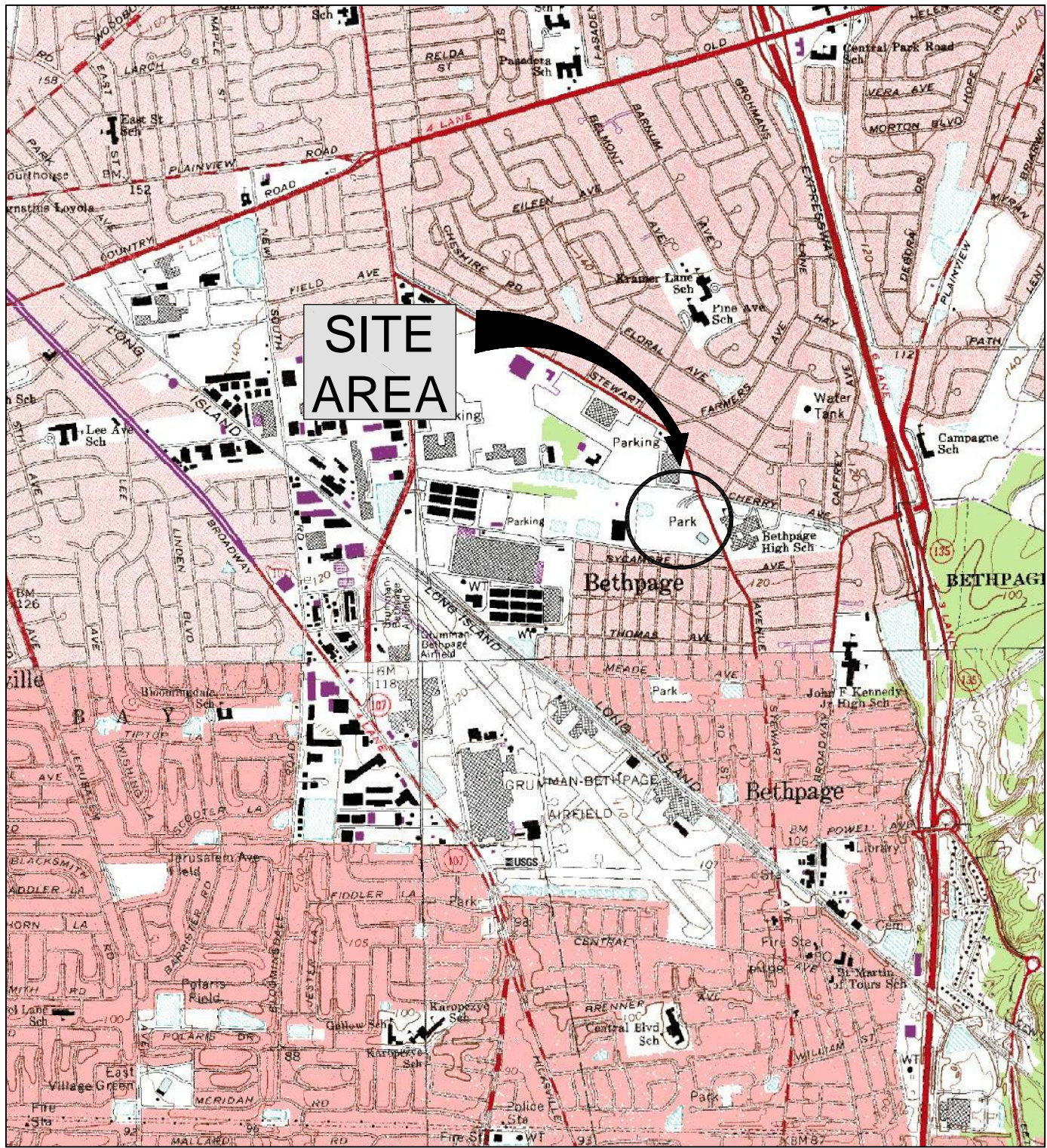
Table 4. Secondary Fail-Safe Alarms Groundwater IRM, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

ALARM DESCRIPTION	TAG NO.	DEVICE TYPE	LOCATION
TREATMENT PLANT INFLUENT LOW PRESSURE	PSL-111	PRESSURE SWITCH	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE	PSL-121	PRESSURE SWITCH	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE	PSL-131	PRESSURE SWITCH	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE	PSL-141	PRESSURE SWITCH	INFLUENT LINE IN BUILDING
AIR STRIPPER LOW AIR PRESSURE	PSL-AS	PRESSURE SWITCH	AIR STRIPPER CONTROL PANEL (DRY CONTACT)
AIR STRIPPER HIGH AIR PRESSURE	PSH-AS	PRESSURE SWITCH	AIR STRIPPER CONTROL PANEL (DRY CONTACT)
AIR STRIPPER SUMP HIGH WATER LEVEL	LSH-AS	LEVEL SWITCH	AIR STRIPPER CONTROL PANEL (DRY CONTACT)

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Table 5. Advisory Conditions at PLC, Groundwater IRM, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

ADVISORY DESCRIPTION (ADVISORY SCREEN ON HMI)	TAG NO.	DEVICE(S) TYPE	LOCATION
BAG FILTER PRESSURE ADVISORY FILTER SWITCH OCCURRED	PT-700	PRESSURE TRANSMITTER	INFLUENT LINE TO BAG FILTER
WELL PUMP (P-110) RUN INDICATION ADVISORY	YI-110	RUN INDICATOR	MCP/PLC
WELL PUMP (P-120) RUN INDICATION ADVISORY	YI-120	RUN INDICATOR	MCP/PLC
WELL PUMP (P-130) RUN INDICATION ADVISORY	YI-130	RUN INDICATOR	MCP/PLC
WELL PUMP (P-140) RUN INDICATION ADVISORY	YI-140	RUN INDICATOR	MCP/PLC
AIR STRIPPER BLOWER (B-410) RUN INDICATION ADVISORY	YI-410	RUN INDICATOR	AIR STRIPPER CONTROL PANEL
AIR STRIPPER DISCHARGE PUMP (P-400) RUN INDICATION ADVISORY	YI-400	RUN INDICATOR	AIR STRIPPER CONTROL PANEL



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

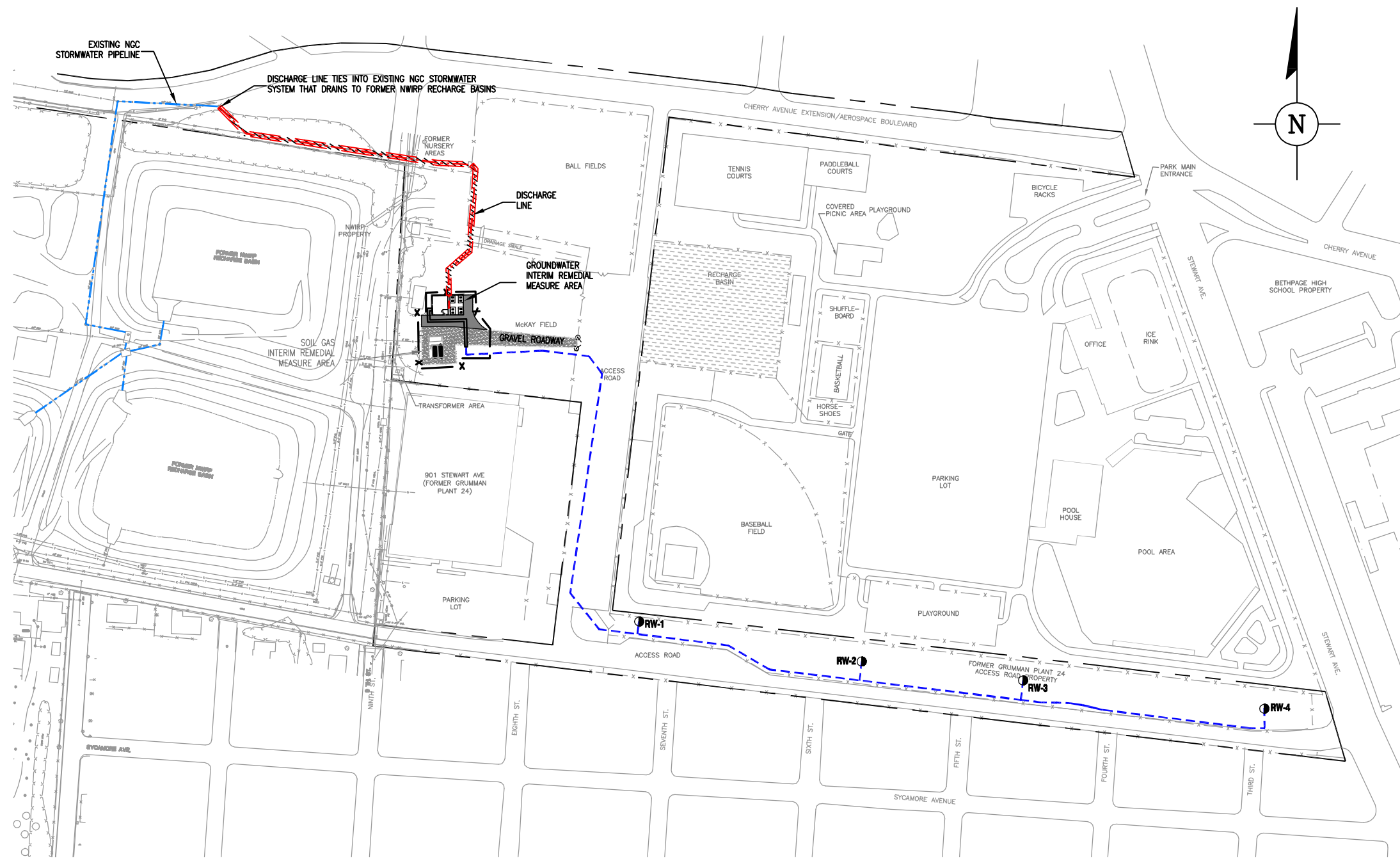
**NORTHROP GRUMMAN CORPORATION
 BETHPAGE, NEW YORK
 FINAL DESIGN REPORT OPERABLE UNIT 3
 FORMER GRUMMAN SETTLING PONDS**

SITE LOCATION MAP

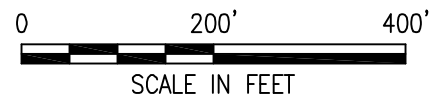


FIGURE
1

CITY: MELVILLE DIV: GROUP: ENR1 DE: ALS LD: PIC: PM: CSG TM: LVR ON: OFF: REF: G: A: PROJECT: Northrop Grumman Superfund 2008OU3 NY001464.1807 GWIRM Design Documents Design Report Final Design Report Figures Final F02.dwg LAYOUT: 2: SA: VED: 9/3/2008 1:37 PM BY: SANCHEZ, ADRIAN XREFS: IMAGES: PROJECTNAME: NY001464.1807.00003 BCP-08_NAD: BCP_Aerial.jpg Navy2_Brain_NVA03



- LEGEND:**
- NORTHROP GRUMMAN PROPERTY LINE
 - X- FENCE
 - o.o. BITUMINOUS PAVEMENT
 - - - - GROUNDWATER IRM INFLUENT PIPELINE
 - ▨ GROUNDWATER IRM EFFLUENT PIPELINE
 - - - - EXISTING NGC STORMWATER PIPELINE
 - RW-1 APPROXIMATE LOCATION OF GROUNDWATER RECOVERY WELL
 - NWIRP NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

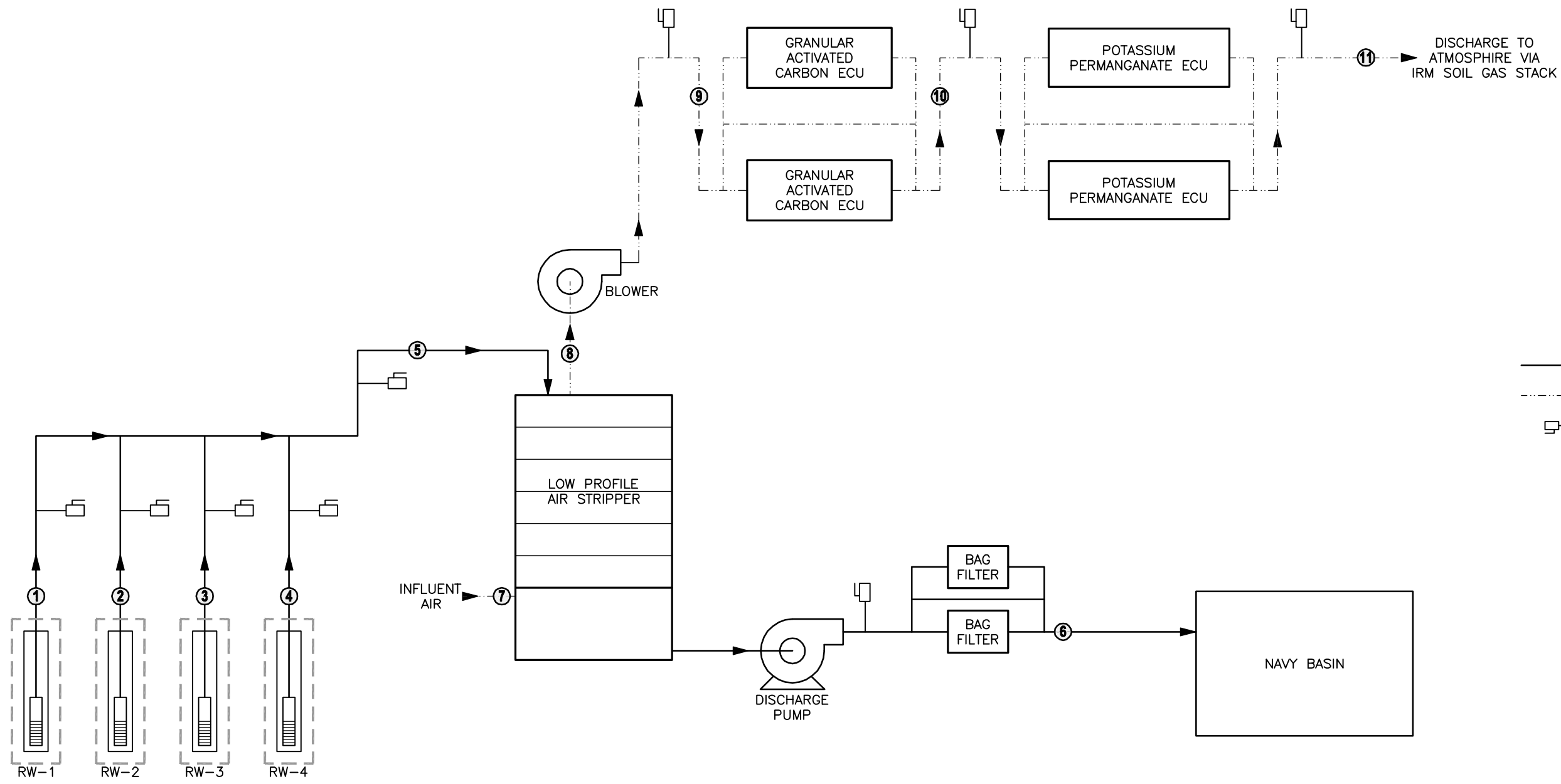


NORTHROP GRUMMAN CORPORATION
BETHPAGE, NEW YORK
**FINAL DESIGN REPORT OPERABLE UNIT 3
FORMER GRUMMAN SETTLING PONDS**

**GROUNDWATER INTERIM REMEDIAL
MEASURE LAYOUT**

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FIGURE
2




- LEGEND:**
- PROCESS WATER
 - - - PROCESS AIR
 - ☐ SAMPLE PORT
 - ▶ FLOW ARROW
 - Ⓢ PROCESS DESIGNATION

PROCESS	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪
Mass Loading (lbs/day)											
Trichloroethene	0.009	0.041	0.082	0.008	0.140	<0.008	0.000	0.140	0.140	<0.014	<0.014
cis -1,2 Dichloroethene	0.007	1.877	0.431	0.030	2.346	<0.008	0.000	2.346	2.346	<0.235	<0.235
Vinyl Chloride	0.000	0.443	0.001	0.000	0.444	<0.003	0.000	0.444	0.444	0.444	<0.044
Flow Rate (gpm)	40	85	85	40	250	250	---	---	---	---	---
Flow Rate (CFM)	---	---	---	---	---	---	1,300 - 1,600	1,300	1,535	1,557	1,581
Pressure (feet of water)	10	10	10	10	8	15	---	---	---	---	---
Pressure (inches of water)	---	---	---	---	---	---	0	- 28 to - 38	12	6	0
pH	6.4	6.4	6.4	6.4	6.4	6.2	---	---	---	---	---
Temperature	55	55	55	55	55	55	10	55	97	95	95
Relative Humidity	---	---	---	---	---	---	20 - 80	100	<50	<50	<50

NORTHROP GRUMMAN CORPORATION
BETHPAGE, NEW YORK
**FINAL DESIGN REPORT OPERABLE UNIT 3
FORMER GRUMMAN SETTLING PONDS**

**PROCESS FLOW
DIAGRAM**



**FIGURE
3**

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Drawings

Under Separate Cover

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Appendix A

Groundwater Modeling
Memorandum, December, 3, 2007



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MEMO

To:
Steve Scharf
New York State Department of Environmental
Conservation

Copies:
Mike Wolfert
Carlo San Giovanni
David Stern

From:
Robert Porsche & Doug Smolensky

Date:
December 3, 2007

ARCADIS Project No.:
NY001464.1107.00001

Subject:
Preliminary Results of Groundwater Interim Remedial Measure Modeling, Operable
Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Introduction

This memo has been prepared to document the modeling conducted in support of the development of a Groundwater Interim Remedial Measure (IRM) for Operable Unit 3 (Former Grumman Settling Ponds), located in Bethpage, New York. Specifically, this memo discusses the selected preliminary remedial design: "Pump and Treat without Local Recharge", which is explained further below and described in the Groundwater IRM Work Plan, dated November 14, 2007, currently under review by the New York State Department of Environmental Conservation (NYSDEC).

Groundwater IRM Design Goals

The Groundwater IRM is being designed to accomplish the following goals.

- Mitigate the off-site migration of volatile organic compounds (VOCs) in groundwater where total VOCs exceed 50 micrograms per liter ($\mu\text{g/L}$), through the implementation of a groundwater pump and treat system that will extract groundwater along the former Grumman Plant 24 Access Road property, south of the Bethpage Community Park.
- Comply with applicable NYSDEC Standards, Criteria, and Guidance Values (SCGs).

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Model Scenario Configuration

For the simulations described herein, the current, NYSDEC-accepted regional groundwater flow model for the Northrop Grumman/Navy, Bethpage, NY sites was utilized. For this effort, the model focused specifically on Bethpage Park and the surrounding area.

Multiple simulations were conducted to assess various pumping and recharge configurations of the "Pump and Treat without Local Recharge" scenario. Extraction well screen settings, pumping rates, and the number of wells were varied and the effect of the changes evaluated with respect to containment of VOCs in groundwater.

The scenario that best met the IRM design goals in a technically efficient manner included four extraction wells (identified as Wells EW-1 through EW-4) simulated as pumping along the former Grumman Plant 24 Access Road. Spacing between the extraction wells was approximately 300 ft. Moving across the former Grumman Plant 24 Access Road from west to east, each well was simulated to pump continuously at rates of 30, 75, 75, and 30 gallons per minute (gpm), respectively; with wells screened from 20 to -2, 41 to 22, 41 to 22, and 18 to -5 ft relative to mean sea level (ft msl), respectively. The irregular and inconsistent screen zone settings are directly related to the distribution of VOCs observed in the subsurface and hydrogeologic conditions.

The treated effluent from the IRM will be discharged to one of the basins located on the Naval Weapons Industrial Reserve Plant (NWIRP) property such that there will be no hydraulic interference at the extraction wells.

Model Simulation Results

Simulation results are best observed through the use of particle tracking techniques. Figures 1 through 8 indicate particle pathlines of particles initialized in the uppermost eight model layers (where VOCs have been observed) within and around the Bethpage Park. The impact that the extraction wells have on flow is significant as particles are shown to be drawn towards and captured by the four extraction wells. With the exception of several particles started outside the Park boundary in Model Layers 1 and 2 (the uppermost layers, i.e. the water table), particle tracking results indicate full containment from the water table to Model Layer 8 (approximately -17 ft msl) throughout the footprint of groundwater exhibiting detectable concentrations of VOCs.

Figure No. 1
Model Layer 1
Groundwater Pump and Treat Simulation for Bethpage Park, Northrop Grumman Corporation, Bethpage, New York.
Head Contour Interval is 0.5 ft.#

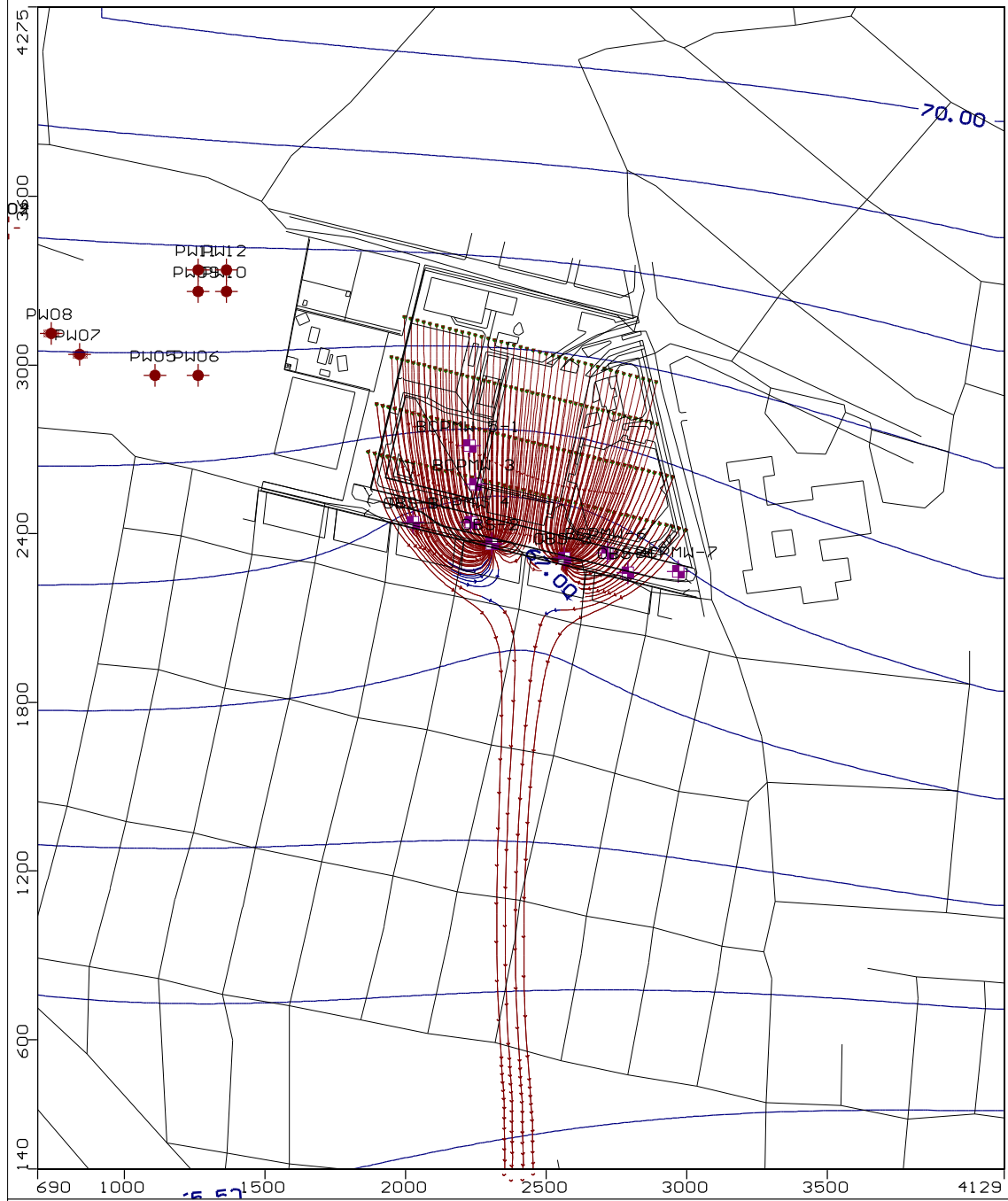


Figure No. 2
Model Layer 2
Groundwater Pump and Treat Simulation for Bethpage Park, Northrop Grumman Corporation, Bethpage, New York.
Head Contour Interval is 0.5 ft.#

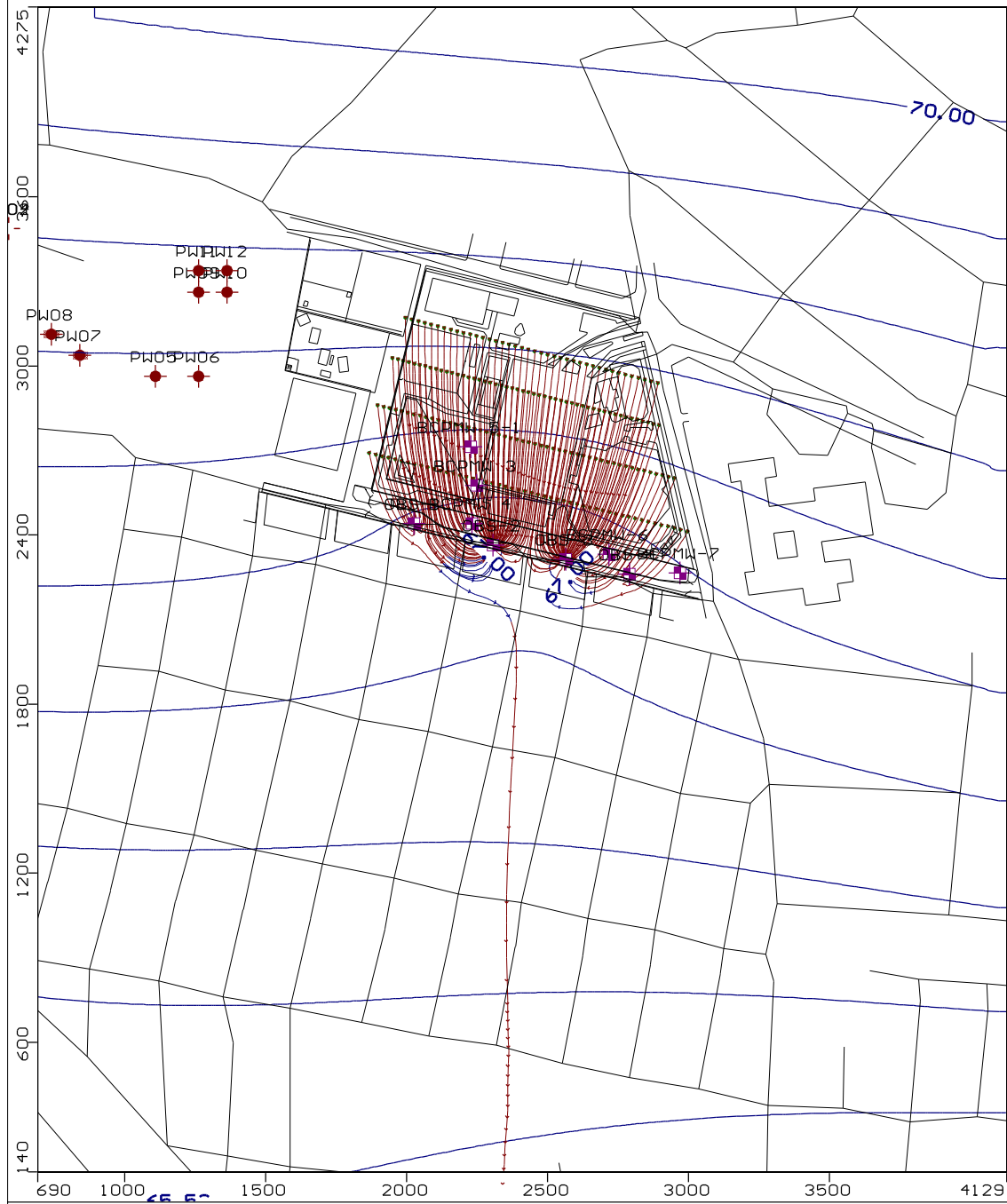


Figure No. 3
Model Layer 3
Groundwater Pump and Treat Simulation for Bethpage Park, Northrop Grumman Corporation, Bethpage, New York.
Head Contour Interval is 0.5 ft.#

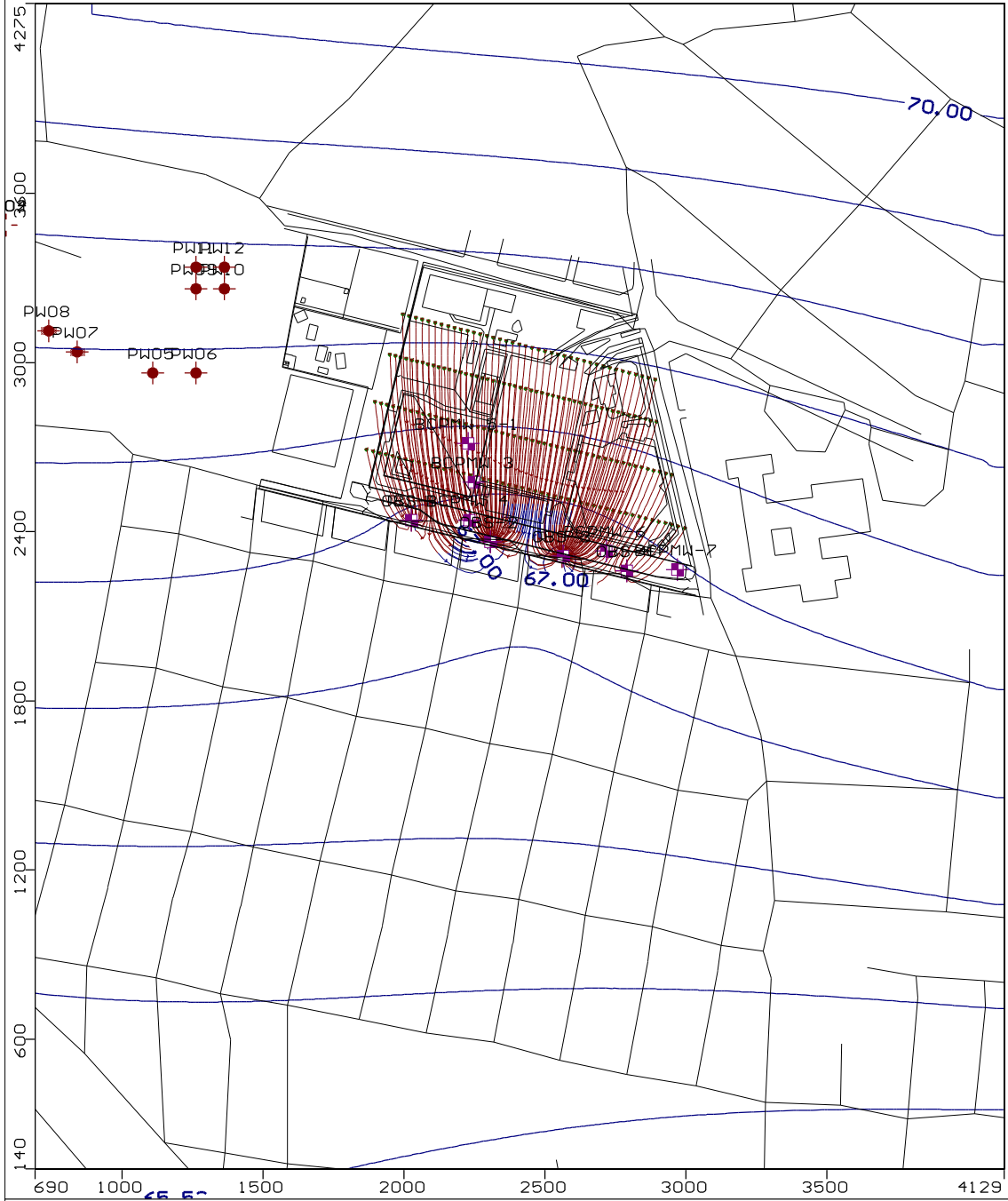


Figure No. 4
Model Layer 4
Groundwater Pump and Treat Simulation for Bethpage Park, Northrop Grumman Corporation, Bethpage, New York.
Head Contour Interval is 0.5 ft.#

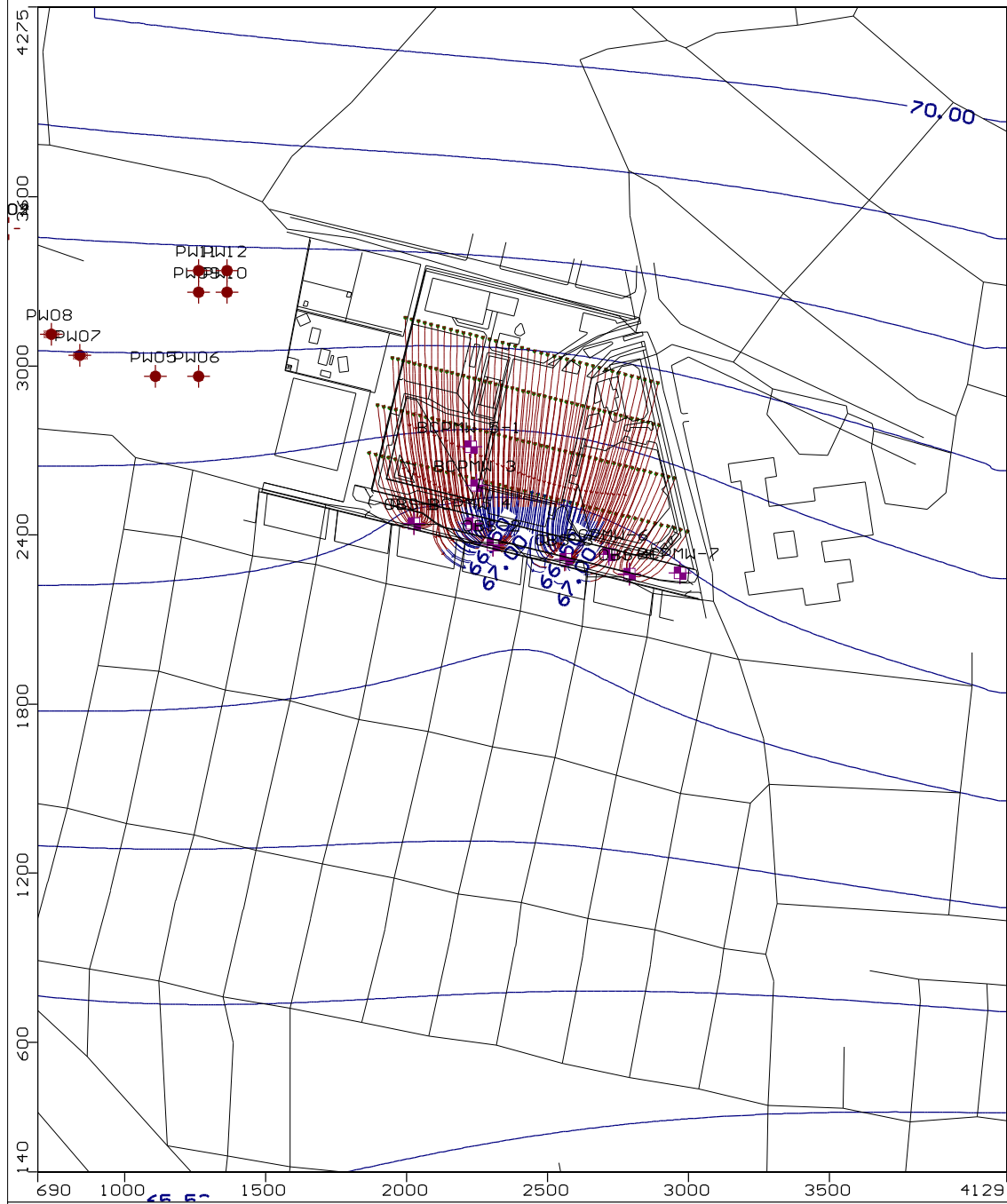


Figure No. 5
Model Layer 5
Groundwater Pump and Treat Simulation for Bethpage Park, Northrop Grumman Corporation, Bethpage, New York.
Head Contour Interval is 0.5 ft.#

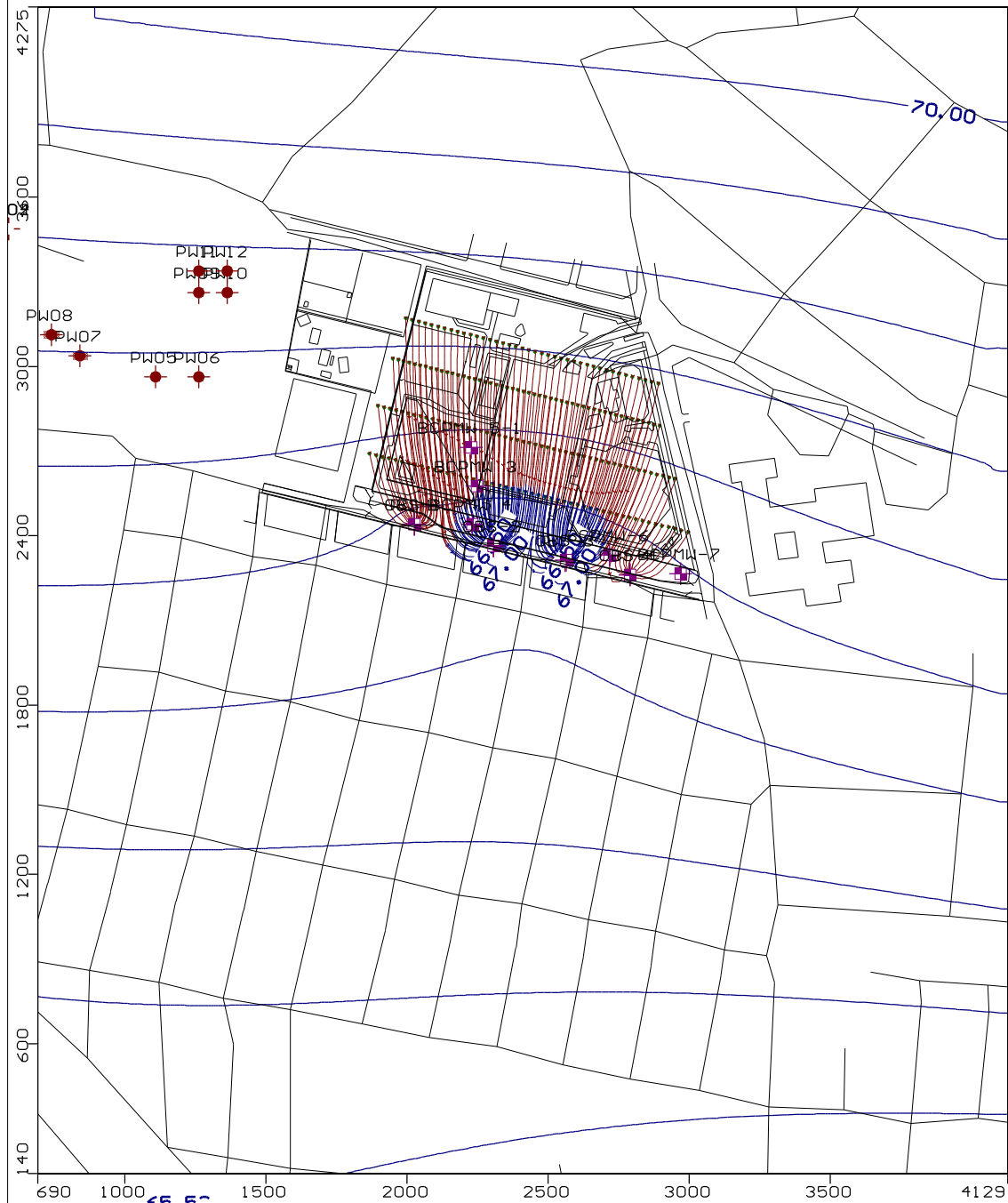


Figure No. 6
Model Layer 6
Groundwater Pump and Treat Simulation for Bethpage Park, Northrop Grumman Corporation, Bethpage, New York.
Head Contour Interval is 0.5 ft.#

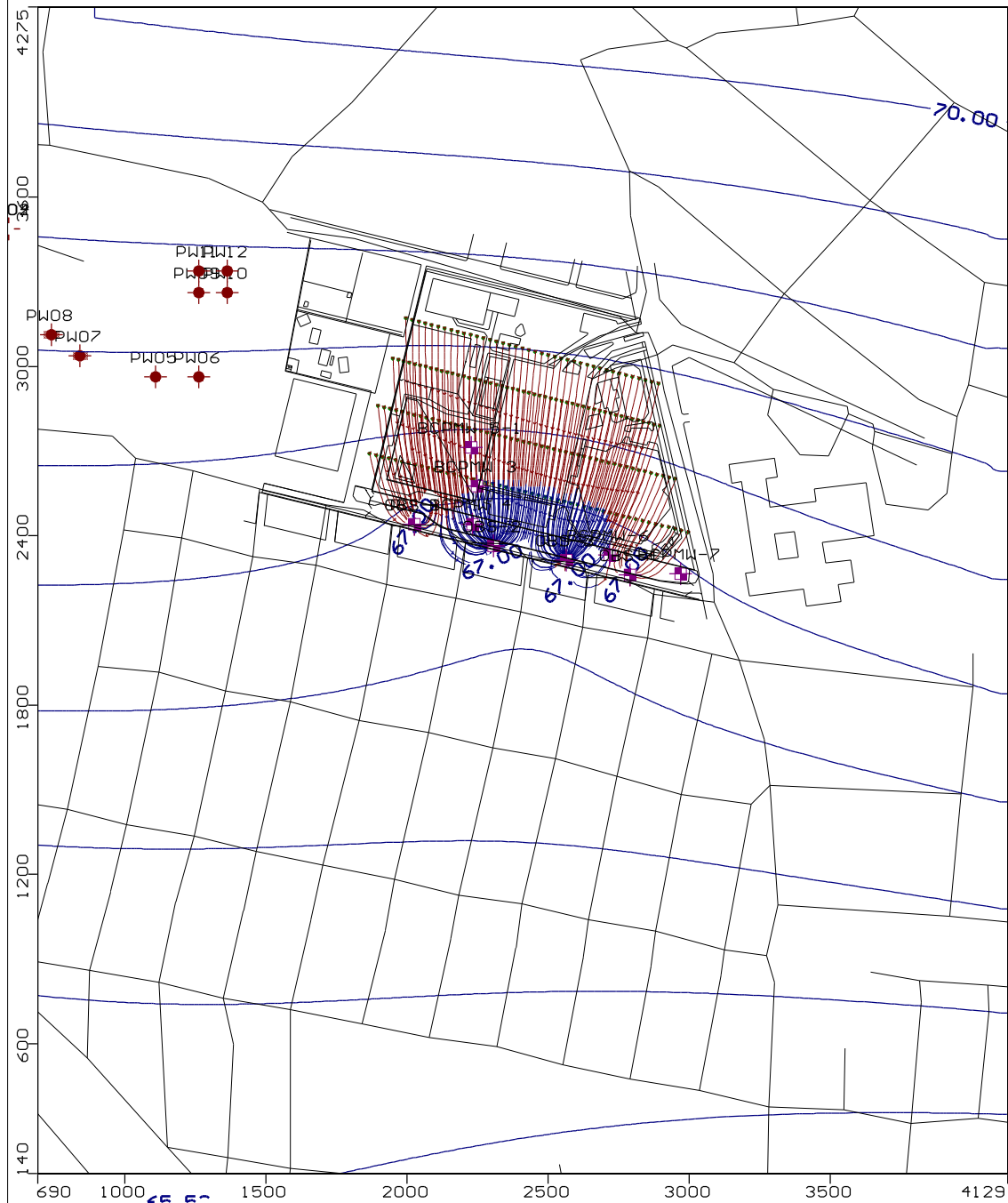


Figure No. 7
Model Layer 7
Groundwater Pump and Treat Simulation for Bethpage Park, Northrop Grumman Corporation, Bethpage, New York.
Head Contour Interval is 0.5 ft.#

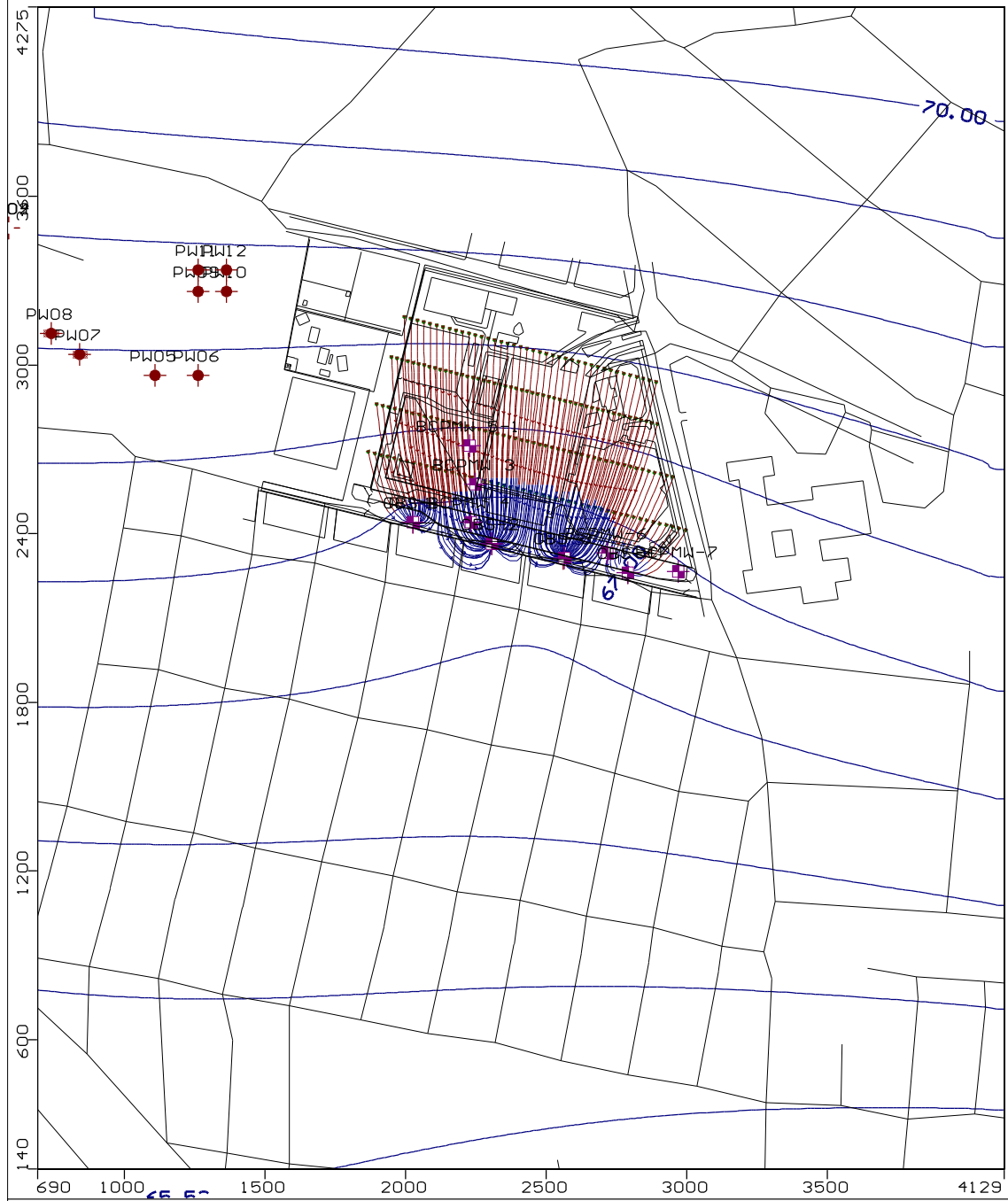
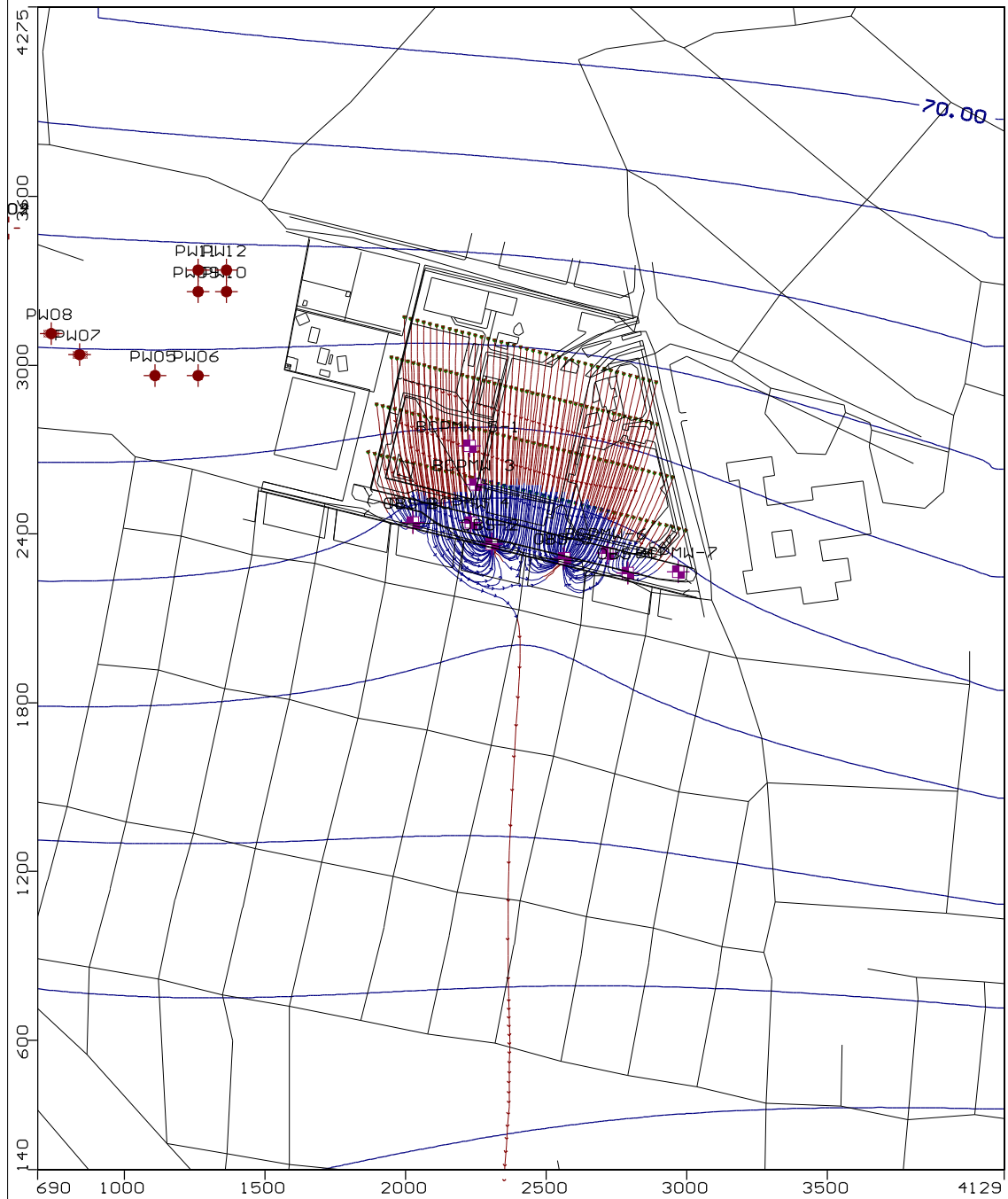


Figure No. 8
Model Layer 8
Groundwater Pump and Treat Simulation for Bethpage Park, Northrop Grumman Corporation, Bethpage, New York.
Head Contour Interval is 0.5 ft.#



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Appendix B

Pumping Test Memorandum, April
22, 2008



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MEMO

To:
Bill Wittek

Copies:
Carlo San Giovanni
Michael Wolfert

From:
Robert Porsche and Doug Smolensky

Date:
April 22, 2008

ARCADIS Project No.:
NY001464.1807.00002

Subject:
Analysis of 48-hour Pumping Test on Remedial Well RW-02, Northrop Grumman Operable Unit 3, Bethpage, New York.

A 48-hour pumping test was conducted (April 8–10, 2008) on proposed Remedial Well RW-02 in support of the design of a groundwater Interim Remedial Measure (IRM) for Northrop Grumman's Operable Unit 3 (Bethpage Park), in Bethpage, New York. This pumping test was specifically conducted to verify the hydraulic conductivity assignments in the groundwater flow model used to design the IRM extraction well network.

This memo summarizes the design of the test well and monitoring wells, discusses the data analysis and interpretation effort and describes the groundwater flow model validation effort.

Well Construction Details

Remedial Well Design and Construction

Remedial Well RW-02 was constructed with 6-inch diameter, black steel casing and a 20-ft long, 0.025-inch wire wrapped continuous slot stainless steel screen. Based on this design, the well has a theoretical yield of 310 gallons per minute at an entrance velocity of 0.1 feet per second.

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Monitoring Well Network

A monitoring well network consisting of two 3-piezometer clusters (PZ-1a, PZ-1b, PZ-1c, PZ-2a, PZ-2b and PZ-2c) and two piezometers (PZ-3 and PZ-4) were installed to monitor drawdown and recovery in the aquifer during the pumping test. Monitoring wells were constructed of 1 or 2-inch diameter schedule 40 PVC and fitted with 5-ft long, 0.01-inch slotted screens. **Table 1** summarizes the IRM Pilot Test Monitoring Well Network. The locations of the remedial well and monitoring wells are shown on **Figure 1**.

Remedial Well Development and Testing

Remedial Well Development

Remedial well RW-02 was developed using air lifting, bailing, surging and jetting techniques. ARCADIS' hydrogeologist monitored the well's discharge, estimated the rate and volume of discharge (by observing the flow from the well head into a mud tub) and tracked the turbidity, pH, conductance and temperature of the water discharged. All development water was temporarily containerized in a Baker tank to allow any suspended sediment to settle before discharging the water to the Sixth Street Publicly Owned Treatment Works (POTW) manhole.

During development by air-jetting, a peak discharge rate of 30 gpm (estimated from the discharge to the mud tub) was achieved.

Remedial Well Step Testing

Preliminary step testing of Remedial Well RW-02 with a 10 HP submersible pump (capable of pumping 230 gpm with a net positive suction head of 13ft) indicated additional development was needed. Following development using air jetting, the wells sustainable yield increased to 120 gpm, at a specific capacity of about 3 gpm/ft of drawdown. Although this level of well performance is satisfactory for the proposed IRM pumping rate of 75 gpm, a rate of 120 gpm is less than that planned for the pumping test. The specific capacity data indicates that well performance could likely be improved with additional development. However, in the interest of the overall project schedule for the design and construction of the IRM system, the pumping test was conducted at 120 gpm.

Pre-Test Water-Level and Precipitation Monitoring

Pre-test water-level, barometric pressure, and precipitation monitoring was conducted from 4/4/08 to 4/7/08. Water-level monitoring was accomplished with down-hole transducers and data loggers to observe and record water-levels every half hour in the days prior to the test. Accumulated precipitation was manually monitored twice a day with an on-site rain gage (installed in the southeast corner of the

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baseball field). No significant precipitation occurred immediately prior (within 48 hours) to the pumping test.

In addition to water level monitoring, each data logger was equipped with an internal pressure transducer to monitor barometric pressure. Water level monitoring was conducted using the monitoring well network shown on **Figure 1** and consisted of PZ-1a,b,c; PZ-2a,b,c; PZ-3; PZ-4; H3-PZ; and BCPMW5-1. **Figure 2** is a plot of the pre-test water level trends.

Pumping Test Procedure

Although ARCADIS was permitted (by the Town of Oyster Bay's POTW) to discharge 200 gpm to the Sixth Street manhole for the test, the sustainable yield of RW-02 was limited to 120 gpm. Therefore, the test was conducted by pumping RW-02 continuously at 120 gpm for approximately 48 hours. The pumping test was conducted from 4/8/05 to 4/10/08.

To regulate and monitor the rate of discharge, Remedial Well RW-02 was equipped with a flow control valve and flow meter (indicating both instantaneous flow and total discharged).

Groundwater pumped from RW-02 during the aquifer test was impacted with volatile organic compounds (VOCs), therefore, water was conveyed from the well head through a fire hose to a pair of liquid phase carbon vessels prior to being discharged via a POTW manhole on the north end of Sixth Street.

Data Collection and Interpretation

This section describes methods of data collection used during the pumping test, and provides an interpretation of the data collected. With the exception of the rain gage, each of the monitoring points described below (i.e., monitoring well network, upgradient monitoring point, and piezometers) were equipped with a pressure transducer connected to a data logger (Hermit 3000 by In-Situ Inc.).

Changes in aquifer water levels in response to pumping Remedial Well RW-02 were recorded by data loggers. Observations of water level (follow pump start-up) were recorded at the frequency described below:

- For the first minute, measurements were taken every 2 seconds.
- Between 1 and 3 minutes, measurements were taken every 5 seconds.
- Between 3 and 10 minutes, measurements were taken every 10 seconds.
- Between 10 and 20 minutes, measurements were taken every 1 minute.
- Between 20 and 40 minutes, measurements were taken every 2 minutes.
- Between 40 and 60 minutes, measurements were taken every 3 minutes.
- Between 60 and 80 minutes, measurements were taken every 4 minutes.

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- Between 80 and 100 minutes, measurements were taken every 5 minutes.
- Between 100 and 500 minutes, the interval between measurements was gradually raised to 30 minutes.
- After 500 minutes, measurements were taken every 30 minutes.

Rain Gage

No significant precipitation occurred during the test; a correction to remove the effect of recharge due to precipitation during this test was not necessary.

Barometric Pressure

During the pumping test, barometric pressure fell by approximately 0.35 ft of water (between 200 and 2,630 minutes after the start of the test). Just prior to the end of the test (between 2,630 and 2,870 minutes elapsed time) barometric pressure increased by approximately 0.1 ft of water. Water level fluctuations in all monitoring points except H3-PZ exhibited a response matching the late-time barometric fluctuations. That is, the fluctuations observed in barometric pressure between about 2,000 and 2,870 minutes after the start of the test are mirrored in the recorded water-level response (water levels rose as barometric pressure fell, and water levels declined as barometric pressure increased). As the observed barometric effect was limited in magnitude and occurred near the conclusion of the test, no correction was made for the effect of barometric pressure changes on observed water-levels.

Upgradient Monitoring Point

Monitoring well BCPMW5-1 was used to monitor water-level variability in the shallow aquifer prior to and during the pumping test. The data collected from monitoring well BCPMW5-1 indicated that prior to the test, water-levels in the area were generally stable; therefore a correction for regional groundwater trends is not necessary prior to evaluating the test data (**Figure 2**).

The well was believed to be sufficiently distant (and upgradient) from Remedial Well RW-02 so that it was not expected to exhibit a response to pumping during the test. However, the observed water level decline (0.046 ft by 2600 minutes after the start of the test) in monitoring well BCPMW5-1 is believed to be a response to the pumping at Remedial Well RW-02 (**Figure 3**). Their minor response, which occurred late in the test, does not preclude this use of this well as a valid upgradient (background) monitoring point.

Piezometer

Piezometer H3-PZ was used to monitor the response of perched water to pumping. The water-level in piezometer H3-PZ declined 0.03 ft by the conclusion of the test (**Figure 3**). Given the similar decline

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noted in BCPMW5-1, it appears that the water level decline observed in H3-PZ may be the result of infiltration induced by the pumping of Remedial Well RW-02.

Monitoring Well Network

Drawdown observed during the test throughout the monitoring well network, the upgradient monitoring point, and the perched water piezometer are shown on **Figure 3**. The semi-logarithmic plot of drawdown vs. time indicates a maximum observed drawdown of 0.75 ft (observed in piezometer PZ-01b). A review of **Figure 3** indicates that the magnitude of drawdown response declines with distance from Remedial Well RW-02.

Remedial Well RW-02

Significant drawdown was noted in Remedial Well RW-02 during the pumping test. At 120 gpm, the water level in the pumping well was drawn down 36.54 ft after about 1 minute of pumping (**Figure 4**). During the remainder of the test, the water level in the pumping well declined an additional 4.2 ft for a total drawdown at the conclusion of the test of 40.74 ft.

It is believed that the significant observed drawdown is the result of well inefficiency rather than inappropriate well design or overpumping.

Preliminary Evaluation of Transmissivity

AQTESOLV for Windows (HydroSOLVE, Inc.) was used to estimate values of transmissivity from the time-drawdown data collected during the pumping test. A preliminary evaluation of the pump test data using the Cooper Jacob method for unconfined aquifers resulted in a hydraulic conductivity estimate of about 250 ft/d.

While this method can be used for estimating a transmissivity, the assumptions for this solution method are not consistent with the conditions under which the test was conducted; specifically, the pumping well was not fully penetrating, and there appears to have been a delayed gravity response in the aquifer. A more appropriate analytical technique, based on the conditions of the test is the Neuman (1974) method for a pumping test in an unconfined aquifer.

Final Evaluation of Transmissivity

Interpretation of pumping test data is predicated on the selection of the appropriate evaluation method. Each method is associated with a set of assumptions regarding the aquifer (confined vs. unconfined) and the conditions imposed on it during the test (i.e., no recharge, steady pumping rate, partial penetration of the aquifer with pumping and observation wells, etc.)

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The Neuman method assumes:

- the aquifer has infinite areal extent,
- the aquifer is homogeneous and has uniform thickness,
- the aquifer potentiometric surface is initially horizontal,
- the pumping well is fully or partially penetrating,
- the aquifer is unconfined with delayed gravity response,
- flow is unsteady, and
- the diameter of the pumping well is very small so that storage in the well can be neglected.

As shown on **Table 1** the monitoring wells observed during this pumping test are screened above, near the top of and below the screen zone of Remedial Well RW-02.

As shown on **Table 2**, using the Neuman analytical method a transmissivity of 21,200 ft²/d was estimated using wells screened above, near the top of and below the screen zone of Remedial Well RW-02. Based on an assumed saturated thickness of 120 ft (estimated from plots of drawdown vs. depth of observation point below the water table at the conclusion of the test), the estimated average hydraulic conductivity is 176 ft/d.

Based on the estimated aquifer transmissivity of 21,200 ft²/d and assuming remedial well RW-02 were 100% efficient, it should have a specific capacity of about 18 gpm/ft (**Table 3**). Therefore, when pumping at 120 gpm, the well should exhibit 6.7 ft of drawdown. However, observed drawdown in Remedial Well RW-02 was 40.6 ft at the conclusion of the test. Using the theoretical drawdown (6.7 ft), and the observed drawdown from the conclusion of the pumping test (40.6 ft), the well has an efficiency of 16%. The observed specific capacity at the conclusion of the pumping test (2,870 minutes) was 3 gpm/ft.

IRM Design Modeling

Groundwater quality data collected during the site investigation effort indicates that the aquifer segment represented by model layers 1 through 8 is impacted with dissolved volatile organic compounds (VOCs). The groundwater IRM system was designed to provide full containment of site groundwater in model layers 1 through 8. Model predictions indicate that full capture of site groundwater can be achieved with a 4-well system. Full capture of groundwater was demonstrated by tracking the movement through the aquifer of four lines of particles from each of the VOC-impacted model layers (i.e., layers 1 through 8) and ensuring that the particles stopped in one of the four simulated remedial wells. The four lines of particles were started parallel to the sites southern boundary; 50 particles per line, approximately 25 ft between each particle in a line, and approximately 170 ft separating the lines of particles. In total, 1,600 particles were tracked (4 lines of 50 particles each; 200 per layer, distributed over 8 layers).

Verification of Model Parameters

In the groundwater flow model the upper glacial aquifer and Magothy formation deposits are assigned hydraulic conductivities of 200 and 120 feet per day (ft/d), in model layers 4 and 5, respectively. To assess the sensitivity of the model-generated IRM design to changes in hydraulic conductivity anisotropy, the assigned conductivities in model layers 4 and 5, corresponding to the elevation of the screen zone of remedial well RW-02, were changed to 176 ft/d, and two model runs were conducted. For the first, the horizontal to vertical anisotropy assigned in the model was left unchanged, at 5:1. For the second, the horizontal to vertical anisotropy was set to 10:1. Under both scenarios, the model predicts that the groundwater IRM system will fully contain all site groundwater from model layers 1 through 8.

Conclusions and Recommendations

1. The verification and sensitivity analysis conducted for this evaluation indicates that additional groundwater modeling of the IRM design is not necessary, as the existing groundwater flow model reasonably approximates the transmissivity estimated from the analysis of the pumping test.
2. The specific capacity of RW-02 is 3 gpm/ft of drawdown, and its efficiency has been calculated at 18.5%. Additional development of Remedial Well RW-02 is needed to increase the well's specific capacity and efficiency.

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Table 1. Summary of IRM Pilot Test Monitoring Network, Former Grumman Settling Ponds, Bethpage, New York.

Well ID	Land Surface	Screen Elevation		Well Diameter (inches)	Depth to Screen		Screen Length (ft)	Well Depth (ft)	Distance from Remedial Well (ft)	Purpose of Well/Cluster.	Flushmount/ StickUp	Transducer Length (ft)
	Elevation (ft msl)	Top (ft msl)	Bottom (ft msl)		Top (ft)	Bottom (ft)						
RW-02	125	41	21	6	84	104	20	104	0	Pumping Well	StickUp	130
PZ-01a	125	65	60	2	60	65	5	68	35	Drawdown/vertical gradient monitoring	StickUp	108
PZ-01b	125	45	40	1	80	85	5	88	35	Drawdown/vertical gradient monitoring	StickUp	115
PZ-01c	125	-5	-10	1	130	135	5	138	35	Drawdown/vertical gradient monitoring	StickUp	105
PZ-02a	125	65	60	2	60	65	5	68	75	Drawdown/vertical gradient monitoring	StickUp	105
PZ-02b	125	45	40	1	80	85	5	85	75	Drawdown/vertical gradient monitoring	StickUp	105
PZ-02c	125	-5	-10	1	130	135	5	138	75	Drawdown/vertical gradient monitoring	StickUp	105
PZ-03	125	45	40	1	80	85	5	88	60	Drawdown Monitoring	Flushmount	135
PZ-04	125	45	40	1	80	85	5	88	50	Drawdown Monitoring	Flushmount	120

RW - Remedial Well.

PZ- Piezometer.

ft - feet.

ft msl - feet relative to mean sea level.

-- Not Applicable.

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Table 2. Estimated Aquifer Parameters, Northrop Grumman Operable Unit 3, Bethpage Park, Bethpage, New York.

Well ID	Analytical Method	T (ft ² /d)	S	Sy	Kz/Kr	b (ft)
"a" wells	Theis (unconfined)	24,670	0.029	--	0.43	120
	Neuman (unconfined)	11,740	0.018	0.30	0.10	120
"b" wells	Neuman (unconfined)	21,160	0.023	0.26	0.06	120
"mid" wells	Neuman (unconfined)	23,640	0.019	0.16	0.04	120
"c" wells	Neuman (unconfined)	28,220	0.007	0.62	0.08	120
PZ-3 and PZ-4	Theis (unconfined)	28,910	0.005	--	0.10	120
	Neuman (unconfined)	15,380	0.018	0.50	0.08	120
	Neuman average ⁽¹⁾ :	19,125				
	Neuman average ⁽²⁾ :	21,200				

RW-02 pumped for 48 hrs. at 120 gallons per minute.

Based on its design, this well has a theoretical yield of 310 gallons/minute at an entrance velocity of 0.1 feet/second.

The well is constructed with a 6-inch diameter, 20-ft long, 0.025-inch wire wrapped continuous slot screen.

-- not computed by this method.

T Transmissivity.

ft²/d square feet per day.

S Storage coefficient.

Sy Specific Yield.

b Saturated thickness.

"a" wells Screened above RW-02; PZ-1a and PZ-2a were included in this analysis.

"b" wells Screened coincident with RW-02; PZ-1b and PZ-2b were included in this analysis.

"c" wells Screened below RW-02; PZ-1c and PZ-2c were included in this analysis.

"mid" wells Screened coincident with RW-02; PZ-1b, PZ-2b, PZ-3 and PZ-4 were included in this analysis.

(1) Includes wells "a", "b", "c", PZ-3 and PZ-4.

(2) Includes the "a", "mid", and "c" wells

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Table 3. Specific Capacity for RW-02, Northrop Grumman Operable Unit 3, Bethpage Park, Bethpage, New York.

For a 100% efficient well in an unconfined aquifer with $T=21,200 \text{ ft}^2/\text{day}$,

$$\begin{aligned} \text{Specific capacity} &= (\text{Transmissivity (gpd/ft)} \times (\text{Well Screen Length/Aquifer Thickness})) / 1,500 \\ &= ((21,200 \text{ ft}^2/\text{d} \times 7.48 \text{ gallons/ft}^3) \times (20 \text{ ft} / 120 \text{ ft})) / 1,500 \\ &= 26,430 \text{ gpd/ft} / 1500 \end{aligned}$$

Estimated Specific Capacity: 17.6 gpm/ft

Pumping Rate: 70 gpm

Observed Drawdown: 22.17 ft

Observed Specific Capacity: 3.2 gpm/ft

Pumping Rate: 120 gpm

Observed Drawdown: 40.6 ft

Observed Specific Capacity: 3.0 gpm/ft

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Table 4. Pre-Test Vertical Gradients, Northrop Grumman Operable Unit 3, Bethpage Park, Bethpage, New York.

Well ID	Assumed Measuring Point Elevation (ft msl)	Depth to Water (ft)	Static Head (ft msl)	Elevation of Screen Mid-Point (ft msl)	Gradient ⁽¹⁾ (ft/ft)	Well Pairs
PZ-01a	125	55.34	69.66	62.5	0.0030	a-b
PZ-01b	125	55.4	69.6	42.5	0.0006	b-c
PZ-01c	125	55.43	69.57	-7.5	0.0013	a-c
PZ-02a	125	54.92	70.08	62.5	-0.0010	a-b
PZ-02b	125	54.9	70.1	42.5	0.0026	b-c
PZ-02c	125	55.03	69.97	-7.5	0.0016	a-c

ft msl feet relative to mean sea level

ft feet

(1) Positive vertical gradient indicates downward groundwater movement; negative vertical gradient indicates upward groundwater movement.

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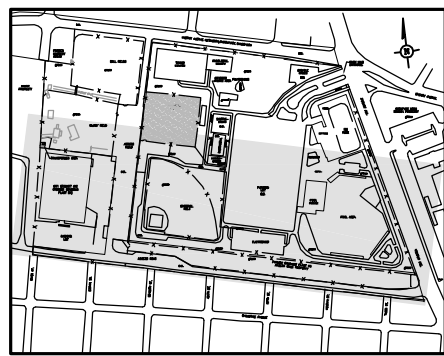
Table 5. Vertical Gradients after 48-hour Pump Test, Northrop Grumman Operable Unit 3, Bethpage Park, Bethpage, New York.

Well ID	Assumed Measuring Point Elevation (ft msl)	Depth to Water (ft)	Static Head (ft msl)	Drawdown at End of Test (ft)	Head at End of Test (ft msl)	Elevation of Screen Mid-Point (ft msl)	Gradient ⁽¹⁾ (ft/ft)	Well Pairs
PZ-01a	125	55.34	69.66	0.626	69.034	62.5	0.0099	a-b
PZ-01b	125	55.4	69.6	0.763	68.837	42.5	-0.0102	b-c
PZ-01c	125	55.43	69.57	0.225	69.345	-7.5	-0.0044	a-c
PZ-02a	125	54.92	70.08	0.468	69.612	62.5	-0.0002	a-b
PZ-02b	125	54.9	70.1	0.485	69.615	42.5	-0.0029	b-c
PZ-02c	125	55.03	69.97	0.208	69.762	-7.5	-0.0021	a-c

ft msl feet relative to mean sea level

ft feet

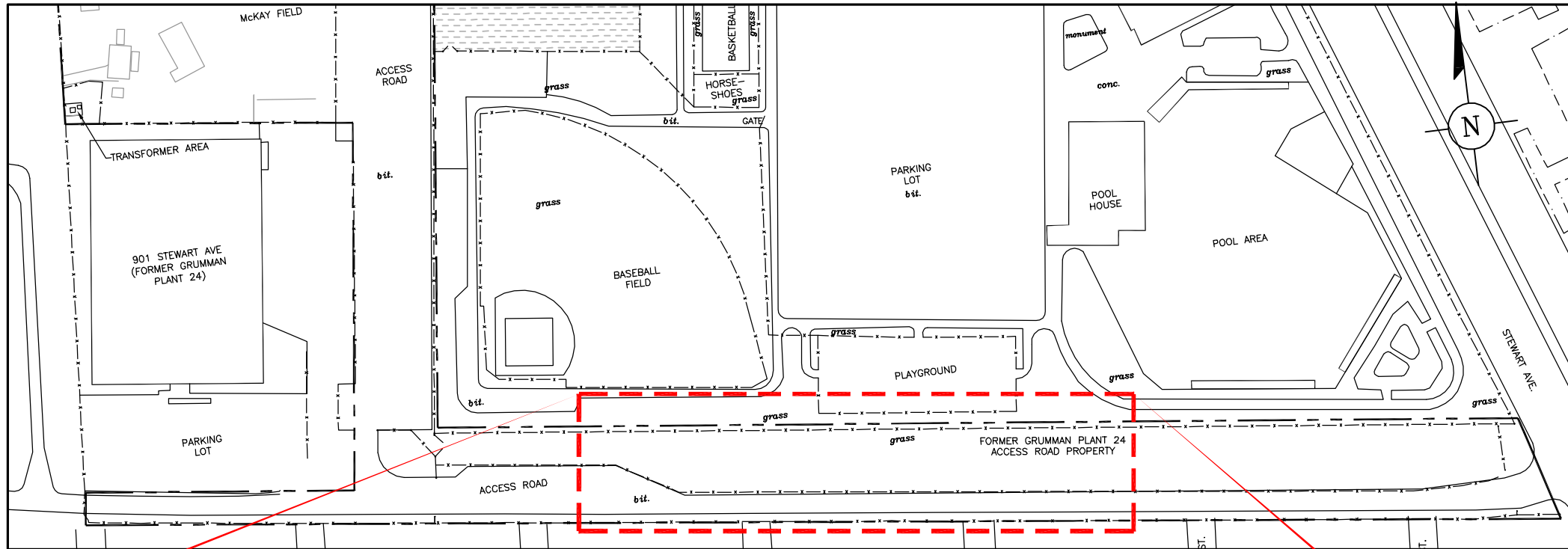
(1) Positive vertical gradient indicates downward groundwater movement; negative vertical gradient indicates upward groundwater movement.



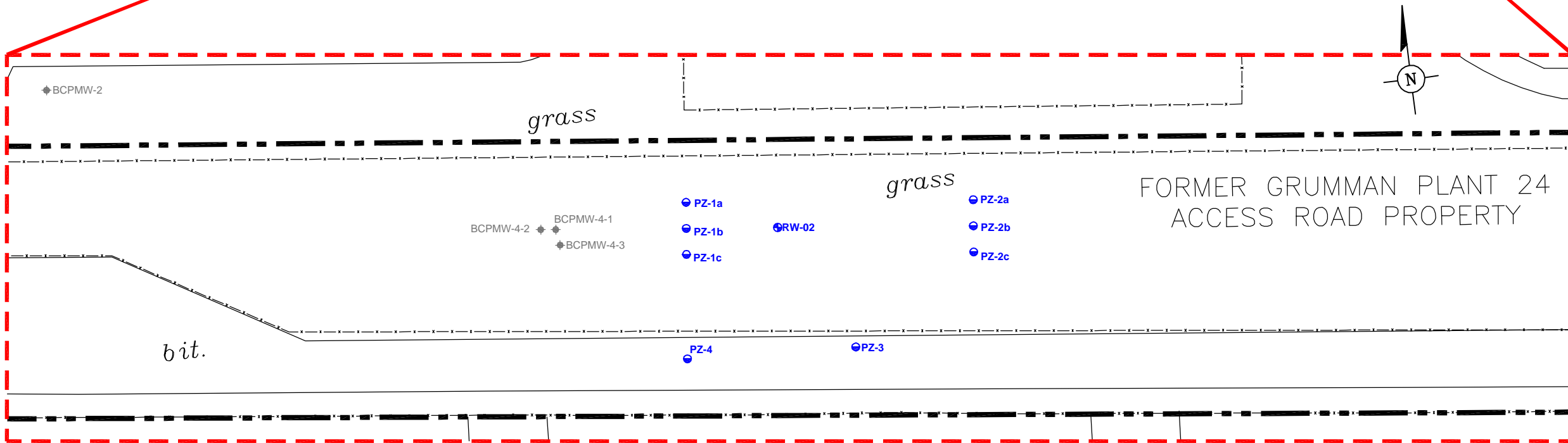
KEY MAP
SCALE: 1" = 500'

EXPLANATION

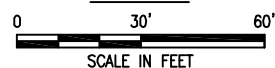
- NORTHROP GRUMMAN PROPERTY LINE
- x - FENCE
- - - LIMITS OF BETHPAGE HIGH SCHOOL MAIN BUILDING
- [Hatched Box] BASIN
- bit. BITUMINOUS PAVEMENT
- ◆ EXISTING WELL
- EXISTING PERCHED WATER PIEZOMETER
- RW-02 ● RECOVERY WELL
- PZ-1a ● PIEZOMETER



SITE PLAN



DETAIL



NOTES:

1. MONITORING WELLS AND PERCHED WATER PIEZOMETERS SURVEYED TO NORTH AMERICAN DATUM (NAD) 83. RECOVERY WELL RW-02 AND ASSOCIATED PIEZOMETERS ARE APPROXIMATE BASED ON FIELD MEASUREMENTS.
2. PARK FEATURES SHOWN WERE PRESENT PRIOR TO TOWN OF OYSTER BAY REDEVELOPMENT IN 2005.

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)

**SITE PLAN SHOWING LOCATION OF
PILOT TEST WELL AND PIEZOMETER**



CITY OF BETHPAGE, DIVISION OF ENVIRONMENTAL SERVICES, 100 W. MAIN ST., BETHPAGE, NY 11702
 PROJECT: 1716 (MAB) TECHPAGES/SETUP - PLOTBYTABLE
 DRAWING: 1716 (MAB) TECHPAGES/SETUP - PLOTBYTABLE
 DATE: 08/20/2018
 PROJECT NUMBER: 1716 (MAB) TECHPAGES/SETUP

Figure No. 2, Pre-Test Monitoring, RW-02 Pumping Test, Northrop Grumman OU3, Bethpage, New York.

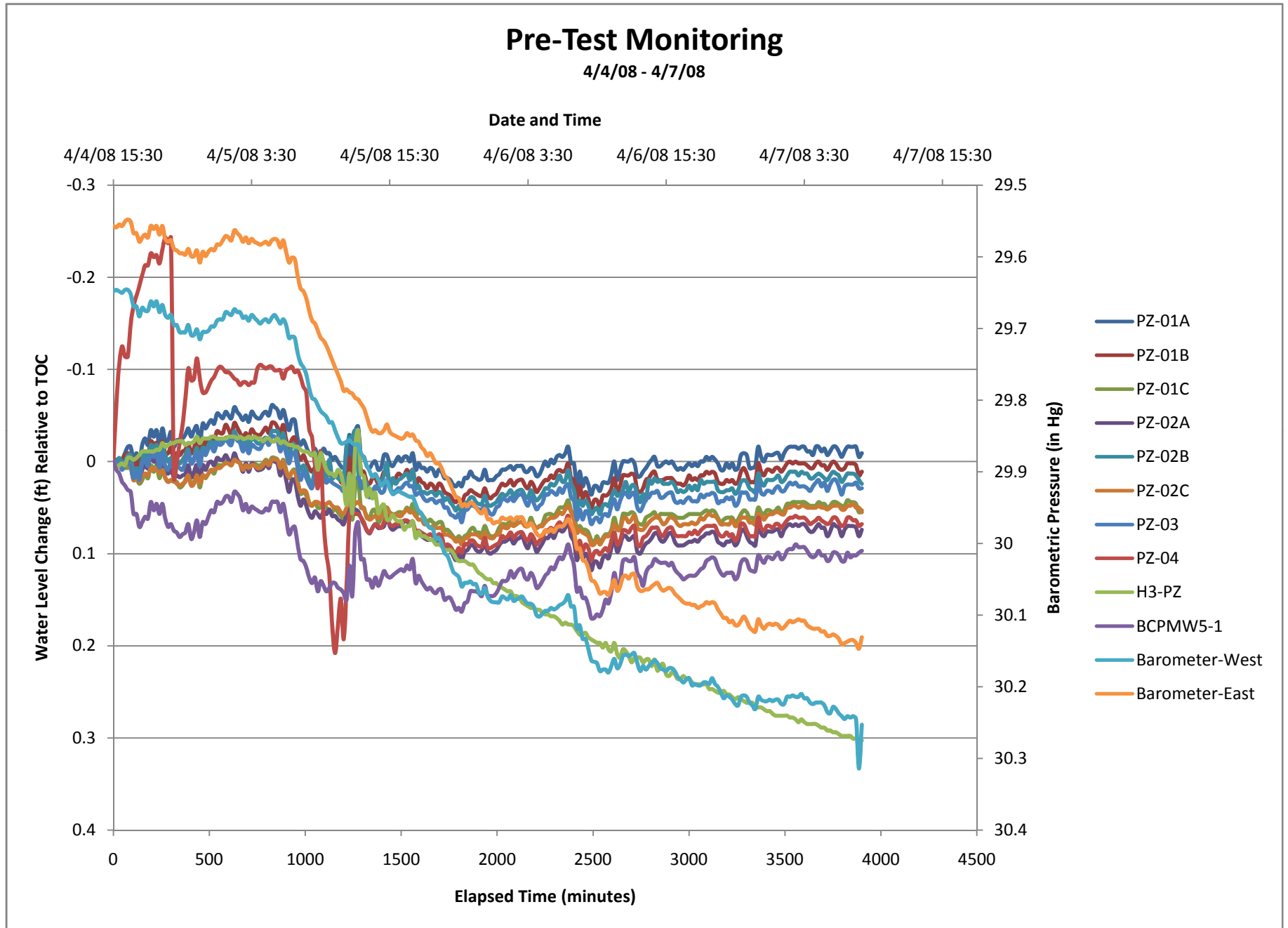


Figure 3, Observed Drawdown in the Monitoring Well Network,
 RW-02 Pumping Test, Northrop Grumman OU3, Bethpage, New York.

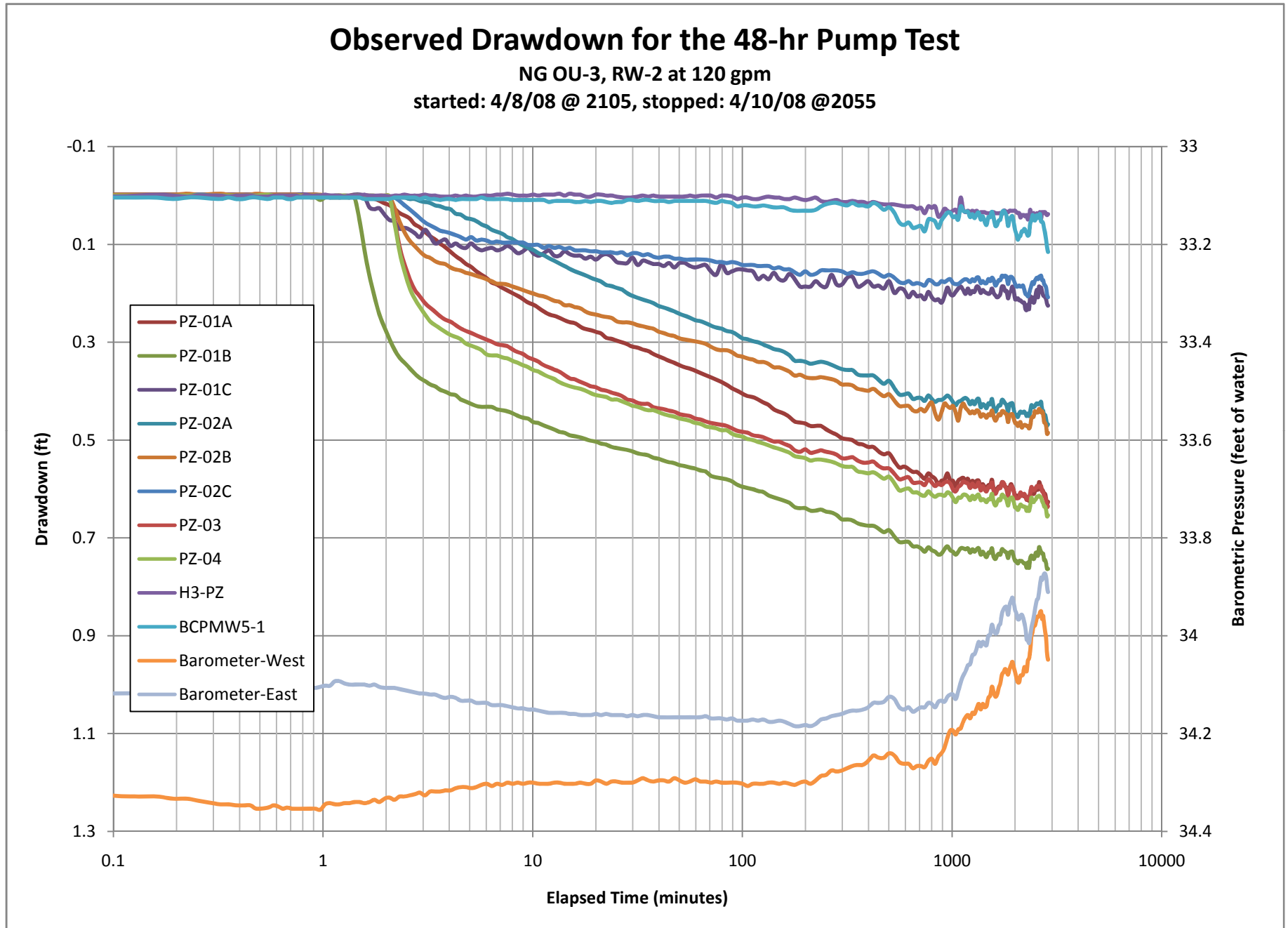
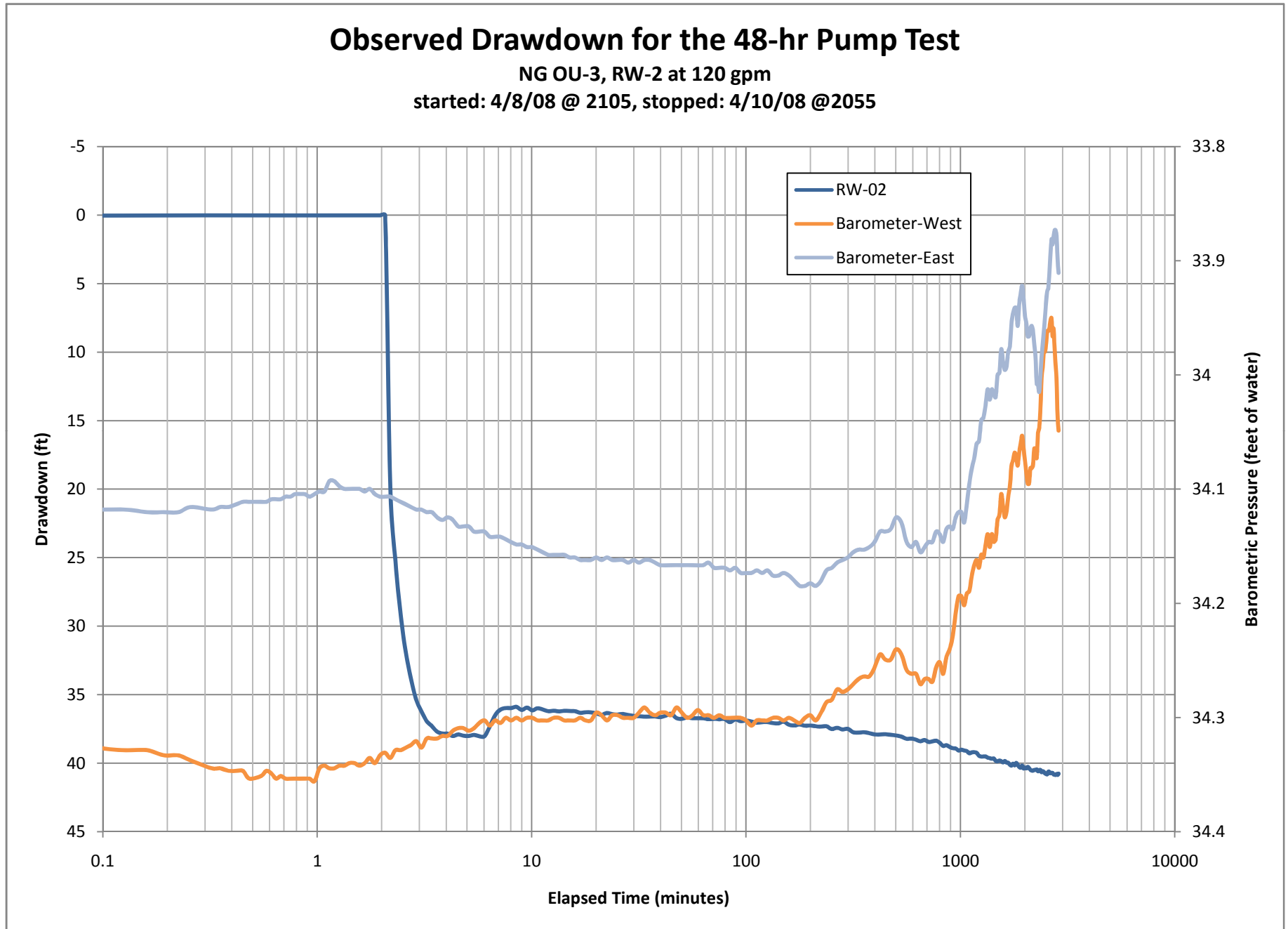


Figure 4, Observed Drawdown in Pumping Well RW-02,
RW-02 Pumping Test, Northrop Grumman OU3, Bethpage, New York.

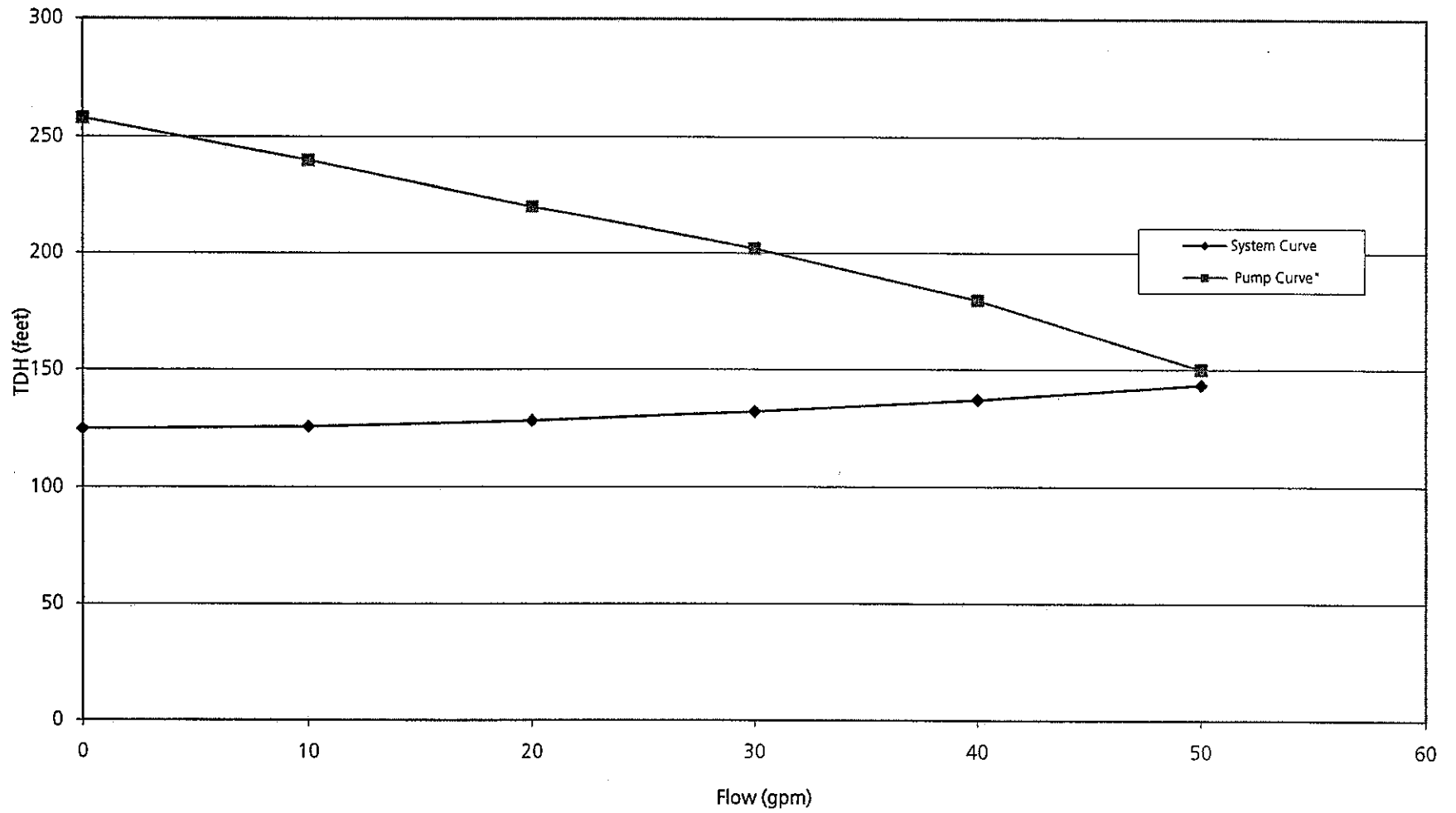


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Appendix C

Total Discharge Head Calculations –
Recovery Well and Discharge Pump

Northrop Grumman Systems Corporation
Bethpage, New York
OU3 Groundwater IRM
RW-1 & 4 Pumps (P-110 and P-140)



NORTHROP GRUMMAN SYSTEMS CORPORATION - BETHPAGE, NEW YORK
OU3 GROUNDWATER IRM
PUMP SIZING CALCULATIONS - FITTINGS EQUIVALENT LENGTH
P-110 AND P-140 (DESIGN FLOW RATE = 40GPM)

Fittings (plastic unless otherwise noted)

Pipe Diameter = 3.949 inch tee to discharge

Fitting	Quantity	Eq. Length Per Fitting (Pipe Diameters)	Total Eq. Length (Feet)	
90 deg. el.	4	30	39.49	
60 deg. el.		25	0.00	
45 deg. el.	6	16	31.59	
45 deg. Y		60	0.00	
22 1/2 deg. bend		8	0.00	
Running Tee	2	20	13.16	
Branch Tee	0	50	0.00	
Gate Valve, full open		8	0.00	
Butterfly Valve		40	0.00	(3" to 14")
Butterfly Valve		30	0.00	(14" and greater)
Swing Check	1	100	32.91	
Ball Valve, full open	2	3	1.97	
Globe Valve, full open	1	400	131.63	
Reducer	2	50	32.91	
Total			283.67	

NORTHROP GRUMMAN SYSTEMS CORPORATION - BETHPAGE, NEW YORK
OU3 GROUNDWATER IRM
P-110 AND P-140 PUMP SIZING CALCULATIONS
 (DESIGN FLOW RATE = 40GPM)

This spreadsheet uses Hazen-Williams to calculate the friction head loss for the straight pipe: $hf = (10.44 * Length) * ((GPM^{1.85}) / ((Friction\ Factor^{1.85}) * (diameter\ in\ inches^{4.8655})))$
 The friction loss for the fittings is added in by determining equivalent lengths for each fitting, then adding the total equivalent length to the straight pipe length; H-W eqn is then used for the total (straight pipe plus equivalent) length

Pipe, Fittings, and Static Head Loss

3" SDR17 HDPE

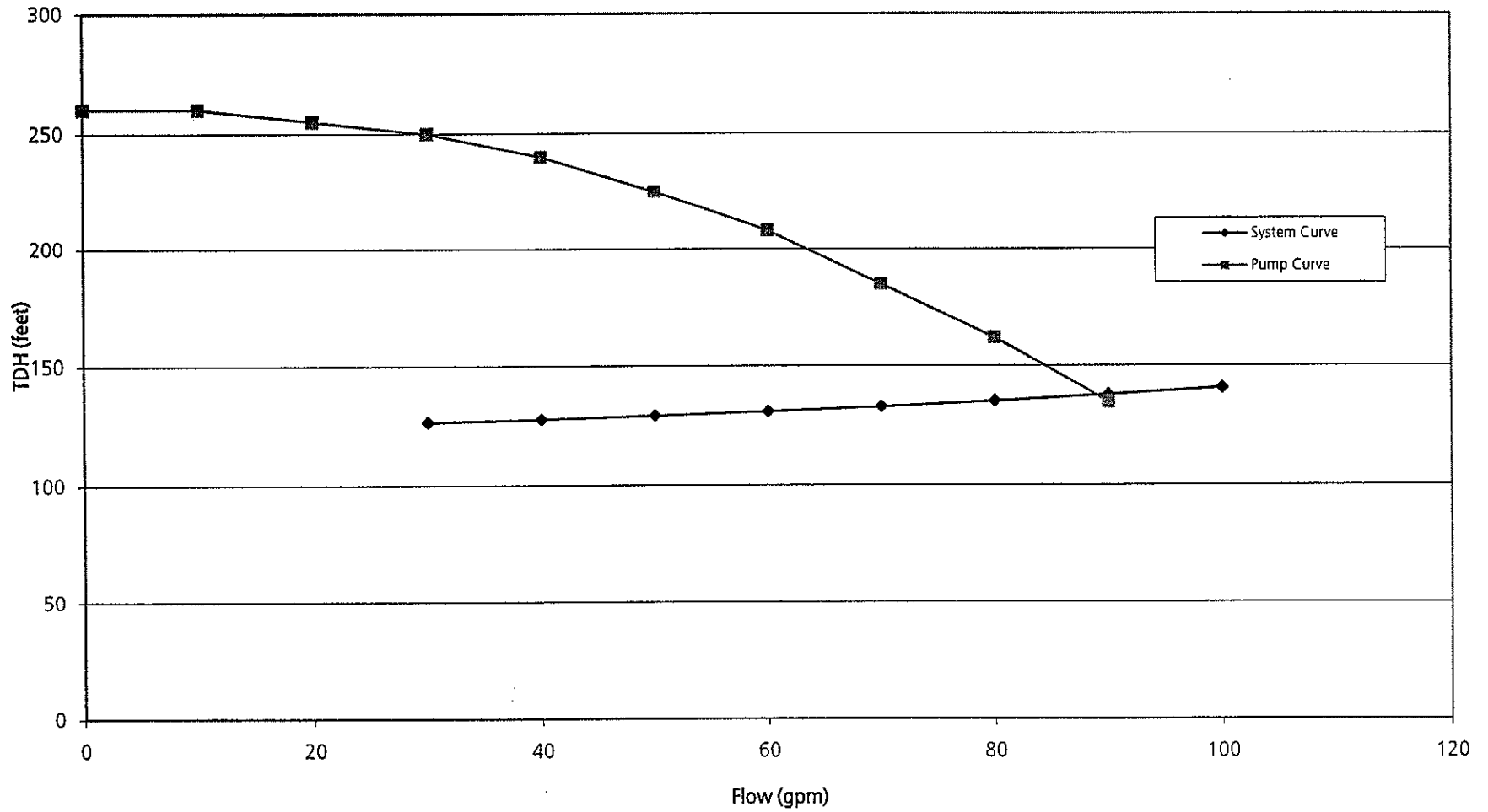
Inside Diameter	3.07 (in)
Friction Factor	120
Pipe Length	1825 (ft)
Fittings-Eq. Length	284 (ft)
Pump Elevation	0 (ft)
Outlet Elevation	125 (ft)
Static Head Loss	125 (ft)

Hazen-Williams Calculation

Pump Flow Rate (gpm)	Straight Pipe		Equiv. Length		Static Headloss	
	H _f (ft)	H _f (ft)	Vel (ft)	H _{sd} (ft)	TDH (ft)	
0	0.0	0.0	0.0	125	125	
10	0.8	0.1	0.4	125	126	
20	2.9	0.5	0.9	125	128	
30	6.2	1.0	1.3	125	132	
40	10.6	1.6	1.7	125	137	
50	16.0	2.5	2.2	125	143	
60	22.4	3.5	2.6	125	151	
70	29.7	4.6	3.0	125	159	
80	38.1	5.9	3.5	125	169	
90	47.3	7.4	3.9	125	180	
100	57.5	8.9	4.3	125	191	

Pump curve (40S30-9(3HP))					
Head	GPM				
258	0				
240	10				
220	20				
202	30				
180	40				
150	50				

Northrop Grumman Systems Corporation
Bethpage, New York
OU3 Groundwater IRM
RW-2 & 3 Pumps (P-120 and P-130)



NORTHROP GRUMMAN SYSTEMS CORPORATION - BETHPAGE, NEW YORK
OU3 GROUNDWATER IRM
PUMP SIZING CALCULATIONS - FITTINGS EQUIVALENT LENGTH
P-120 AND P-130 (DESIGN FLOW RATE = 85GPM)

Fittings (plastic unless otherwise noted)

Pipe Diameter = 3.949 inch tee to discharge

Fitting	Quantity	Eq. Length Per Fitting (Pipe Diameters)	Total Eq. Length (Feet)	
90 deg. el.	4	30	39.49	
60 deg. el.		25	0.00	
45 deg. el.	6	16	31.59	
45 deg. Y		60	0.00	
22 1/2 deg. bend		8	0.00	
Running Tee	2	20	13.16	
Branch Tee	0	50	0.00	
Gate Valve, full open		8	0.00	
Butterfly Valve		40	0.00	(3" to 14")
Butterfly Valve		30	0.00	(14" and greater)
Swing Check	1	100	32.91	
Ball Valve, full open	2	3	1.97	
Globe Valve, full open	1	400	131.63	
Reducer	2	50	32.91	
Total			283.67	

NORTHROP GRUMMAN SYSTEMS CORPORATION - BETHPAGE, NEW YORK
OU3 GROUNDWATER IRM
P-120 AND P-130 PUMP SIZING CALCULATIONS
 (DESIGN FLOW RATE = 85GPM)

This spreadsheet uses Hazen-Williams to calculate the friction head loss for the straight pipe: $hf = (10.44 * \text{Length}) * ((\text{GPM}^{1.85}) / ((\text{Friction Factor}^{1.85}) * (\text{diameter in inches}^{4.8655})))$; The friction loss for the fittings is added in by determining equivalent lengths for each fitting, then adding the total equivalent length to the straight pipe length; H-W eqn is then used for the total (straight pipe plus equivalent) length

Pipe, Fittings, and Static Head Loss

4" SDR17 HDPE

Inside Diameter =	3.95 (in)
Friction Factor =	120
Pipe Length =	1425 (ft)
Fittings Eq. Length =	284 (ft)
Pump Elevation =	0 (ft)
Outlet Elevation =	125 (ft)
Static Head Loss =	125 (ft)

Hazen-Williams Calculation

Pump Flow Rate (gpm)	Straight Pipe		Equiv. Length		Static Headloss	
	Fr (ft)	Fr (ft)	Vel (ft)	Hsd (ft)	Total (ft)	
0	0.0	0.0	0.0	125	125	
10	0.2	0.0	0.3	125	125	
20	0.7	0.1	0.5	125	126	
30	1.4	0.3	0.8	125	127	
40	2.4	0.5	1.0	125	128	
50	3.7	0.7	1.3	125	129	
60	5.1	1.0	1.6	125	131	
70	6.8	1.4	1.8	125	133	
80	8.7	1.7	2.1	125	135	
90	10.9	2.2	2.4	125	138	
100	13.2	2.6	2.6	125	141	

Pump curve (75S50-8 (5HP))					
Head	GPM				
260	0				
260	10				
255	20				
250	30				
240	40				
225	50				
208	60				
185	70				
162	80				
135	90				

NORTHROP GRUMMAN SYSTEMS CORPORATION - BETHPAGE, NEW YORK
OU3 GROUNDWATER IRM

PUMP SIZING CALCULATIONS - FITTINGS EQUIVALENT LENGTH

Fittings (plastic unless otherwise noted)

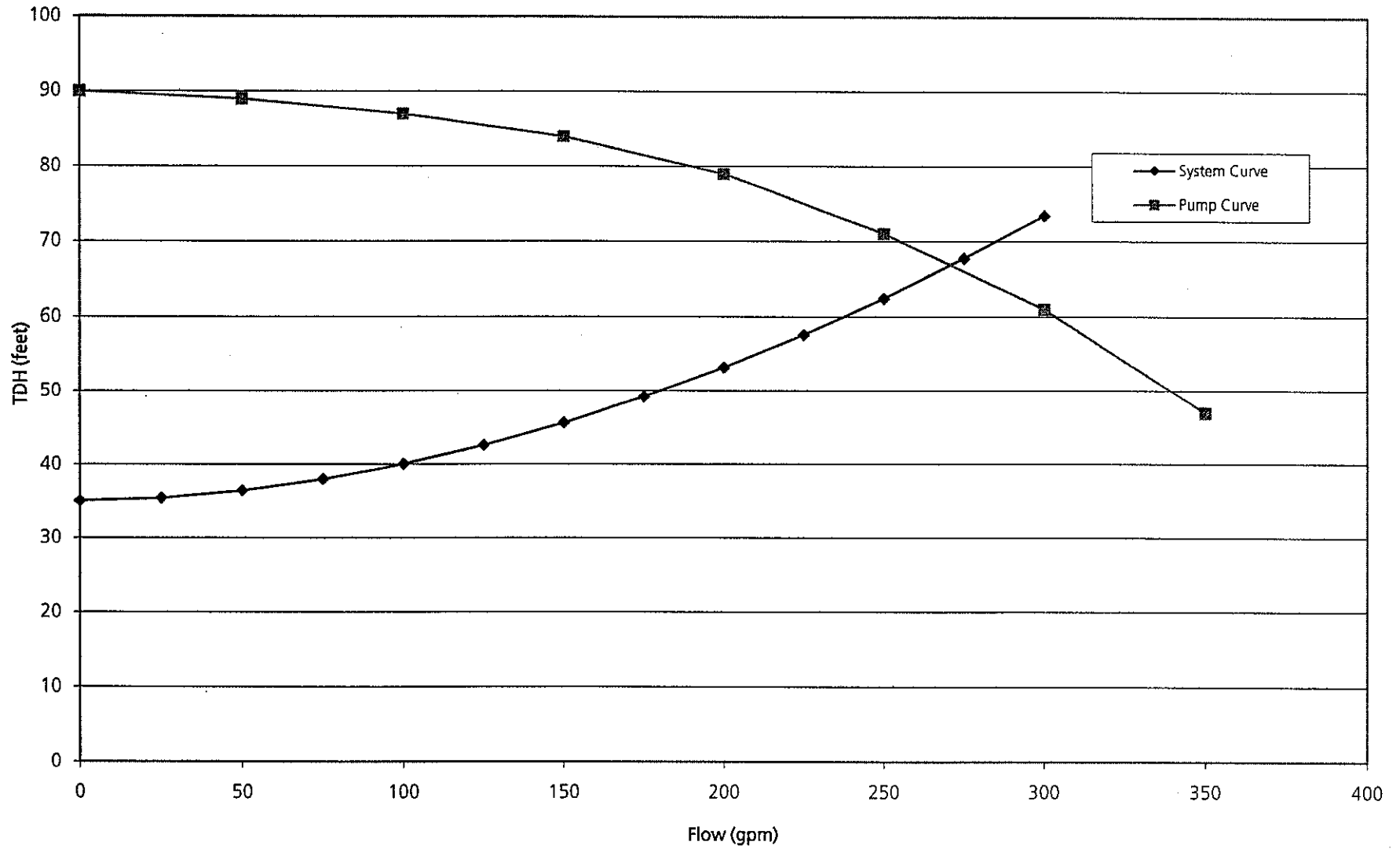
Pipe Diameter = 3.786 inch

Fitting	Quantity	Eq. Length Per Fitting (Pipe Diameters)	Total Eq. Length (Feet)	
90 deg. el.	11	30	104.12	
60 deg. el.		25	0.00	
45 deg. el.		16	0.00	
45 deg. Y		60	0.00	
22 1/2 deg. bend		8	0.00	
Running Tee	5	20	31.55	
Branch Tee	2	50	31.55	
Gate Valve, full open		8	0.00	
Butterfly Valve		40	0.00	(3" to 14")
Butterfly Valve		30	0.00	(14" and greater)
Swing Check	1	100	31.55	
Ball Valve, full open	2	3	1.89	
Globe Valve, full open		400	0.00	
Reducer	1	50	15.78	
Total			216.43	

Pipe Diameter = 5.846 inch

Fitting	Quantity	Eq. Length Per Fitting (Pipe Diameters)	Total Eq. Length (Feet)
90 deg. el.	5	30	47.33
60 deg. el.		25	0.00
45 deg. el.	5	16	25.24
45 deg. Y		60	0.00
22 1/2 deg. bend		8	0.00
Running Tee		20	0.00
Branch Tee		50	0.00
Gate Valve, full open		8	0.00
Butterfly Valve		40	0.00
Butterfly Valve		30	0.00
Swing Check		100	0.00
Ball Valve, full open		3	0.00
Globe Valve, full open		400	0.00
Reducer	2	50	31.55
Total			104.12

Northrop Grumman Systems Corporation
Bethpage, New York
OU3 Groundwater IRM
Discharge Pump (P-400)



NORTHROP GRUMMAN SYSTEMS CORPORATION - BETHPAGE, NEW YORK
OU3 GROUNDWATER IRM
PUMP SIZING CALCULATIONS

This spreadsheet uses Hazen-Williams to calculate the friction head loss for the straight pipe: $hf = (10.44 * \text{Length}) * ((\text{GPM} \wedge 1.85) / ((\text{Friction Factor} \wedge 1.85) * (\text{diameter in inches} \wedge 4.8655)))$
 The friction loss for the fittings is added in by determining equivalent lengths for each fitting, then adding the total equivalent length to the straight pipe length; H-W eqn is then used for the total (straight pipe plus equivalent) length

Pipe, Fittings, and Static Head Loss

4" Sch80 PVC

Inside Diameter	3.79 (ft)
Friction Factor	120
Pipe Length	100 (ft)
Fittings Equi Length	284 (ft)
Pump Elevation	0 (ft)
Outlet Elevation	0 (ft)
Static Head Loss	0 (ft)

Static Head Loss	35 (ft)
------------------	---------

6" SDR 17 HDPE

Inside Diameter	5.85 (ft)
Friction Factor	120
Pipe Length	300 (ft)
Fittings Equi Length	104 (ft)
Pump Elevation	0 (ft)
Outlet Elevation	0 (ft)
Static Head Loss	0 (ft)

existing 8" PVC

Inside Diameter	7.8 (ft)
Friction Factor	120
Pipe Length	330 (ft)
Fittings Equi Length	0 (ft)

Hazen-Williams Calculation

Pump Flow Rate (gpm)	4" Sch80 PVC			6" SDR17 HDPE			existing 4" PVC	Total
	Straight Pipe	Equiv. Length	Vel	Straight Pipe	Equiv. Length	Vel		
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35
25	0.1	0.2	0.9	0.0	0.0	0.3	0.0	35
50	0.3	0.9	1.4	0.1	0.0	0.6	0.0	36
75	0.7	1.9	2.1	0.2	0.1	0.9	0.1	38
100	1.1	3.2	2.8	0.4	0.1	1.2	0.1	40
125	1.7	4.9	3.6	0.6	0.2	1.5	0.2	43
150	2.4	6.8	4.3	0.9	0.3	1.8	0.2	46
175	3.2	9.1	5.0	1.2	0.4	2.1	0.3	49
200	4.1	11.6	5.7	1.5	0.5	2.4	0.4	53
225	5.1	14.5	6.4	1.8	0.6	2.7	0.5	58
250	6.2	17.6	7.1	2.2	0.8	3.0	0.6	62
275	7.4	21.0	7.8	2.7	0.9	3.3	0.7	68
300	8.7	24.7	8.6	3.1	1.1	3.6	0.8	73

Pump curve					
Head	GPM				
90	0				
89	50				
87	100				
84	150				
79	200				
71	250				
61	300				
47	350				

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Appendix D

Air Stripper Modeling

CLIENT INFORMATION

NGC Bethpage

Maximum flow and concentraion

FLOW
250 GPM

WATER
55 °F

AIR
50 °F

Safety Factor:

Units:

NGC Bethpage

Maximum flow and concentraion

Series chosen: 31200
 Water Flow Rate: 250 gpm 56.8 m3/hr
 Air Flow Rate: 1800 acfm 3060 m3/hr
 Water Temp: 55 °F 13 °C
 Air Temp: 50 °F 10 °C
 A/W Ratio: 54 :1
 Safety Factor: 0%

Contaminant	Untreated Influent Effluent Target	Model 31211		Model 31221		Model 31231		Model 31241		Model 31251		Model 31261	
		lbs/hr	ppmv	lbs/hr	ppmv	lbs/hr	ppmv	lbs/hr	ppmv	lbs/hr	ppmv	lbs/hr	ppmv
Trichloroethylene	49 ppb	10 ppb	0.12	2 ppb	0.15	<1 ppb	0.15	<1 ppb	0.15	<1 ppb	0.15	<1 ppb	0.15
Solubility 1100 ppm	2.5 ppb	0.00		0.01		0.01		0.01		0.01		0.01	
Mwt 131.5		78.63%		95.43%		99.02%		99.79%		99.96%		99.99%	
o/a-1,2-DCE	780 ppb	244 ppb	2.43	77 ppb	3.19	24 ppb	3.43	8 ppb	3.51	2 ppb	3.53	<1 ppb	3.53
Solubility 8,690 ppm	2.5 ppb	0.07		0.09		0.09		0.10		0.10		0.10	
Mwt 96.94		68.66%		90.18%		96.92%		99.04%		99.70%		99.81%	
Vinyl Chloride	147 ppb	13 ppb	0.94	1 ppb	1.03	<1 ppb	1.03	<1 ppb	1.04	<1 ppb	1.04	<1 ppb	1.04
Solubility 1100 ppm	2 ppb	0.02		0.02		0.02		0.02		0.02		0.02	
Mwt 62.5		91.04%		99.19%		99.93%		99.99%		100.00%		100.00%	
Total ppb	973 ppb	267 ppb		80 ppb		25 ppb		8 ppb		2 ppb		<1 ppb	
Total VOC lbs/hr - ppmv		0.08	3.50	0.11	4.37	0.12	4.62	0.12	4.70	0.12	4.72	0.12	4.72
Total		72.51%		91.79%		97.48%		99.22%		99.76%		99.85%	

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Appendix E

Total Discharge Pressure
Calculations – Air Stripper Blower

NORTHROP GRUMMAN SYSTEMS CORPORATION - BETHPAGE, NEW YORK
OU3 GROUNDWATER IRM

Blower Pressure Drop

Suction (Air Stripper)		
ΔP per tray (in. w.c.)	# of trays	Suction ΔP (in. w.c.)
5	6	30

Discharge (ECUs + Ductwork)			
ΔP per ECU (in. w.c.)	# of ECUs	ΔP per due to Duct Losses (in. w.c.)	Discharge ΔP (in. w.c.)
2	4	1.5	9.5

Total pressure drop =	39.5 (in. w.c.)
-----------------------	-----------------

Available fan pressure =	54 (in. w.c. at 2,000 cfm)
--------------------------	----------------------------

Duct Pressure Loss and Velocity Pressure Results		
Total Duct Loss (inches Water): 1.39	Velocity Pressure (inches Water): 0.128	
Job Number: Client: Date: Line Number: Fluid: Duct Type: ROUND Duct Diameter (in): 16 Flow Rate: 2000 ACFM Duct Length (ft): 200 Viscosity (cP): 0.018 Inlet Pressure (PSIG): 0 Temperature (F): 70 Duct Material: ALUMINUM Duct Roughness (ft): 0.00015	Fluid Velocity (ft/min): 1433.12 Reynolds Number: 197364 Flow Region: Turbulent Friction Factor: 0.0165 Density at Inlet: 0.075 Specific Volume at Inlet: 13.34 Specific Heat Ratio: 1.4	Velocity Pressure (inches Water): 0.128 Total Duct Loss (inches Water): 1.39 Straight Duct Loss (inches Water): 0.318 Hood Entry Type: None Elbow Type 1: 4 piece Radius / Duct Diameter 1: 1.50 Number Of Elbows 1: 31 Elbow Sweep 1 (Degrees): 90 Elbow Loss Factor 1: 0.27 Elbow Loss 1 (inches Water): 1.073 Duct Exit Configuration: Main Duct Line Exit Configuration Loss (inches Water): 0

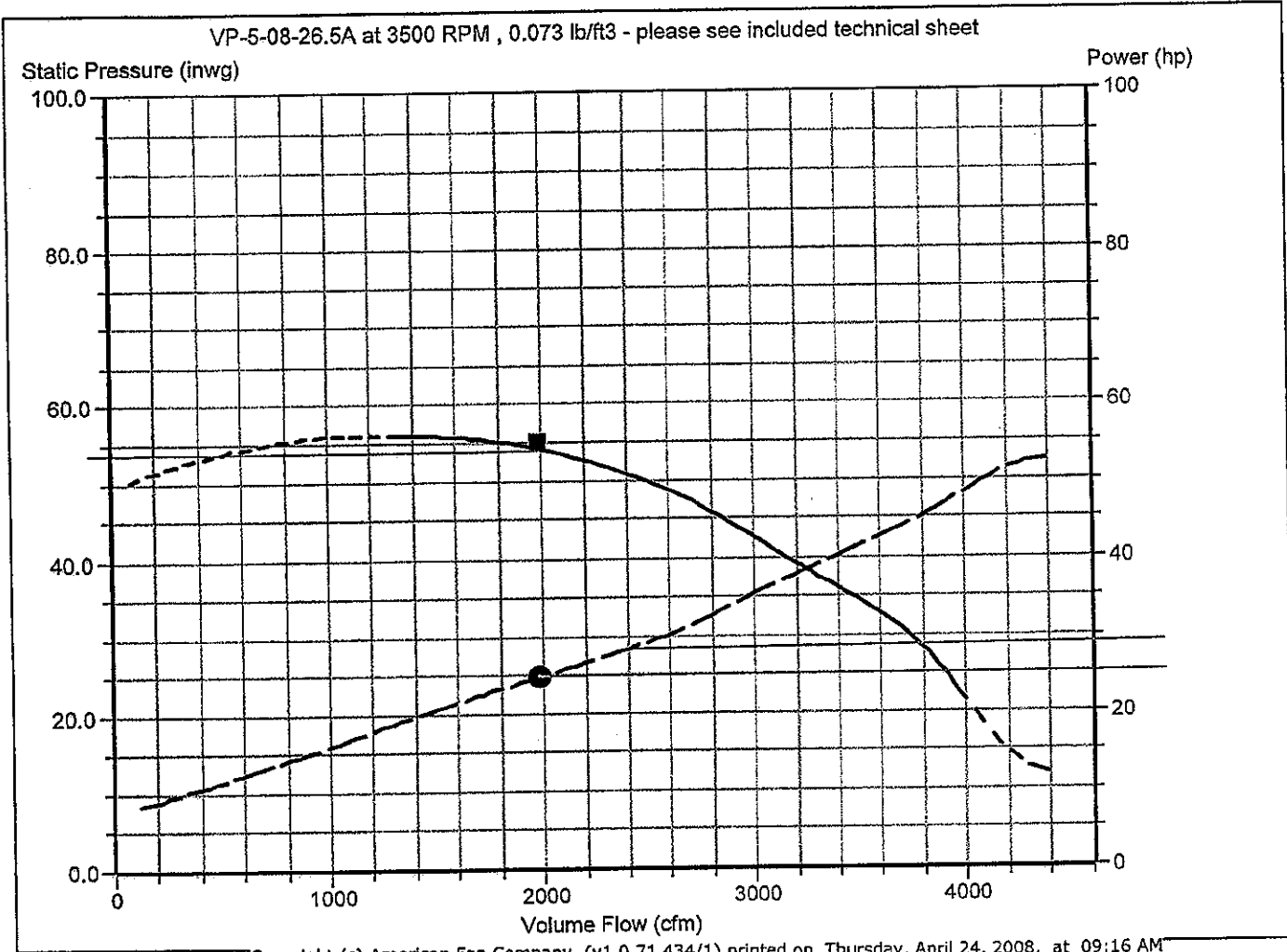
'Copy and Paste' Pressure Loss or Head Loss into other applications



Curve Key	—— Performance Curve
■ Duty Point	- - - Power Curve

Date 4/24/2008
Customer
Contact
Customer Ref.

Proposal
Tag
Project
Location



ARCADIS

Appendix F

Air Facility Registration

**New York State Department of Environmental Conservation
Air Facility Registration**



DEC ID									
-									

Owner/Firm						Taxpayer ID								
						1	3	6	4	0	4	3	4	
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	John Cofman
Phone No.	516-575-4680

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	
<p>Northrop Grumman Systems Corporation (NGC) is implementing the Operable Unit 3 (OU3) Groundwater Interim Remedial Measure (Groundwater 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 NGC, 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. NGC has elected to implement a groundwater IRM to mitigate the off-site migration of VOCs through the implementation of a groundwater pump-and-treat system. The concentration of non-Freon VOCs in the air stripper off-gas will be reduced by vapor phase granular activated carbon and potassium permanganate-impregnated zeolite, as needed, prior to discharge to the atmosphere via a stack with a discharge height of 18 feet above grade.</p> <p>A summary of the design potential (uncontrolled) annual mass emission rates of individual project VOCs and the allowable annual mass emission rates, as determined by the Screen 3 air dispersion model, are presented in Table 2 of the 95% Design Report. The system will be periodically monitored to determine actual, and allowable, annual emission rates to ensure that the AGCs and SGCs are not exceeded.</p>	

Standard Industrial Classification Codes				
NAICS 336411				

HAP CAS Numbers				
00156-59-2	00079-01 -6	00075-01 -4		

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 / /

ARCADIS

Appendix G

SPDES Permit Application

**State Pollutant Discharge Elimination System (SPDES)
INDUSTRIAL APPLICATION FORM NY-2C**
For New Permits and Permit Modifications to Discharge Industrial Wastewater and Storm Water
Section I - Permittee and Facility Information

Please type or print the requested information.

1. Current Permit Information (leave blank if for new discharge)

SPDES Number:	DEC Number:
---------------	-------------

2. Permit Action Requested: (Check applicable box)

<input checked="" type="checkbox"/> A NEW proposed discharge	<input type="checkbox"/> An EBPS INFORMATION REQUEST response	<input type="checkbox"/> A RENEWAL of an existing SPDES permit
<input type="checkbox"/> A MODIFICATION of the existing permit	<input type="checkbox"/> An EXISTING discharge currently without permit	

Does this request include an increase in the quantity of water discharged from your facility to the waters of the State?

<input type="checkbox"/> YES - Describe the increase: <input type="checkbox"/> NO - Go to Item 3. below.	<div style="border: 1px solid black; height: 60px;"></div>
---	--

3. Permittee Name and Address

Name Northrop Grumman Systems Corp.		Attention John Cofman	
Street Address Mail Stop W16-35, 925 South Oyster Bay Road			
City or Village Bethpage	State NY	ZIP Code 11714-3583	

4. Facility Name, Address and Location

Name OU3 Ground Water Treatment System			
Street Address Cherry Road Extension/Aerospace Blvd.			P.O. Box
City or Village Bethpage	State NY	ZIP Code 11714	
Town Oyster Bay	County Nassau		
Telephone	FAX	NYTM - E	NYTM - N
Tax Map Info (New York City, Nassau County and Suffolk County only)			
Section 46	Block G	Subblock	Lot 92

5. Facility Contact Person

Name John Cofman		Title Senior Environmental Engineer	
Street Address Mail Stop W16-35, 925 South Oyster Bay Road			P.O. Box
City or Village Bethpage	State NY	ZIP Code 11714-3583	
Telephone 516-575-4680	FAX 516-575-6672	E-Mail or Internet John.cofman@ngc.com	

6. Discharge Monitoring Report (DMR) Mailing Address

Mailing Name John Cofman			
Street Address Mail Stop W16-35, 925 South Oyster Bay Road			P.O. Box
City or Village Bethpage	State NY	ZIP Code 11714-3583	
Telephone 516-575-4680	FAX 516-575-6672	E-Mail or Internet John.cofman@ngc.com	
Name and Title of person responsible for signing DMRs John Cofman			Signature

**INDUSTRIAL APPLICATION FORM NY-2C
Section I - Permittee and Facility Information**

Facility Name: OU3 Ground Water Treatment System	SPDES Number:
---	---------------

7. Summarize the outfalls present at the facility:

Outfall Number	Receiving Water	Type of discharge
OU1	Ground water via recharge basin	Effluent from ground water treatment system

8. Map of Facility and Discharge Locations:

Provide a detailed map showing the location of the facility, all buildings or structures present, wastewater discharge systems, outfall locations into receiving waters, nearby surface water bodies, water supply wells, and groundwater monitoring wells, and attach it to this application. Also submit proof, either by indication on the map or other documentation, that a right of way for the discharges exists from the facility property to a public right of way.

9. Water Flow Diagram:

Figure 3 (attached)

INDUSTRIAL APPLICATION FORM NY-2C
Section I - Permittee and Facility Information

Facility Name: OU3 Ground Water Treatment System	SPDES Number:
---	---------------

15. Facility Ownership: (Place an "X" in the appropriate box)

Corporate
 Sole Proprietorship
 Partnership
 Municipal
 State
 Federal
 Other

Are any of the discharges applied for in this application on Indian lands?
 Yes No

16. List information on any other environmental permits for this facility:

Issuing Agency	Permit Type	Permit Number	Permit Status		
			Active	Applied for	Inactive
NYSDEC	Air			X	

17. Laboratory Certification:

Were any of the analyses reported in Section III of this application performed by a contract laboratory or a consulting firm?

YES - Complete the following table.

NO - Go to Item 18 below.

Name of laboratory or consulting firm	Address	Telephone (area code and number)	Pollutants analyzed

18. Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name and official title (type or print) John Cofman, Senior Environmental Engineer		Date signed
Signature	Telephone number 516-575-4680	FAX number 516-575-6672

**INDUSTRIAL APPLICATION FORM NY-2C
Section I - Permittee and Facility Information**

Facility Name: <p align="center">OU3 Ground Water Treatment System</p>	SPDES Number:
---	---------------

19. Industrial Chemical Survey (ICS)

Complete all information for those substances your facility has used, produced, stored, distributed, or otherwise disposed of in the past five (5) years at or above the threshold values listed in the instructions. Include substances manufactured at your facility, as well as any substances that you have reason to know or believe present in materials used or manufactured at your facility. Do not include chemicals used only in analytical laboratory work, or small quantities of routine household cleaning chemicals. Enter the name and CAS number for each of the chemicals listed in Tables 6-10 of the instructions, and the table number which lists the chemical. You may use ranges (e.g. 10-100 lbs., 100-1000 lbs., 1000-10000 lbs., etc.) to describe the quantities used on an annual basis as well as for the amount presently on hand. For those chemicals listed in Tables 6, 7, or 8 which are indicated as being potentially present in the discharge from one or more outfalls at the facility, indicate which outfalls may be affected in the appropriate column below, and include sampling results in Section III of this application for each of the potentially affected outfalls. Make additional copies of this sheet if necessary.

Name of Substance	Table	CAS Number	Average Annual Usage	Amount Now On Hand	Units (gallons, lbs, etc)	Purpose of Use (see codes in Table 2 of instructions)	Present in Discharge? (Outfall(s)?)
Not applicable, new facility							

This completes Section I of the SPDES Industrial Application Form NY-2C. Section II, which requires specific information for each of the outfalls at your facility, and Section III, which requires sampling information for each of the outfalls at your facility, must also be completed and submitted with this application.

State Pollutant Discharge Elimination System (SPDES)
INDUSTRIAL APPLICATION FORM NY-2C
 For New Permits and Permit Modifications to Discharge Industrial Wastewater and Storm Water
Section II - Outfall Information

Please type or print the requested information.

Facility Name: OU3 Ground Water Treatment System	SPDES Number:
---	---------------

1. Outfall Number and Location

Outfall No.: 001	Latitude ° ' "	Longitude ° ' "	Receiving Water
---------------------	-------------------------------	--------------------------------	-----------------

2. Type of Discharge and Discharge Rate (List all information applicable to this outfall)

	Volume/Flow	Units				Volume/Flow	Units		
		MGD	GPM	Other (specify)			MGD	GPM	Other (specify)
a. Process Wastewater					f. Noncontact Cooling Water				
b. Process Wastewater					g. Remediation System Discharge	250		X	
c. Process Wastewater					h. Boiler Blowdown				
d. Process Wastewater					i. Storm Water				
e. Contact Cooling Water					j. Sanitary Wastewater				
k. Other discharge (specify):									
l. Other discharge (specify):									

3. List process information for the Process Wastewater streams identified in 2.a-d above:

a. Name of the process contributing to the discharge			Process SIC code:
Describe the contributing process	Category	Quantity per day	Units of measure
	Subcategory		
b. Name of the process contributing to the discharge			Process SIC code:
Describe the contributing process	Category	Quantity per day	Units of measure
	Subcategory		
c. Name of the process contributing to the discharge			Process SIC code:
Describe the contributing process	Category	Quantity per day	Units of measure
	Subcategory		
d. Name of the process contributing to the discharge			Process SIC code:
Describe the contributing process	Category	Quantity per day	Units of measure
	Subcategory		

4. Expected or Proposed Discharge Flow Rates for this outfall:

a. Total Annual Discharge	b. Daily Minimum Flow	c. Daily Average Flow	d. Daily Maximum Flow	e. Maximum Design flow rate
132 MG	0.0 MGD	0.30 MGD	0.36 MGD	0.36 MGD

INDUSTRIAL APPLICATION FORM NY-2C
Section II - Outfall Information

Facility Name: OU3 Ground Water Treatment System	Outfall No.: 001
SPDES Number:	

5. Is this a seasonal discharge?

YES - Complete the following table.
 NO - Go to Item 6 below.

Operations contributing flow (list)	Discharge frequency		Flow				
	Batches per year	Duration per batch	Flow rate per day		Total volume per discharge	Units	Duration (Days)
			LTA	Daily Max			

6. Water Supply Source (indicate all that apply)

	Name or owner of water supply source	Volume or flow rate	Units (check one)		
Municipal Supply			MGD	GPD	GPM
Private Surface Water Source			MGD	GPD	GPM
Private Supply Well 5	Northrop Grumman Systems Corp.	250	MGD	GPD	<input checked="" type="checkbox"/> GPM
Other (specify)			MGD	GPD	GPM

7. Outfall configuration: (Surface water discharges only)

A. Where is the discharge point located with respect to the receiving water?

In the streambank:
 In the stream:
 Within a lake or ponded water:
 Within an estuary: Attach Supplement C, MIXING ZONE REQUIREMENTS FOR DISCHARGES TO ESTUARIES.
 Discharge is equipped with diffuser: Attach description, including configuration and plan drawing of diffuser, if used.

B. If located in a stream, approximately what percentage of stream width from shore is the discharge point located?

10% 25% 50% Other:

C. If located in a stream, describe the stream geometry in the general vicinity of the discharge point, under low flow conditions:

Stream width	Stream depth	Stream velocity	Are the results of a mixing/diffusion study attached?
Feet	Feet	Feet/Sec	<input type="checkbox"/> YES
			<input type="checkbox"/> NO

**INDUSTRIAL APPLICATION FORM NY-2C
Section II - Outfall Information**

Facility Name: <p align="center">OU3 Ground Water Treatment System</p>	Outfall No.: 001 <hr/> SPDES Number:
---	---

11. Is the discharge from this outfall treated to remove process wastes, water treatment additives, or other pollutants?

- YES - Complete the following table. Treatment codes are listed in Table 4.
- NO - Go to Item 12 below.

Treatment process	Treatment Code(s)	Treatment used for the removal of:	Design Flow Rate (include units)
Recovered ground water is treated by an air stripper	1-4	Chlorinated Solvent	250 gpm

12. Does this facility have either a compliance agreement with a regulating agency, or have planned changes in production, which will materially alter the quantity and/or quality of the discharge from this outfall?

- YES - Complete the following table.
- NO - Go to Section III on the following page.

Description of project	Subject to Condition or Agreement in existing permit or consent order? (List)	Change due to production increase?	Completion Date(s)	
			Required	Projected
Ground water remediation per NYSDEC Consent Order	Order on Consent index #W1-0018-04-01			

This completes Section II of the SPDES Industrial Application Form NY-2C. Section I, which requires general information regarding your facility, and Section III, which requires sampling information for each of the outfalls at your facility, must also be completed and submitted with this application.

INDUSTRIAL APPLICATION FORM NY-2C Section III - Sampling Information

Facility Name: OU3 Ground Water Treatment System	SPDES No.:
--	------------

Outfall No.: 001

1. Sampling Information - Conventional Parameters

Provide the analytical results of at least one analysis for every pollutant in this table. If this outfall is subject to a waiver as listed in Table 5 of the instructions for one or more of the parameters listed below, provide the results for those parameters which are required for this type of outfall.

Pollutant	Effluent data							Units		Intake data (optional)		
	a. Maximum daily value		b. Maximum 30 day value		c. Long term average		d. Number of analyses	a. Concentration	b. Mass	a. Long term average value		b. Number of analyses
	1. Concentration	2. Mass	1. Concentration	2. Mass	1. Concentration	2. Mass				1. Concentration	2. Mass	
a. Biochemical Oxygen Demand (5 day) (BOD)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
b. Chemical Oxygen Demand (COD)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
c. Total Suspended Solids (TSS)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
d. Total Dissolved Solids (TDS)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
e. Oil & Grease	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
f. Chlorine Total Residual (TRC)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
g. Total Organic Nitrogen (TON)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
h. Ammonia (as N)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
i. Flow	Value 0.36		Value 10.8		Value 0.30		N/A			Value		
j. Temperature, winter	Value N/A		Value N/A		Value N/A		N/A			Value		
k. Temperature, summer	Value N/A		Value N/A		Value N/A		N/A			Value		
l. pH	Minimum N/A	Maximum N/A	Minimum N/A	Maximum N/A			N/A			Minimum	Maximum	

2. Sampling Information - Priority Pollutants, Toxic Pollutants, and Hazardous Substances

a. Primary Industries:

I. Does the discharge from this outfall contain process wastewater?
 Yes - Go to Item ii. below.
 No - Go to Item b. below.

II. Indicate which GC/MS fractions have been tested for:
 Volatiles: Acid: Base/Neutral: Pesticide:

b. All applicants:

I. Do you know or have reason to believe that any of the pollutants listed in Tables 6, 7, or 8 of the instructions are present in the discharge from this outfall?
 Yes - Concentration and mass data attached.
 No - Go to Item II. below.

II. Do you know or have reason to believe that any of the pollutants listed in Table 9 or Table 10 of the instructions, or any other toxic, harmful, or injurious chemical substances not listed in Tables 6-10, are present in the discharge from this outfall?
 Yes - Source or reason for presence in discharge attached
 Yes - Quantitative or qualitative data attached
 No

INDUSTRIAL APPLICATION FORM NY-2C
Section III - Sampling Information

Facility Name: <p align="center">OU3 Ground Water Treatment System</p>	SPDES No.:
---	------------

Outfall No.:
001

3. Projected Effluent Quality - Priority Pollutants, Toxic Pollutants, and Hazardous Substances

Provide analytical results of at least one analysis for each pollutant that you know or have reason to believe is present in this discharge, as well as for any GC/MS fractions and metals required to be sampled from Section III Forms, Item 2.a on the preceding page.

Pollutant and CAS Number	Effluent data						Units		Intake data (optional)			Believed present, no sampling results available	
	a. Maximum daily value		b. Maximum 30 day value (if available)		c. Long term average value (if available)		d. Number of analyses	a. Concentration	b. Mass	a. Long term average value			d. Number of analyses
	(1)Concentration	(2) Mass	(1)Concentration	(2) Mass	(1)Concentration	(2) Mass		(1)Concentration	(2) Mass	(1)Concentration	(2) Mass		
cis-1,2-Dichloroethene CAS Number: 00156-59-2	<5	N/A	<5	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A	N/A
Trichloroethene CAS Number: 00079-01-6	<5	N/A	<5	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A	N/A
Vinyl Chloride CAS Number: 00075-01-4	<5	N/A	<5	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A	N/A
Chromium, Total CAS Number: 07440-47-3	<50	N/A	<50	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A	N/A
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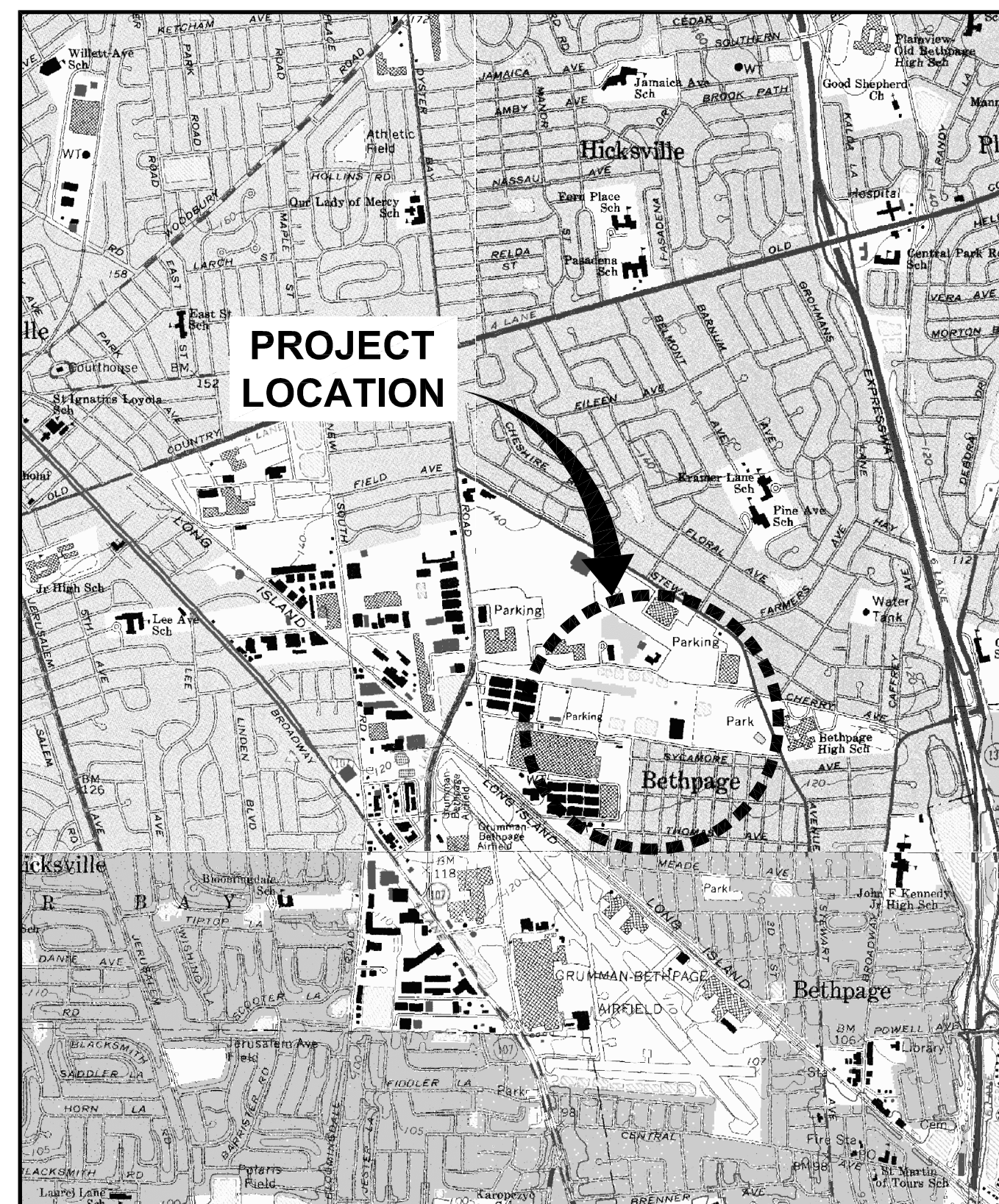
CONTRACT DRAWINGS

OPERABLE UNIT 3 GROUNDWATER INTERIM REMEDIAL MEASURE

FORMER GRUMMAN SETTLING PONDS

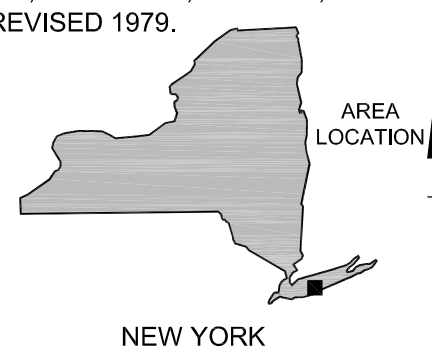
AUGUST 2008

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK



REFERENCE: BASE MAP USGS 7.5 MINUTE QUADRANGLE, AMITYVILLE, FREEPORT, N.Y., 1969, PHOTOREVISED 1979. HUNTINGTON, HICKSVILLE, N.Y., 1967, PHOTOREVISED 1979.

LOCATION MAP
0 2000' 4000'
GRAPHIC SCALE



INDEX TO DRAWINGS

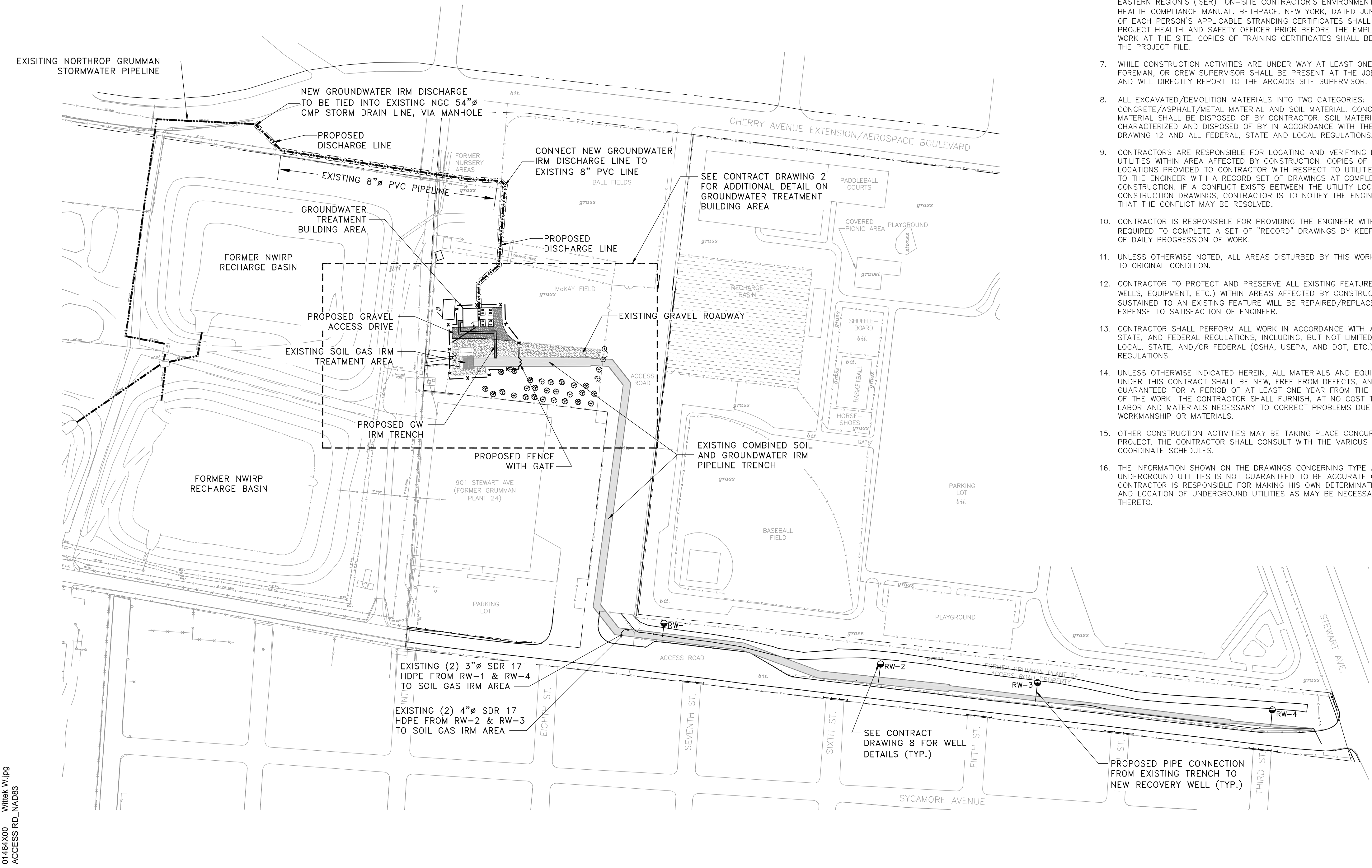
1	SITE PLAN
2	TREATMENT BUILDING AREA PLAN
3	PIPING AND INSTRUMENTATION DIAGRAM #1
4	PIPING AND INSTRUMENTATION DIAGRAM #2
5	PIPING AND INSTRUMENTATION DIAGRAM #3
6	LEGEND, ABBREVIATIONS AND INTERLOCKS
7	EQUIPMENT LAYOUT
8	WELL DETAIL
9	MISCELLANEOUS SECTIONS AND DETAILS
10	MISCELLANEOUS SECTIONS AND DETAILS
11	SPECIFICATIONS
12	SOIL MANAGEMENT PLAN
13	ELECTRICAL SITE PLAN
14	ONE-LINE DIAGRAM
15	EQUIPMENT LAYOUT-ELECTRICAL
16	EQUIPMENT LAYOUT-INSTRUMENTATION
17	EQUIPMENT DETAILS AND SCHEMATICS
18	FOUNDATION PLAN VIEW AND DETAILS
19	SLAB-ON-GRADE PLAN VIEW AND DETAILS
20	BUILDING ELEVATIONS
21	STRUCTURAL NOTES AND SYMBOLS #1
22	STRUCTURAL NOTES AND SYMBOLS #2



ARCADIS U.S., INC.

CITY:SYRACUSE DIV:GROUPE-85 DR:GHS LD:GHS P:C: PM: TM: LYRON-OFF-REF-
 G:\PROJECT\Northrop Grumman\Superfund\2008\01464.1807\GWRM\Design Documents\Design Report\Final Design Report\Contract DWGs\lead\0146401-02.dwg
 LAYOUT: 1 SAVED: 9/2/2008 3:10 PM ACADVER: 17.1S (LIMS TECH) PAGESSETUP: ---- PLOTSTYLETABLE: ARCADIS_MELVILLE.CTB PLOTTED: 9/2/2008 3:27 PM BY: SANCHEZ, ADRIAN PROJECTNAME:

- LEGEND:**
- NORTHROP GRUMMAN PROPERTY LINE
 - x-x- PROPOSED FENCE AND GATE
 - RW-2 APPROXIMATE LOCATION OF PROPOSED GROUNDWATER RECOVERY WELL
 - IRM INTERIM REMEDIAL MEASURE
 - NWIRP NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
 - NGC NORTHROP GRUMMAN CORPORATION



- NOTES:**
- LOCATION OF WORK: ALL WORK DESCRIBED IN THESE DRAWINGS/SPECIFICATIONS SHALL BE PERFORMED ON BEHALF OF NORTHROP GRUMMAN SYSTEMS CORPORATION, INC.
 - CONTRACTORS SHOULD VISIT THE SITE AND EXAMINE ALL OF THE PHYSICAL CONDITIONS THAT AFFECT THE FINAL BID PRICE.
 - CONTRACTORS 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.
 - CONTRACTORS SHALL PROVIDE ALL LABOR, MATERIAL, AND EQUIPMENT, UNLESS OTHERWISE STATED, NECESSARY TO PERFORM THIS WORK. THE SITE WILL BE A UNION SITE.
 - CONTRACTORS SHALL BE RESPONSIBLE FOR OBTAINING ALL TRADE PERMITS, AND APPROVALS NECESSARY TO PERFORM THIS WORK; INCLUDING AGREEMENTS WITH APPLICABLE, LOCAL AND TRADE UNIONS.
 - ALL SITE WORKERS SHALL HAVE THE APPROPRIATE HEALTH AND SAFETY TRAINING; REVIEW AND SIGN THE PROJECT HEALTH AND SAFETY PLAN UNLESS WAIVER IS GRANTED BY THE PROJECT HEALTH AND SAFETY OFFICE; AND REVIEW AND ACKNOWLEDGE NORTHROP GRUMMAN SYSTEMS CORPORATION INTEGRATED SYSTEMS EASTERN REGION'S (ISER) "ON-SITE CONTRACTOR'S ENVIRONMENTAL, SAFETY AND HEALTH COMPLIANCE MANUAL. BETHPAGE, NEW YORK, DATED JUNE 12, 2008." COPIES OF EACH PERSON'S APPLICABLE STRANDING CERTIFICATES SHALL BE PROVIDED TO THE PROJECT HEALTH AND SAFETY OFFICER PRIOR BEFORE THE EMPLOYEE CAN START WORK AT THE SITE. COPIES OF TRAINING CERTIFICATES SHALL BE KEPT ON FILE WITH THE PROJECT FILE.
 - WHILE CONSTRUCTION ACTIVITIES ARE UNDER WAY AT LEAST ONE CONTRACTOR, FOREMAN, OR CREW SUPERVISOR SHALL BE PRESENT AT THE JOB SITE AT ALL TIMES AND WILL DIRECTLY REPORT TO THE ARCADIS SITE SUPERVISOR.
 - 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 IN ACCORDANCE WITH THE SPECIFICATIONS ON DRAWING 12 AND ALL FEDERAL, STATE AND LOCAL REGULATIONS.
 - CONTRACTORS ARE 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.
 - 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.
 - UNLESS OTHERWISE NOTED, ALL AREAS DISTURBED BY THIS WORK SHALL BE RESTORED TO ORIGINAL CONDITION.
 - 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 TO SATISFACTION OF ENGINEER.
 - 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.
 - 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.
 - OTHER CONSTRUCTION ACTIVITIES MAY BE TAKING PLACE CONCURRENTLY WITH THIS PROJECT. THE CONTRACTOR SHALL CONSULT WITH THE VARIOUS PARTIES AND SHALL COORDINATE SCHEDULES.
 - THE INFORMATION SHOWN ON THE DRAWINGS CONCERNING TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. 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.
 - 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.
 - PIPE ROUTING SHOWN FOR CONSTRUCTION LAYOUT PURPOSES ONLY. ACTUAL ROUTING TO BE FIELD DETERMINED AND IS SUBJECT TO ENGINEER'S APPROVAL.
 - CONTRACTOR SHALL EXTEND ALL PROCESS PIPING AND MAKE ALL NECESSARY CONNECTIONS TO WELL VAULTS.
 - ALL PIPING PRESSURE TESTS SHALL BE MADE BY THE CONTRACTOR IN THE PRESENCE OF THE ENGINEER.
 - CONTRACTOR SHALL PROVIDE ALL PRODUCTS AND PROPERLY CALIBRATED TESTING EQUIPMENT REQUIRED TO PERFORM THE PIPING PRESSURE TESTING WORK.
 - TESTS MAY BE PERFORMED ON SEPARATE SECTIONS OF PIPING TO EXPEDITE CONSTRUCTION. THE CONTRACTOR SHALL NOT PERFORM PRESSURE TESTING AGAINST SYSTEM VALVES.
 - AFTER THE INITIAL PRESSURE TEST ON PIPING IS COMPLETED SUCCESSFULLY, THE CONTRACTOR SHALL BACKFILL THE TRENCHES AS SPECIFIED.
 - EXCAVATIONS SHALL BE KEPT FREE FROM STANDING WATER.
 - CONTRACTOR SHALL NOTIFY THE ENGINEER AT THE COMPLETION OF EXCAVATIONS AND TRENCHING TO ALLOW FOR INSPECTIONS.
 - CONTRACTOR SHALL PROVIDE APPROPRIATE SAFETY BARRICADES AROUND TRENCHING AND EXCAVATION TO PREVENT ACCIDENTS OR UNAUTHORIZED ENTRY.
 - BACKFILL OF TRENCHES IN UNPAVED AREAS WILL BE APPLIED IN 6-INCH THICK COMPACTED LIFTS. BACKFILL OF TRENCHES IN DESIGNATED ROAD CROSSING AREAS SHALL BE APPLIED IN 6-INCH COMPACTED LIFTS SUCH THAT A 95% MODIFIED PROCTOR DENSITY SHALL BE ACHIEVED.
 - CONTRACTOR'S FILL SOURCE MUST BE TESTED BY CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO COMMENCING THE WORK AND/OR PLACING THE MATERIAL.
 - EXCAVATIONS WILL BE BACKFILLED AS PROMPTLY AS WORK PERMITS ONCE REQUIRED INSPECTIONS HAVE BEEN COMPLETED.
 - DO NOT PLACE MATERIALS ON SURFACES THAT ARE MUDDY, FROZEN, OR CONTAIN ICE OR FROST.
 - 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.
 - ALL CONCRETE AND PAVEMENT CUTS ARE TO BE SMOOTH EDGE SAW CUTS BY CIRCULAR SAW BLADES.
 - SURVEY NOTE: MAP FEATURES BASED ON SURVEY PREPARED BY NELSON & POPE ENGINEERS AND SURVEYORS, "EXISTING TOPOGRAPHY", DATED 4-19-07.
 - EXISTING FEATURES ON PARK AND OFF-SITE ARE BASED ON AERIAL PHOTOGRAPHY AND ARE APPROXIMATE.
 - ALL PAVED AREAS SHALL BE RESTORED.
 - ALL EXISTING GROUNDWATER EXTRACTION PIPING SHALL BE FLUSHED OUT PRIOR TO CONNECTING TO FINAL CONNECTION.
 - ALL INFLUENT LINES SHALL BE FLUSHED PRIOR TO MAKING FINAL CONNECTIONS AT WELL VAULT AND BUILDING.
 - PIPE CLEAN-OUTS SHALL BE INSTALLED AT WELL VAULTS AND AT PIPE PENETRATIONS INSIDE TREATMENT BUILDING FOR ALL INFLUENT LINES.
 - GROUNDWATER IRM LINES SHALL BE FLUSHED OUT WITH CLEAN WATER PRIOR TO PRESSURE TESTING.
 - ALL INFORMATION PRESENTED ON THESE DRAWINGS IS CONFIDENTIAL.

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

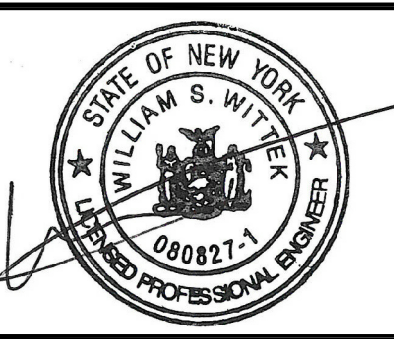


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No.	Date	Revisions	By	Ckd

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Professional Engineer's Name
WILLIAM S. WITTEK
 Professional Engineer's No.
 080827
 State
 NY
 Date Signed
 Project Mgr.
 CSG
 Checked by
 TEM
 Designed by
 CDL
 Drawn by
 BKD

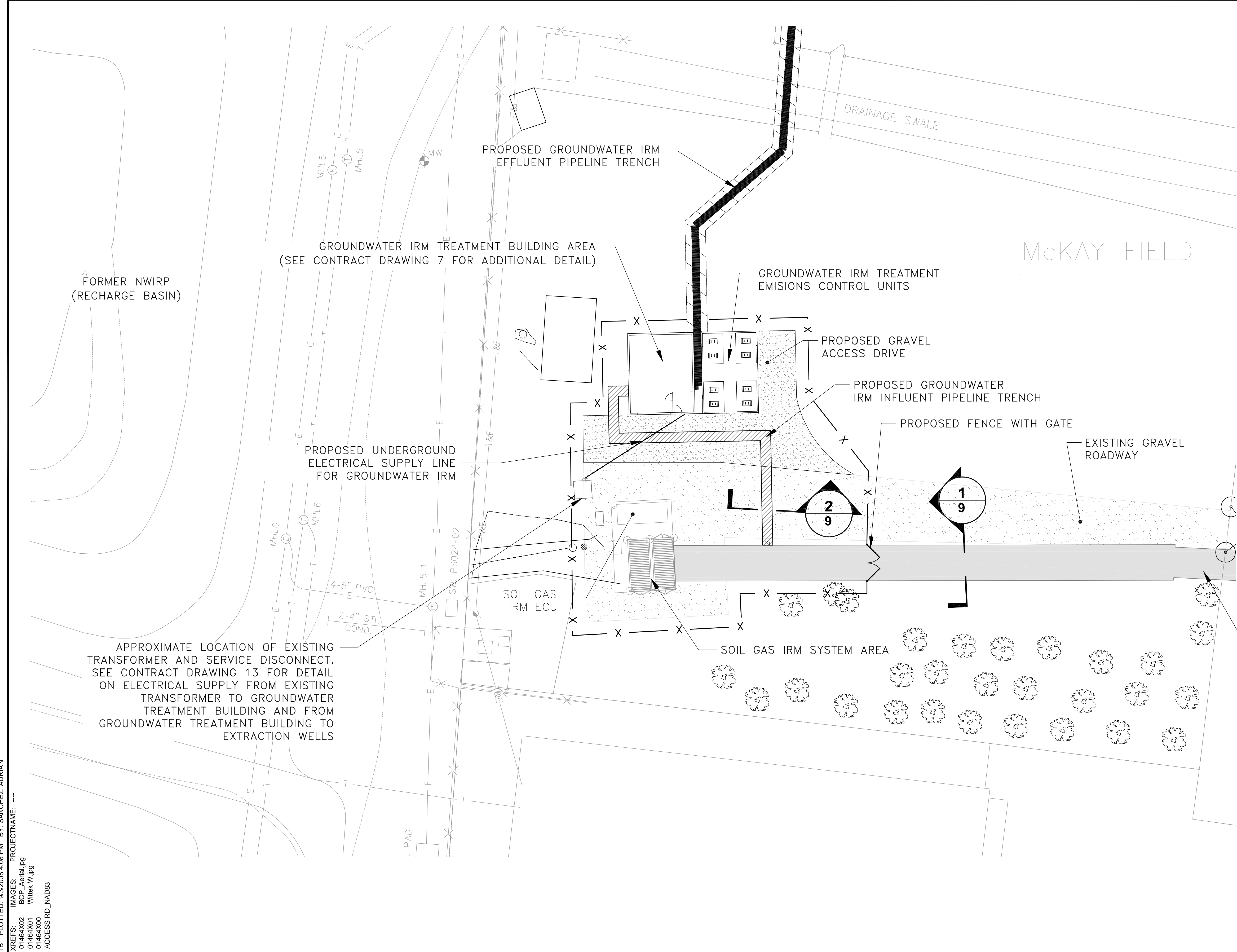


NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
 OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

SITE PLAN

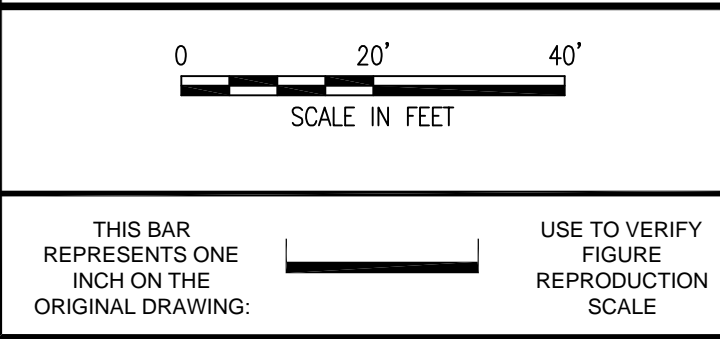
ARCADIS Project No.
 NY001464.1807.00003
 Date
 JUNE 2008
 ARCADIS
 6723 Towpath Road
 Box 66
 Syracuse, NY 13214
 Tel: 315-446-9120

CITY:SYRACUS DIV:GROUPE-85 DR:GHS LD:GHS PIC: PM: TM: LYRON-OFF-REF: G:\PROJECT\Northrop Grumman\Superfund\2008\OU3\NY001464.1807\GWRM\Design Documents\Design Report\Final Design Report\Contract DWGs\add01464G01-02.dwg LAYOUT: 2 SAVED: 9/3/2008 3:36 PM ACADVER: 17.1S (LIMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ARCADIS_MELVILLE.CTB PLOTTED: 9/3/2008 4:08 PM BY: SANCHEZ, ADRIAN PROJECTNAME: ----



APPROXIMATE LOCATION OF EXISTING TRANSFORMER AND SERVICE DISCONNECT. SEE CONTRACT DRAWING 13 FOR DETAIL ON ELECTRICAL SUPPLY FROM EXISTING TRANSFORMER TO GROUNDWATER TREATMENT BUILDING AND FROM GROUNDWATER TREATMENT BUILDING TO EXTRACTION WELLS

- LEGEND:**
- X EXISTING FENCE
 - [Stippled Box] EXISTING GRAVEL ROADWAY
 - [Solid Grey Box] EXISTING SOIL AND GROUNDWATER PIPELINE TRENCH
 - [Dotted Box] PROPOSED GRAVEL ROADWAY
 - [Hatched Box] PROPOSED GROUNDWATER IRM PIPELINE TRENCH
 - IRM INTERIM REMEDIAL MEASURE
 - NWIRP NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
 - ECU EMISSION CONTROL UNIT



No.	Date	Revisions	By	Ckd

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Professional Engineer's Name
WILLIAM S. WITTEK

Professional Engineer's No.
080827

State
NY

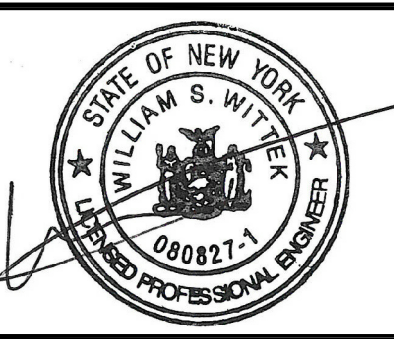
Date Signed

Project Mgr.
CSG

Designed by
CDL

Drawn by
BKD

Checked by
TEM



NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

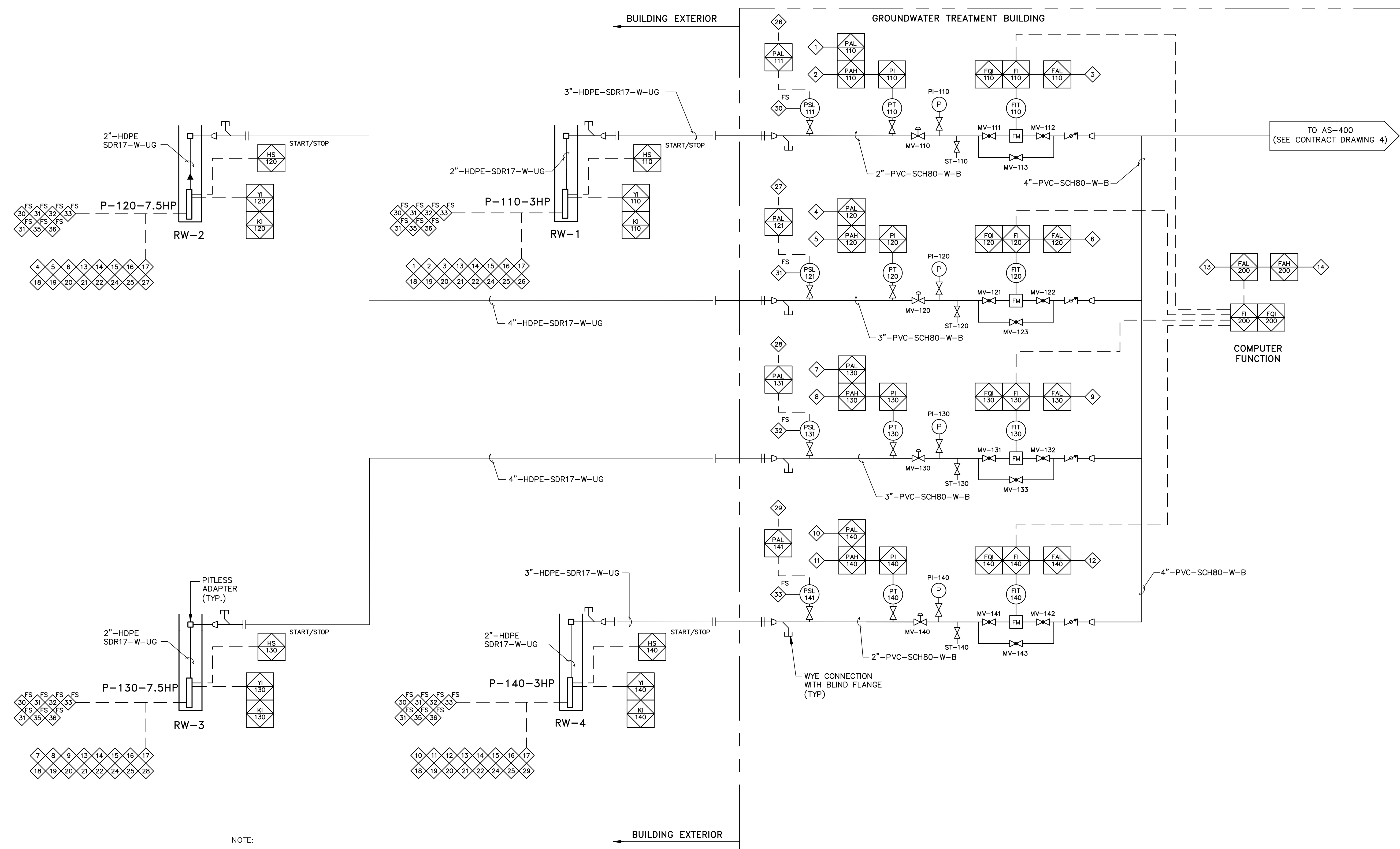
TREATMENT BUILDING AREA PLAN

ARCADIS Project No.
NY001464.1807.00003

Date
JUNE 2008

ARCADIS
6723 Towpath Road
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Tel: 315-446-9120

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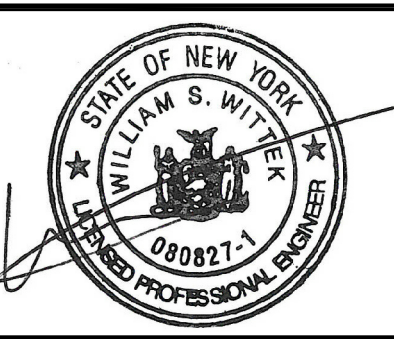
NOTE:
 LEGEND, ABBREVIATIONS AND INTERLOCKS
 SHOWN ON CONTRACT DRAWING 6.

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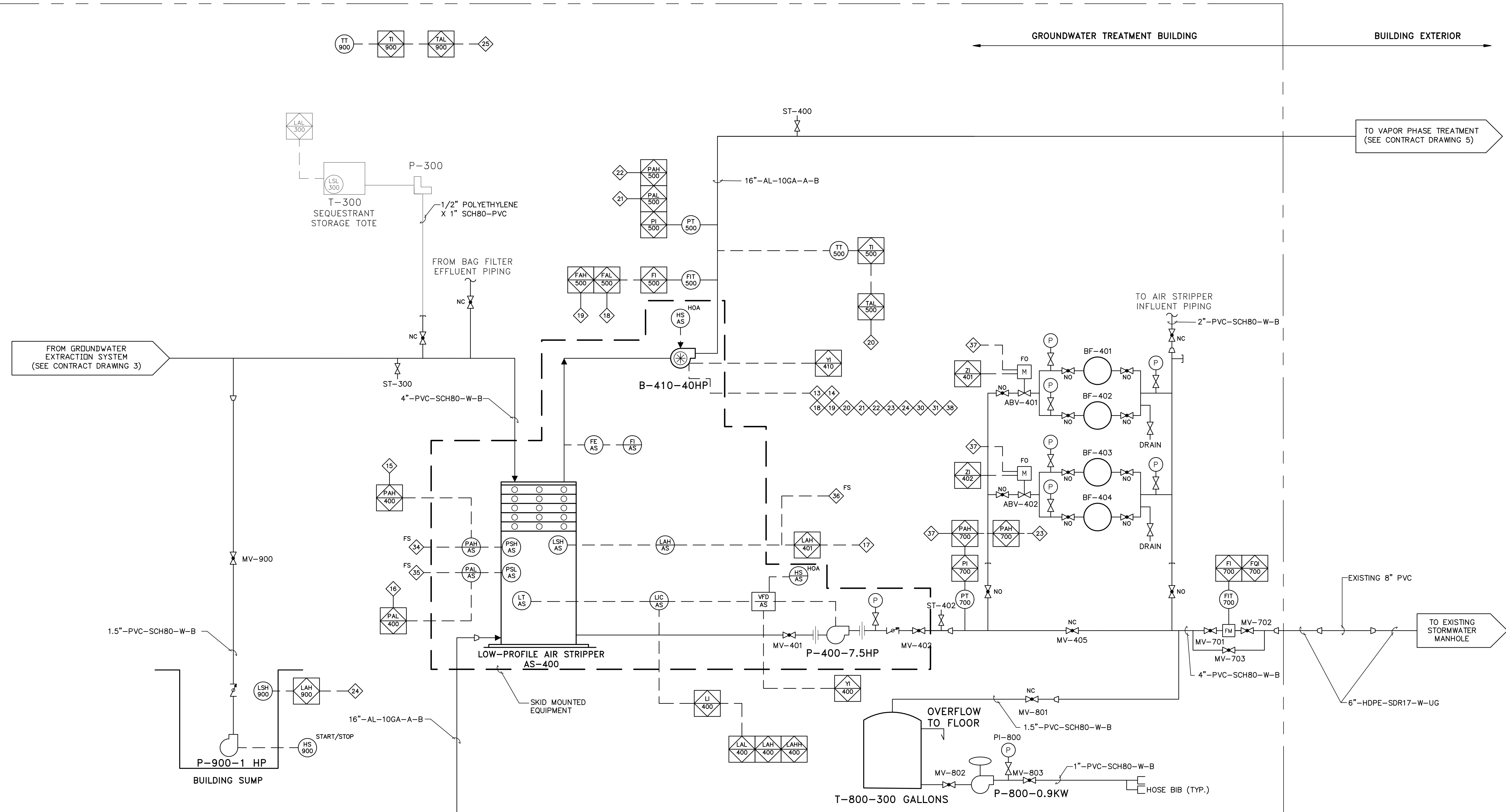
Professional Engineer's Name
WILLIAM S. WITTEK
 Professional Engineer's No.
 080827
 State
 NY
 Date Signed
 8/28/08
 Project Mgr.
 CSG
 Designed by
 CDL
 Drawn by
 KLS
 Checked by
 TEM



NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
 OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS
PIPING AND INSTRUMENTATION DIAGRAM #1
 MECHANICAL

ARCADIS Project No.
 NY001464.1807.00003
 Date
 AUGUST 2008
 ARCADIS
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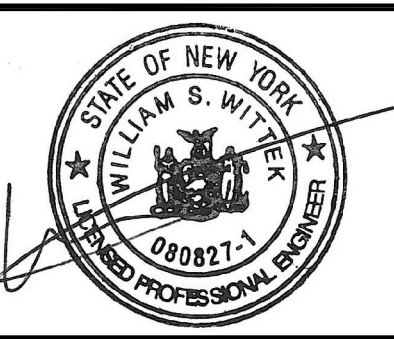
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NOTE:
LEGEND, ABBREVIATIONS AND INTERLOCKS
SHOWN ON CONTRACT DRAWING 6.

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No.	Date	Revisions	By	Ckd

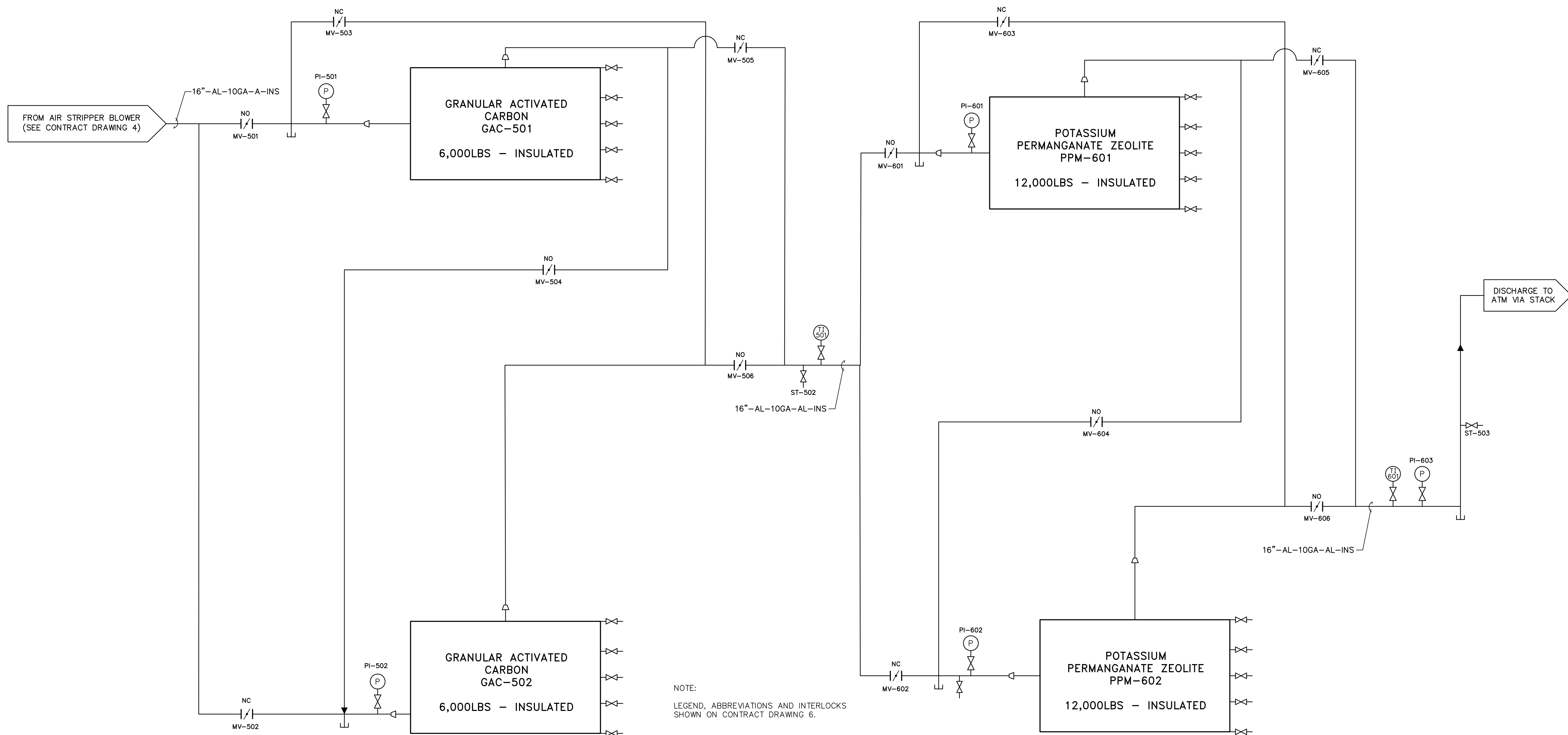
Professional Engineer's Name
WILLIAM S. WITTEK
Professional Engineer's No.
080827
State
NY
Date Signed
8/28/08
Project Mgr.
CSG
Designed by
CDL
Drawn by
KLS
Checked by
TEM



NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS
PIPING AND INSTRUMENTATION DIAGRAM #2
MECHANICAL

ARCADIS Project No.
NY001464.1807.00003
Date
AUGUST 2008
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Tel: 315.446.9120

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NOTE:
 LEGEND, ABBREVIATIONS AND INTERLOCKS
 SHOWN ON CONTRACT DRAWING 6.

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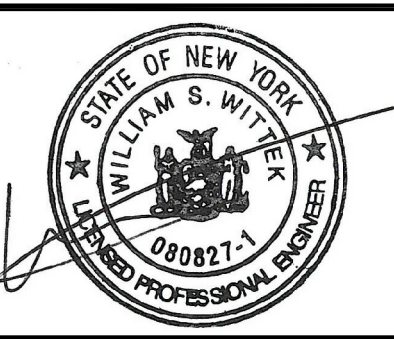
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Professional Engineer's Name
WILLIAM S. WITTEK

Professional Engineer's No.
 080827

State: NY Date Signed: 8/28/08 Project Mgr.: CSG

Designed by: CDL Drawn by: KLS Checked by: TEM



NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
 OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

PIPING AND INSTRUMENTATION DIAGRAM #3

MECHANICAL

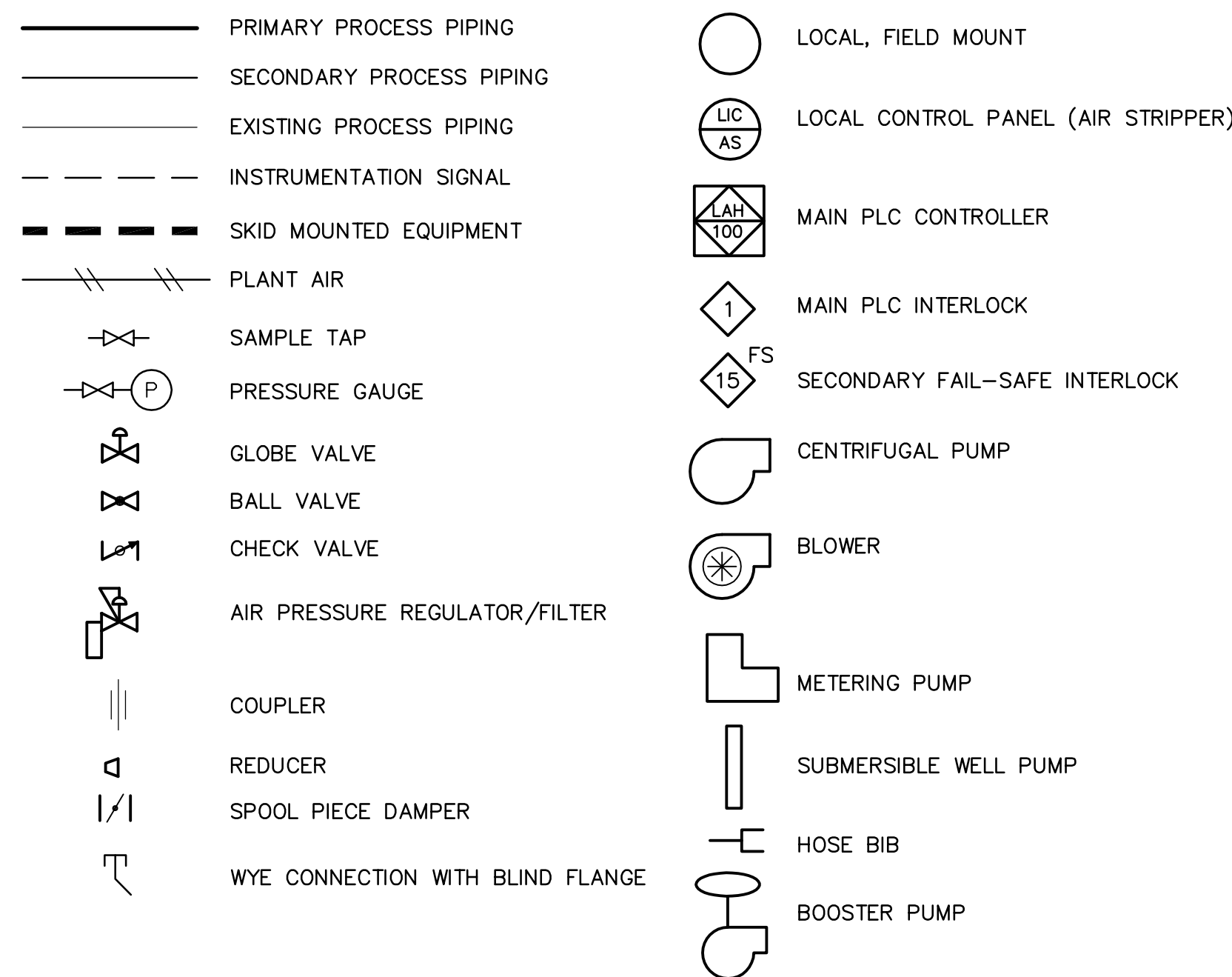
ARCADIS Project No.
 NY001464.1807.00003

Date
 AUGUST 2008

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 PROJECTNAME: WITTEK V1.rvt
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EQUIPMENT LEGEND:



ABBREVIATIONS:

A	AIR	LI	LEVEL INDICATOR
ABV	ACTIVATED BLOCK VALVE	LIC	LEVEL INDICATING CONTROLLER
AL	ALUMINUM	LSH	LEVEL SWITCH HIGH
AS	AIR STRIPPER	LSL	LEVEL SWITCH LOW
BF	BAG FILTER	LT	LEVEL TRANSMITTER
Ø	DIAMETER	MV	MANUAL VALVE
FAH	FLOW ALARM HIGH	NC	NORMALLY CLOSED
FAL	FLOW ALARM LOW	NO	NORMALLY OPEN
FE	FLOW ELEMENT	PAH	PRESSURE ALARM HIGH
FI	FLOW INDICATOR	PAL	PRESSURE ALARM LOW
FIT	FLOW INDICATING TRANSMITTER	PT	PRESSURE TRANSMITTER
FM	FLOW METER	PI	PRESSURE INDICATOR
FO	FAIL OPEN	PLC	PROGRAMMABLE LOGIC CONTROLLER
FP	FLOOR PENETRATION	PPZ	POTASSIUM PERMANANATE ZEOLITE
FQI	TOTALIZED FLOW INDICATOR	PSL	PRESSURE SWITCH LOW
GAC	VAPOR-PHASE GRANULAR ACTIVATED CARBON	PSH	PRESSURE SWITCH HIGH
GA	GAUGE HIGH DENSITY	PVC	POLYVINYL CHLORIDE
HDPE	POLYETHYLENE	SCH	SCHEDULE
HOA	HAND-OFF-AUTO	SDR	STANDARD DIMENSION RATIO
HP	HORSEPOWER	TAL	TEMPERATURE ALARM LOW
HS	HAND SWITCH	TI	TEMPERATURE INDICATOR
INS	INSULATED	TI	TEMPERATURE INDICATING TRANSMITTER
KI	PUMP RUN TIME INDICATOR	TYP	TYPICAL
KW	KILOWATT	RW	RECOVERY WELL
LAH	LEVEL ALARM HIGH	UG	UNDERGROUND
LAHH	LEVEL ALARM HIGH-HIGH	VFD	VARIABLE FREQUENCY DRIVE
LAL	LEVEL ALARM LOW	W	WATER
LALL	LEVEL ALARM LOW-LOW	YI	RUN INDICATION
LE	LEVEL ELEMENT	ZI	POSITION INDICATOR

PLC INPUT/OUTPUT SCHEDULE:

ANALOG INPUTS:

- PT-110
- PT-120
- PT-130
- PT-140
- FIT-110
- FIT-120
- FIT-130
- FIT-140
- LI-400
- FIT-500
- PT-500
- TT-500
- PT-700
- FIT-700
- TT-900

DISCRETE INPUTS:

- YI-110
- YI-120
- YI-130
- YI-140
- KI-110
- KI-120
- KI-130
- KI-140
- PSL-111
- PSL-121
- PSL-131
- PSL-141
- PAH-400
- PAL-400
- LAH-400
- YI-410
- LSH-900

DISCRETE OUTPUTS:

- P-110 SHUTDOWN
- P-120 SHUTDOWN
- P-130 SHUTDOWN
- P-140 SHUTDOWN
- AIR STRIPPER SHUTDOWN
- P-900 ON/OFF
- AUTODIALER
- AUTODIALER
- AUTODIALER
- AUTODIALER
- HIGH PRESSURE AT AIR STRIPPER (PAH-400), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER WILL BE SHUT DOWN LOCALLY BY AIR STRIPPER CONTROL PANEL ON A 5 MINUTE DELAY.
- LOW PRESSURE AT AIR STRIPPER (PAL-400), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER WILL BE SHUT DOWN LOCALLY BY AIR STRIPPER CONTROL PANEL ON A 5 MINUTE DELAY.
- HIGH SUMP LEVEL AT AIR STRIPPER (LAH-400), SHUT DOWN EXTRACTION WELL PUMPS, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER WILL BE SHUT DOWN LOCALLY BY AIR STRIPPER CONTROL PANEL ON A 5 MINUTE DELAY.

PIPE IDENTIFICATION TAGS:

DIAMETER - SERVICE - SCHEDULE - MATERIAL - OTHER

DIAMETER: NOMINAL DIAMETER (INCHES)

SERVICE:
A = AIR
W = WATER

SCHEDULE = US STANDARD UNITS

MATERIAL:
AL = ALUMINUM
HDPE = HIGH DENSITY POLYETHYLENE
PVC = POLYVINYL CHLORIDE

OTHER:
B = BARE
INS = INSULATED
UG = UNDERGROUND

MAIN PLC INTERLOCK SCHEDULE:

- LOW PRESSURE IN P-110 INFLUENT LINE (PAL-110), SHUT DOWN P-110, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
- HIGH PRESSURE IN P-110 INFLUENT LINE (PAH-110), SHUT DOWN P-110, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
- LOW FLOW IN P-110 INFLUENT LINE (FAL-110), SHUT DOWN P-110, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
- LOW PRESSURE IN P-120 INFLUENT LINE (PAL-120), SHUT DOWN P-120, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
- HIGH PRESSURE IN P-120 INFLUENT LINE (PAH-120), SHUT DOWN P-120, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
- LOW FLOW IN P-120 INFLUENT LINE (FAL-120), SHUT DOWN P-120, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
- LOW PRESSURE IN P-130 INFLUENT LINE (PAL-130), SHUT DOWN P-130, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
- HIGH PRESSURE IN P-130 INFLUENT LINE (PAH-130), SHUT DOWN P-130, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
- LOW FLOW IN P-130 INFLUENT LINE (FAL-130), SHUT DOWN P-130, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
- LOW PRESSURE IN P-140 INFLUENT LINE (PAL-140), SHUT DOWN P-140, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
- HIGH PRESSURE IN P-140 INFLUENT LINE (PAH-140), SHUT DOWN P-140, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
- LOW FLOW IN P-140 INFLUENT LINE (FAL-140), SHUT DOWN P-140, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
- LOW FLOW AT COMBINED AIR STRIPPER INFLUENT LINE (FAL-200), SHUT DOWN EXTRACTION WELL PUMPS, SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY) SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
- HIGH FLOW AT COMBINED AIR STRIPPER INFLUENT LINE (FAH-200), SHUT DOWN EXTRACTION WELL PUMPS, SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY) SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER SHUT DOWN DELAY WILL BE CONTROLLED BY AIR STRIPPER LOCAL CONTROL PANEL.
- LOW PRESSURE AT AIR STRIPPER (PAL-400), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER WILL BE SHUT DOWN LOCALLY BY AIR STRIPPER CONTROL PANEL ON A 5 MINUTE DELAY.
- HIGH SUMP LEVEL AT AIR STRIPPER (LAH-400), SHUT DOWN EXTRACTION WELL PUMPS, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER WILL BE SHUT DOWN LOCALLY BY AIR STRIPPER CONTROL PANEL ON A 5 MINUTE DELAY.
- LOW PRESSURE SWITCH (PSL-111) IN P-110 ACTIVATED (DE-ENERGIZED), SHUT DOWN WELL PUMPS.
- LOW PRESSURE SWITCH (PSL-121) IN P-120 ACTIVATED (DE-ENERGIZED), SHUT DOWN WELL PUMPS.
- LOW PRESSURE SWITCH (PSL-131) IN P-130 ACTIVATED (DE-ENERGIZED), SHUT DOWN WELL PUMPS.
- LOW PRESSURE SWITCH (PSL-141) IN P-140 ACTIVATED (DE-ENERGIZED), SHUT DOWN WELL PUMPS.
- HIGH PRESSURE SWITCH (PSH-AS) AT AIR STRIPPER ACTIVATED, SHUT DOWN WELL PUMPS.
- LOW PRESSURE SWITCH (PSL-AS) AT AIR STRIPPER ACTIVATED, SHUT DOWN WELL PUMPS.
- HIGH LEVEL SWITCH (LSH-AS) AT AIR STRIPPER ACTIVATED, SHUT DOWN WELL PUMPS.
- LOW AIR FLOW AT AIR STRIPPER BLOWER DISCHARGE LINE (FAL-500), SHUT DOWN EXTRACTION WELL PUMPS. SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER SHUT DOWN DELAY WILL BE CONTROLLED BY AIR STRIPPER LOCAL CONTROL PANEL.
- HIGH AIR FLOW AT AIR STRIPPER BLOWER DISCHARGE LINE (FAH-500), SHUT DOWN EXTRACTION WELL PUMPS. SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER SHUT DOWN DELAY WILL BE CONTROLLED BY AIR STRIPPER LOCAL CONTROL PANEL.
- LOW AIR TEMPERATURE AT AIR STRIPPER BLOWER DISCHARGE (TAL-500), SHUT DOWN EXTRACTION WELL PUMPS. SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER SHUT DOWN DELAY WILL BE CONTROLLED BY AIR STRIPPER LOCAL CONTROL PANEL.
- LOW AIR PRESSURE AT AIR STRIPPER BLOWER DISCHARGE LINE (PAL-500), SHUT DOWN EXTRACTION WELL PUMPS, SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER SHUT DOWN DELAY WILL BE CONTROLLED BY AIR STRIPPER LOCAL CONTROL PANEL.
- HIGH AIR PRESSURE AT AIR STRIPPER BLOWER DISCHARGE LINE (PAH-500), SHUT DOWN EXTRACTION WELL PUMPS, SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER SHUT DOWN DELAY WILL BE CONTROLLED BY AIR STRIPPER LOCAL CONTROL PANEL.
- HIGH-HIGH PRESSURE AT AIR STRIPPER PUMP DISCHARGE LINE (PAHH-700), SHUT DOWN EXTRACTION WELL PUMPS, SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER SHUT DOWN DELAY WILL BE CONTROLLED BY AIR STRIPPER LOCAL CONTROL PANEL.
- HIGH LEVEL AT BUILDING SUMP (LAH-900), SHUT DOWN EXTRACTION WELL PUMPS, SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER SHUT DOWN DELAY WILL BE CONTROLLED BY AIR STRIPPER LOCAL CONTROL PANEL.
- LOW AIR TEMPERATURE AT BUILDING (TAH-900), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER.
- LOW PRESSURE IN P-110 INFLUENT LINE (PAL-111), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER.
- LOW PRESSURE IN P-120 INFLUENT LINE (PAL-121), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER.
- LOW PRESSURE IN P-130 INFLUENT LINE (PAL-131), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER.
- LOW PRESSURE IN P-140 INFLUENT LINE (PAL-141), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER.
- HIGH PRESSURE AT AIR STRIPPER PUMP DISCHARGE LINE (PAH-700), OPEN SECONDARY VALVE (MBV-402 OR MBV-401) AND CLOSE PRIMARY VALVE (MBV-401 OR MBV-402). PRIMARY AND SECONDARY VALVE DESIGNATION SHALL ALTERNATE AFTER OPERATOR ACKNOWLEDGES THAT PRIMARY BAG FILTERS HAVE BEEN CHANGED.
- IN THE EVENT THAT ALL WELL PUMPS ARE SHUT DOWN BY PLC, AIR STRIPPER SYSTEM SHALL BE SHUT DOWN.

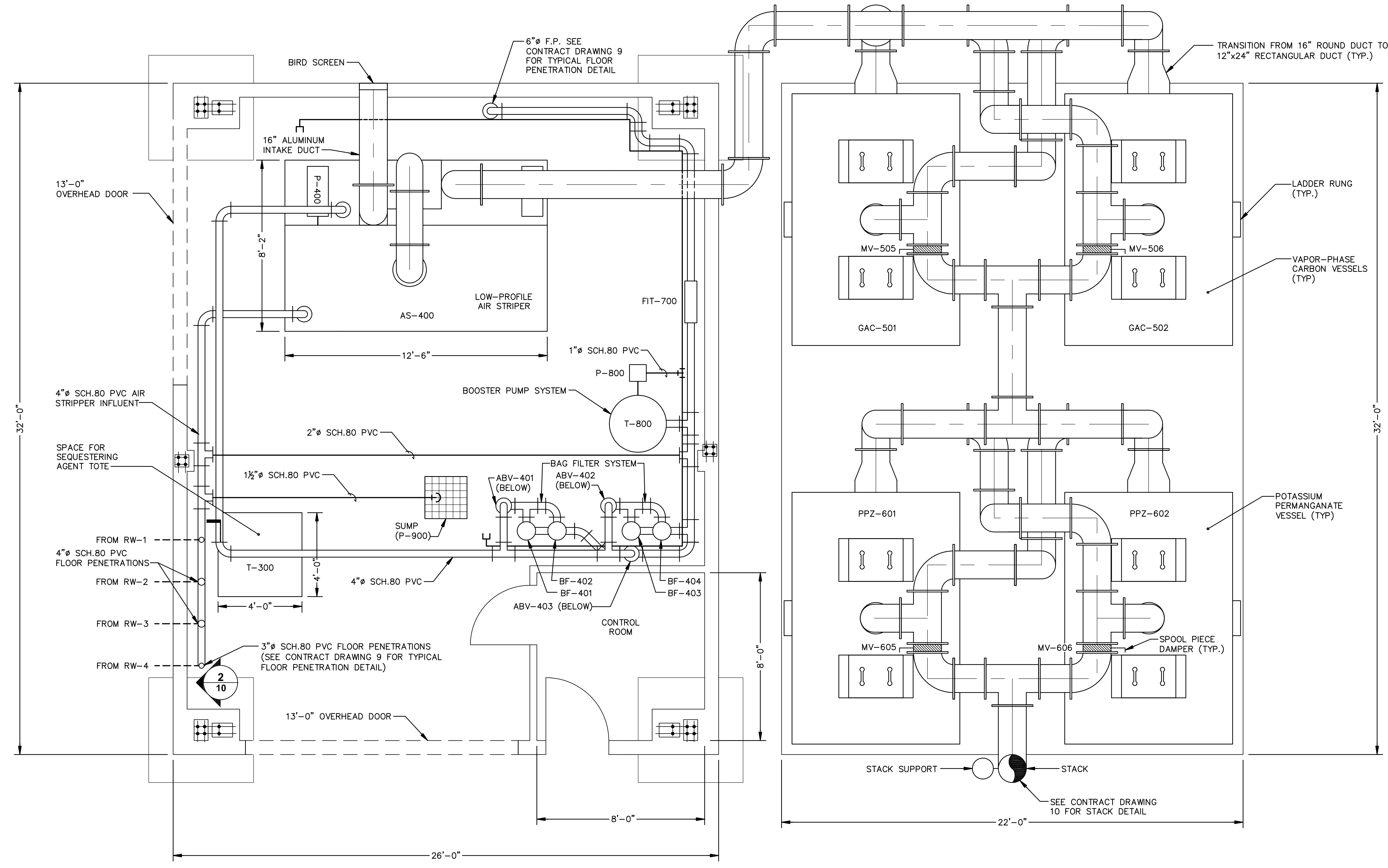
AIR STRIPPER LOCAL CONTROL PANEL INTERLOCK SCHEDULE:

- HIGH PRESSURE AT AIR STRIPPER (PSH-AS), SIGNAL DRY CONTACT FOR EXTERNAL SHUT DOWN/INDICATION, SIGNAL LOCAL PANEL ALARM LIGHT, AND SHUT DOWN AIR STRIPPER BLOWER (5 MINUTE DELAY).
- LOW PRESSURE AT AIR STRIPPER (PSL-AS), SIGNAL DRY CONTACT FOR EXTERNAL SHUT DOWN/INDICATION, SIGNAL LOCAL PANEL ALARM LIGHT, AND SHUT DOWN AIR STRIPPER BLOWER (5 MINUTE DELAY).
- HIGH SUMP LEVEL AT AIR STRIPPER (LSH-AS), SIGNAL DRY CONTACT FOR EXTERNAL SHUT DOWN/INDICATION, SIGNAL LOCAL PANEL ALARM LIGHT, AND SHUT DOWN AIR STRIPPER BLOWER (5 MINUTE DELAY).
- AIR STRIPPER DISCHARGE PUMP SPEED WILL BE CONTROLLED BY VFD BASED ON AIR STRIPPER SUMP LEVEL SET POINT.

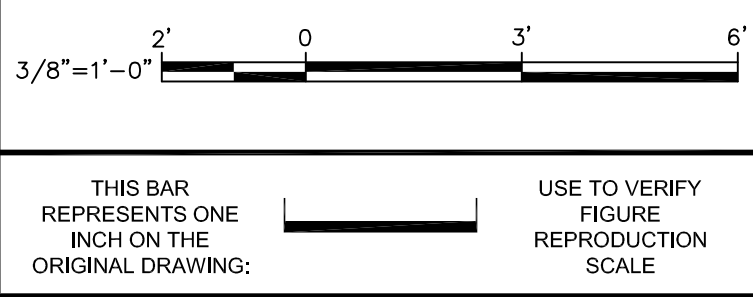
NOT TO SCALE THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING.	USE TO VERIFY FIGURE REPRODUCTION SCALE	Professional Engineer's Name WILLIAM S. WITTEK				NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS	ARCADIS Project No. NY001464.1807.00003	Date AUGUST 2008	6
		State NY	Date Signed 8/28/08						
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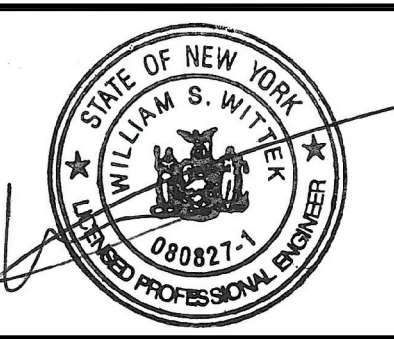


- NOTES:
- REFER TO CONTRACT DRAWINGS 9 AND 10 FOR MISCELLANEOUS SECTIONS AND DETAILS.
 - REFER TO CONTRACT DRAWING 15 FOR EQUIPMENT POWER, LIGHTING, HVAC AND GROUNDING PLAN.
 - REFER TO CONTRACT DRAWING 16 FOR INSTRUMENTATION PLAN.
 - REFER TO CONTRACT DRAWINGS 18 THROUGH 21 FOR FOUNDATION AND BUILDING DETAILS AND SPECIFICATIONS.
 - REFER TO CONTRACT DRAWINGS 3, 4, AND 5 FOR VALVE, SAMPLE TAP, PRESSURE GAUGE, AND TEMPERATURE GAUGE LOCATIONS.
 - REFER TO CONTRACT DRAWING 6 FOR LEGEND AND ABBREVIATIONS.
 - REFER TO CONTRACT DRAWING 11 FOR EQUIPMENT, INSTRUMENT, AND MECHANICAL SPECIFICATIONS.
 - ACTUAL LOCATION OF BAG FILTER SYSTEM UNITS AND ASSOCIATED PIPING SUBJECT TO CHANGE AS DETERMINED IN FIELD.



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

Professional Engineer's Name
WILLIAM S. WITTEK
 Professional Engineer's No.
 080827
 State
 NY
 Date Signed
 8/28/08
 Project Mgr.
 CSG
 Designed by
 CDL
 Drawn by
 TEM
 Checked by
 TEM



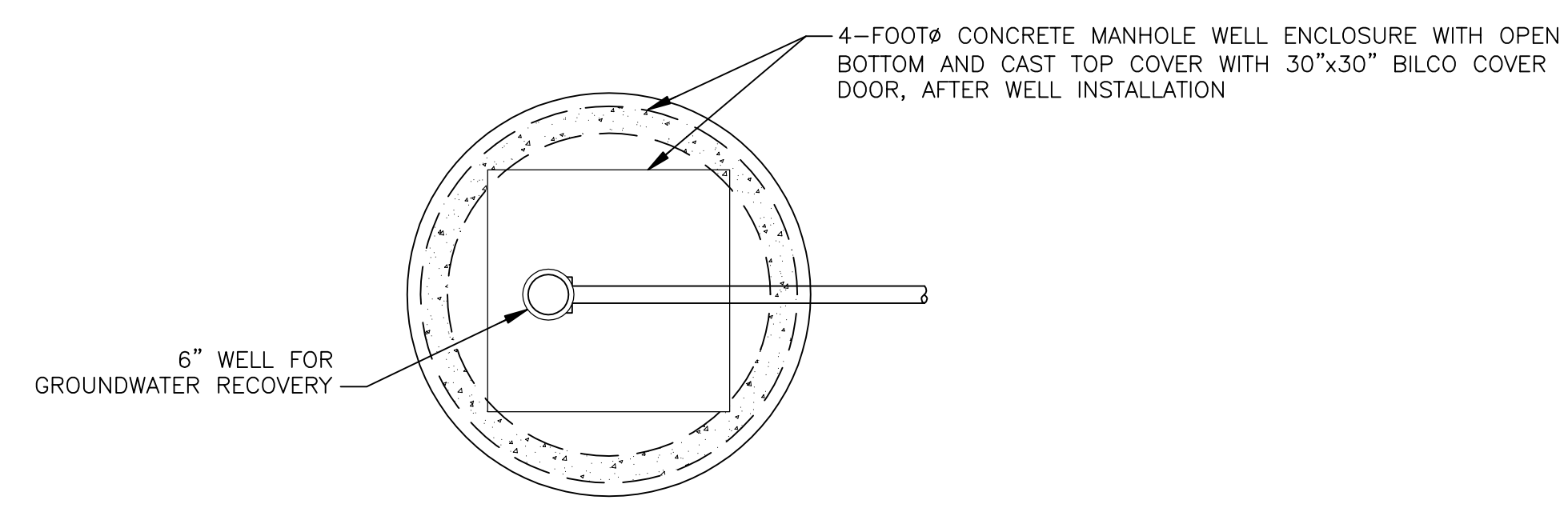
NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
 OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

EQUIPMENT LAYOUT

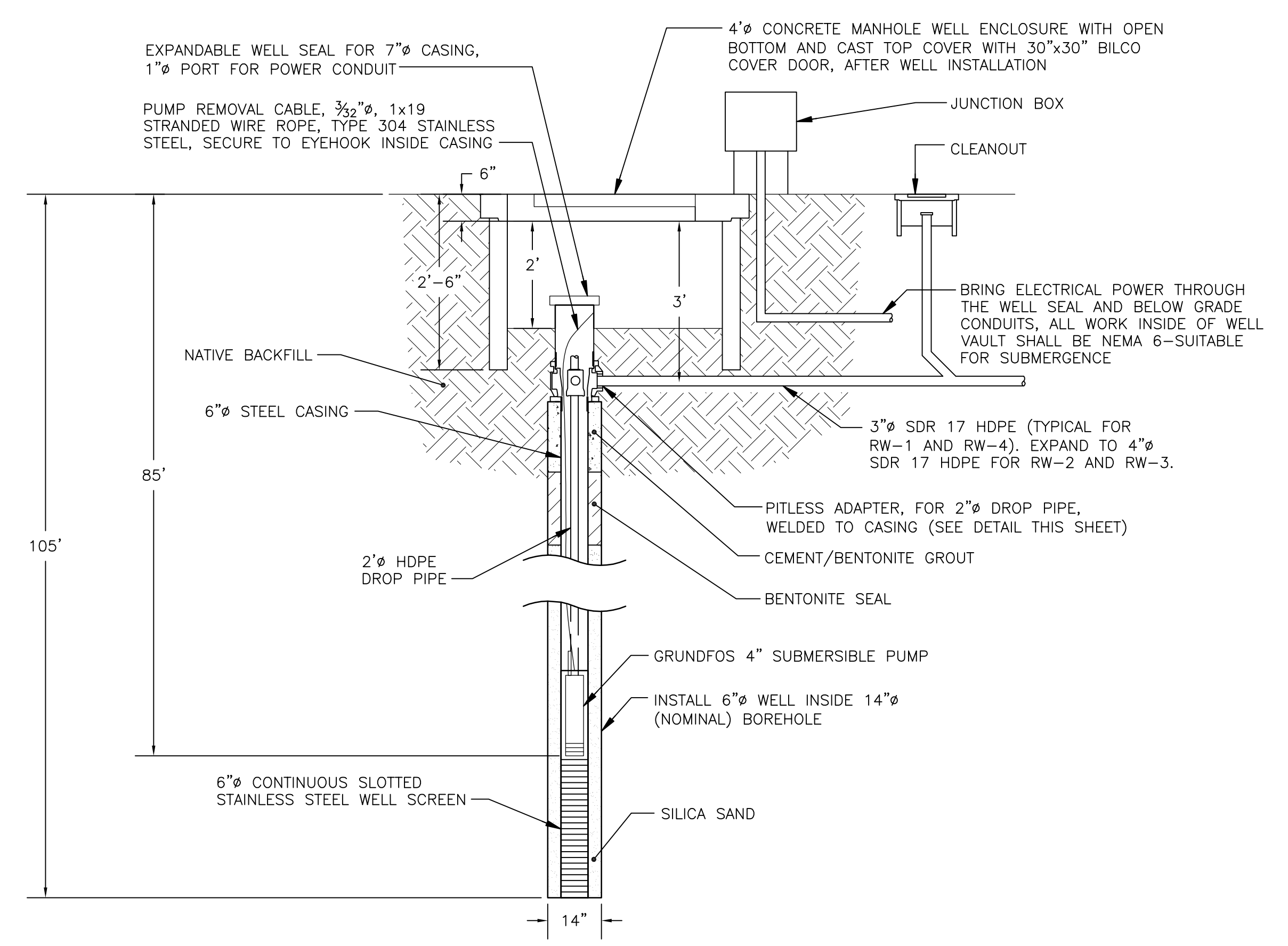
MECHANICAL

ARCADIS Project No.
 NY001464.1807.00003
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 ARCADIS
 6723 Towpath Road
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 Syracuse, NY 13214
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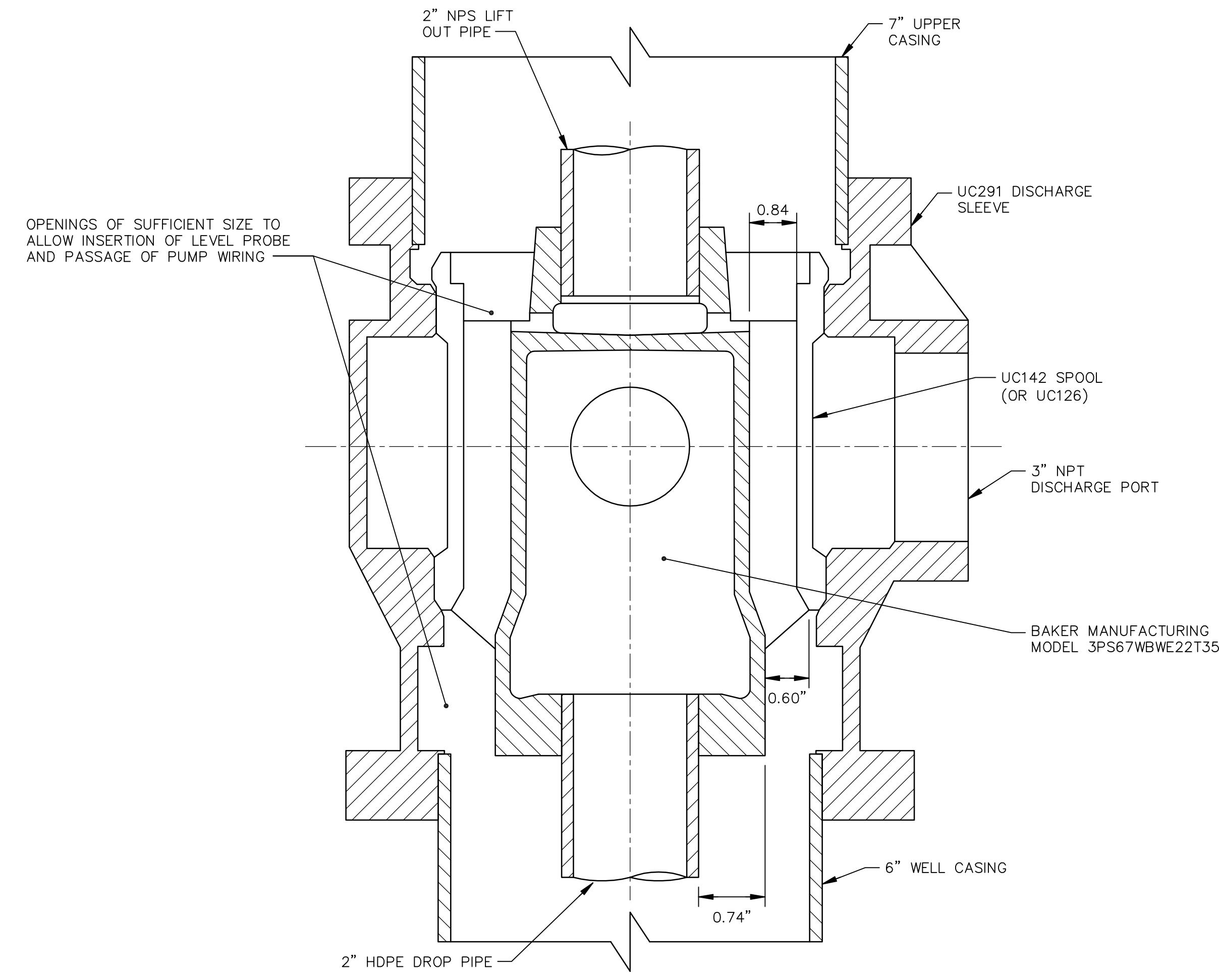
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PLAN
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TYPICAL RECOVERY WELL DETAIL
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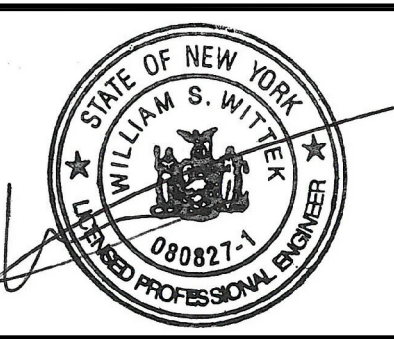
PITLESS ADAPTER
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WELL INSTALLATION PROCEDURE:

- EXCAVATE TO 4' AROUND WELL CASING TO PRODUCE A 6' x 6' x 4' DEEP AREA FOR SETTING CONCRETE MANHOLE WELL ENCLOSURE.
- WELD PITLESS ADAPTER TO 6" WELL CASING PIPE.
- WELD 7' x 18" LONG UPPER CASING ON PITLESS ADAPTER.
- CONNECT EXISTING 3" (OR 4") HDPE PIPE TO PITLESS ADAPTER USING 3" HDPE PIPE WITH 3" MALE NPT END.
- BACKFILL EXCAVATION TO DEPTH OF 2' BELOW GRADE (BED HDPE PIPE IN SAND OR PEA GRAVEL PRIOR TO BACKFILL).
- SET 4' CONCRETE MANHOLE WELL ENCLOSURE.
- INSTALL CONDUIT TO INSIDE OF MANHOLE ENCLOSURE AND ATTACH JUNCTION BOX TO MANHOLE INTERIOR.
- PULL PUMP POWER WIRING TO MANHOLE VIA NEW CONDUIT.
- PREPARE PUMP BY ATTACHING THE APPROPRIATE LENGTH OF 2" HDPE PIPE (OUT FITTED WITH THE INTERNAL COMPONENT OF THE PITLESS ADAPTER) THE APPROPRIATE LENGTH OF 3/32" Ø SUPPORT CABLE AND THE APPROPRIATE LENGTH OF ELECTRICAL POWER CABLES.
- TEMPORARILY CONNECT POWER TO PUMP AND BUMP PUMP TO CHECK FOR PROPER ROTATION. MARK WIRES TO NOTE PROPER CONNECTIONS, AND THEN DISCONNECT TEMPORARY ELECTRICAL CONNECTION TO THE PUMP.
- INSTALL THE WELL PUMP TO THE APPROPRIATE DEPTH.
- SECURE 3/32" SUPPORT CABLE TO EYE HOOK INSTALLED IN THE UPPER WELL CASING ABOVE THE PITLESS ADAPTER.
- THREAD PUMP POWER CABLES THROUGH WELL SEAL AND INSTALL WELL SEAL.
- MAKE ELECTRICAL CONNECTIONS TO PROVIDE POWER TO PUMP.
- PLACE COVER ON MANHOLE WELL ENCLOSURE.
- BACKFILL AND COMPACT AREA AROUND MANHOLE WELL ENCLOSURE.
- RESTORE ANY DISTURBED SURFACES TO ORIGINAL CONDITION.

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Professional Engineer's Name	WILLIAM S. WITTEK		
Professional Engineer's No.	080827		
State	Date Signed	Project Mgr.	
NY	8/28/08	CSG	
Designed by	Drawn by	Checked by	
CDL	TEM	TEM	

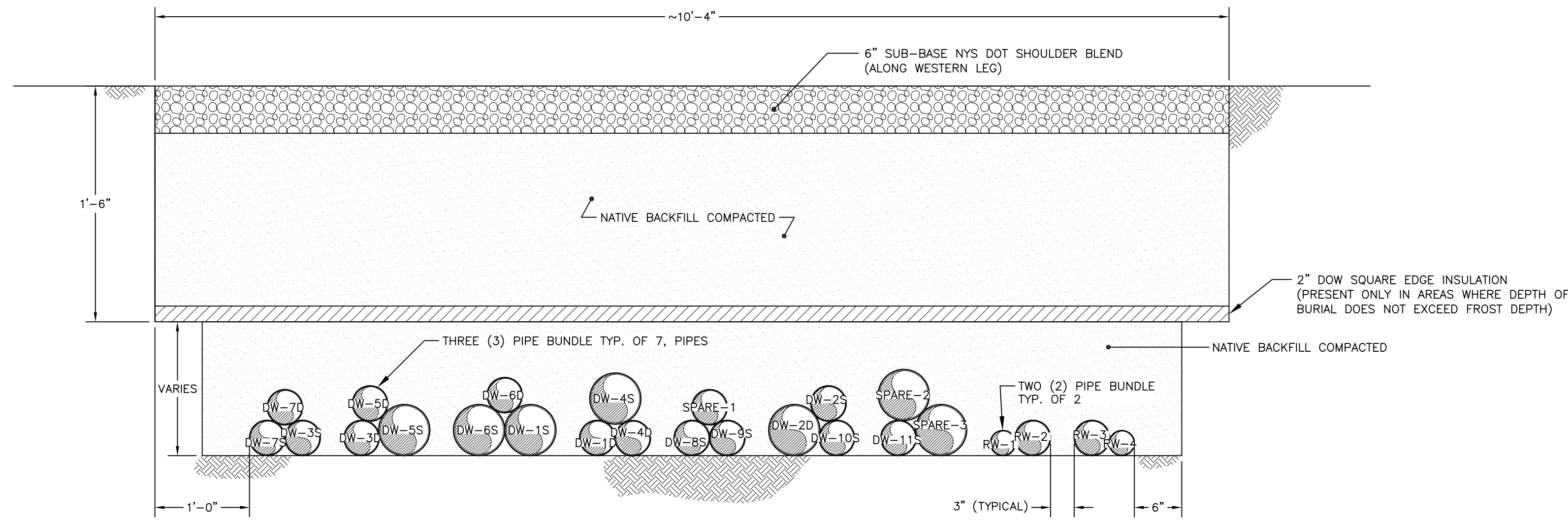


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WELL DETAIL

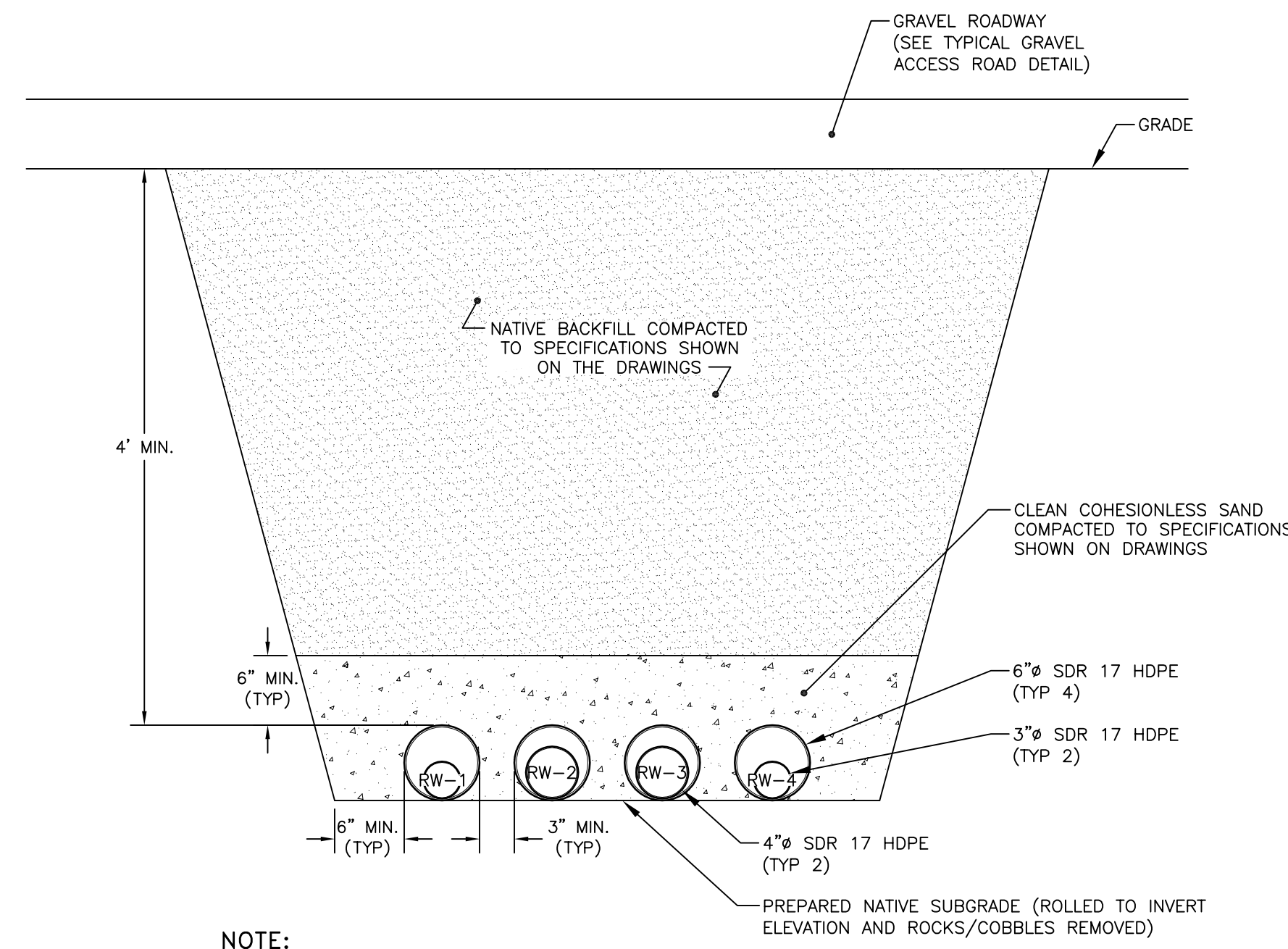
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Date	AUGUST 2008
ARCADIS	6723 Towpath Road P.O. Box 66 Syracuse, NY 13214 Tel: 315.446.9120



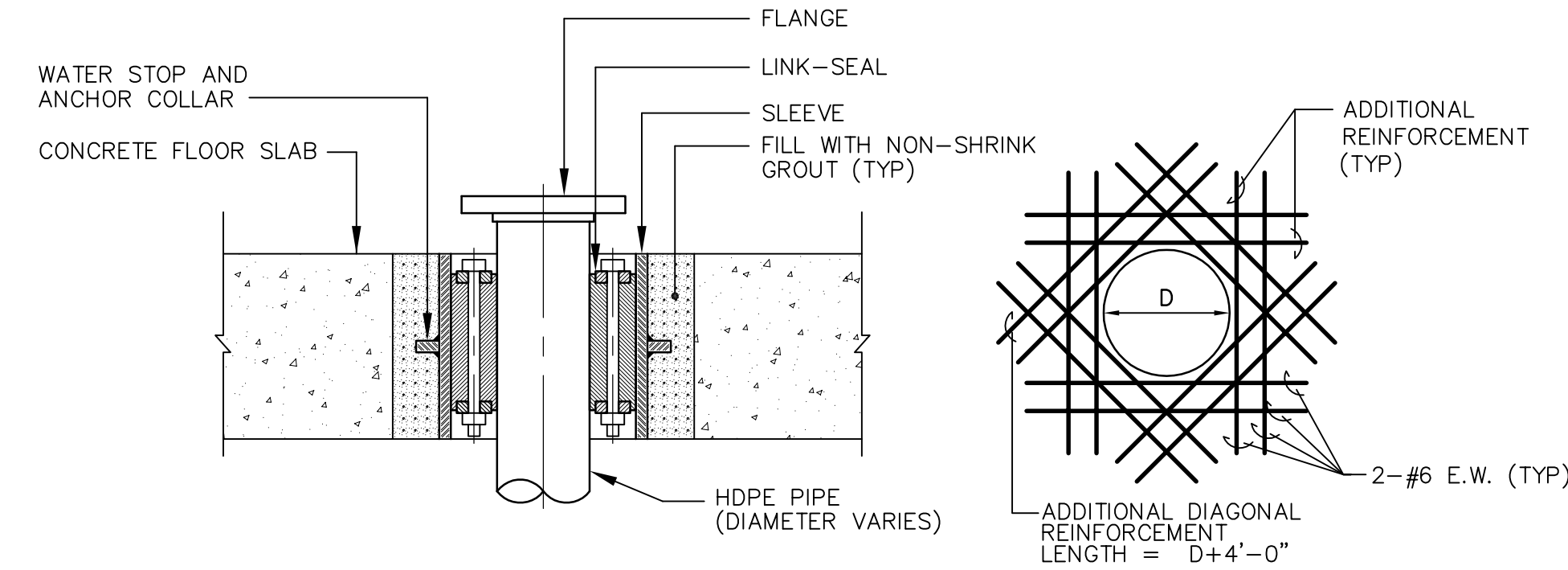
NOTE:
DEPTH OF TRENCH VARIES FROM 2'-6" TO 5'-0".

EXISTING TRENCH DETAIL 1
NOT TO SCALE



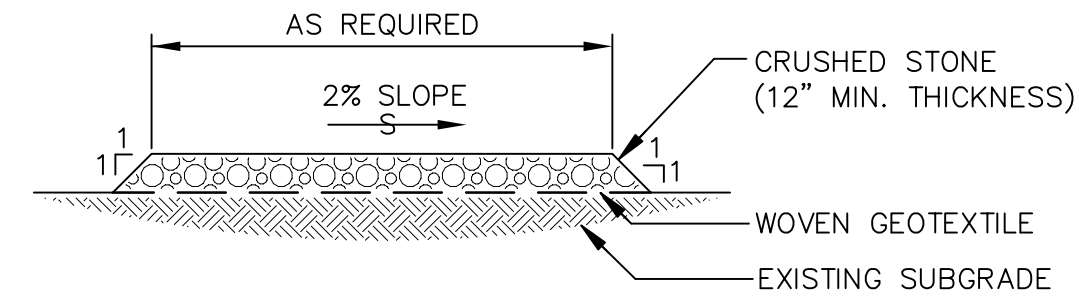
NOTE:
1. GRAVEL ROADWAY TO BE RESTORED TO ORIGINAL CONDITIONS.

TRENCH DETAIL AT GRAVEL ROADWAY CROSSING 2
NOT TO SCALE



NOTE:
EXTEND REINFORCEMENT A MINIMUM OF 48 BAR DIAMETERS BEYOND THE FACE OF THE OPENING

TYPICAL FLOOR SLAB PENETRATION 3
NOT TO SCALE



TYPICAL GRAVEL ACCESS ROAD DETAIL 4
NOT TO SCALE

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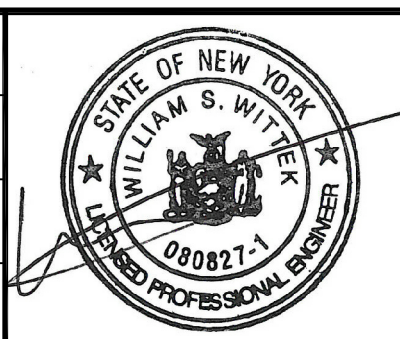
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Professional Engineer's Name WILLIAM S. WITTEK	
Professional Engineer's No. 080827	
State NY	Date Signed 8/28/08
Designed by CDL	Project Mgr. CSG
Drawn by	Checked by TEM

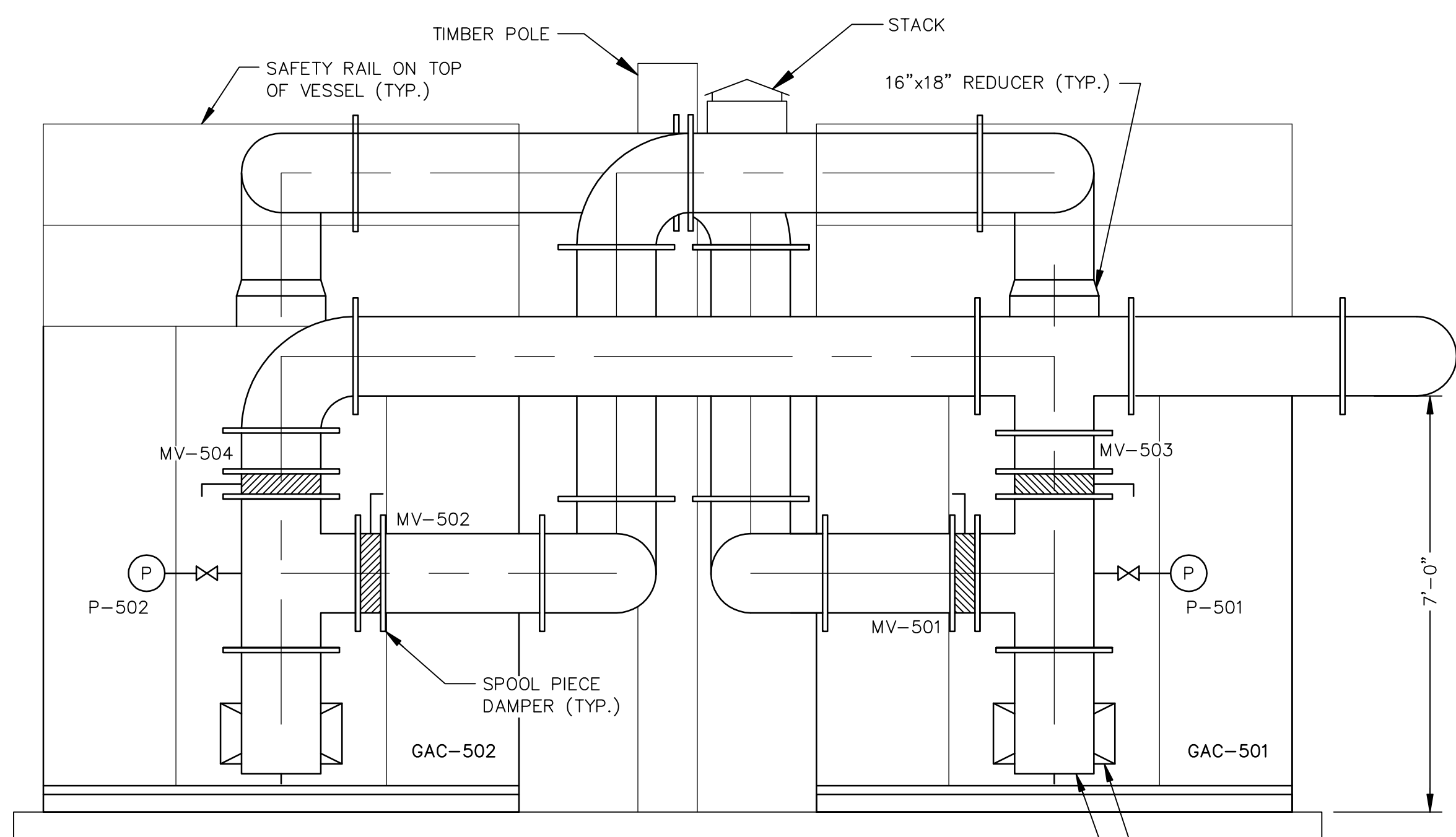


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OPERABLE UNIT 3 - FORMER GRUMMAN SETTLLING PONDS

MISCELLANEOUS SECTIONS AND DETAILS

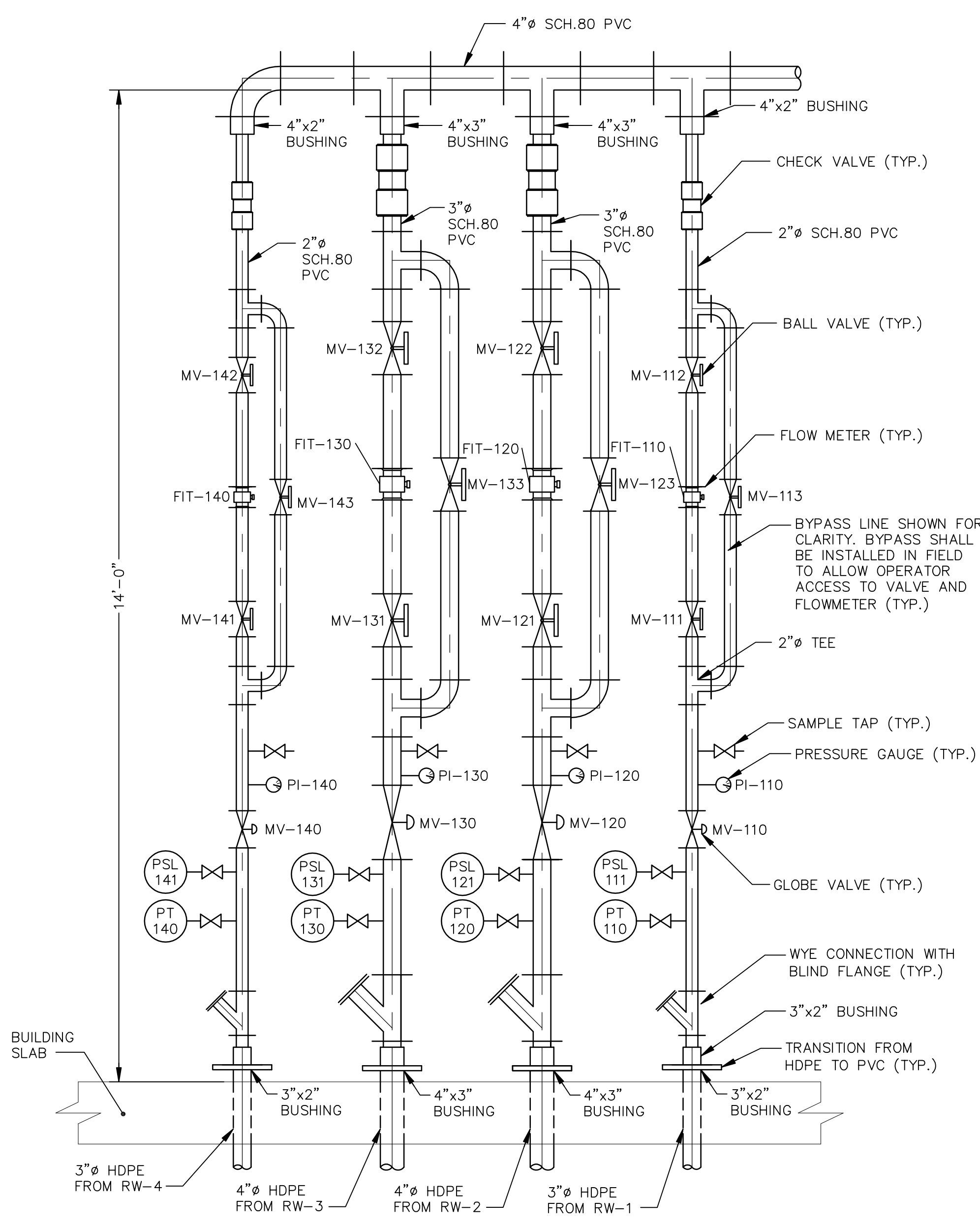
ARCADIS Project No. NY001464.1807.00003
Date AUGUST 2008
ARCADIS 6723 Towpath Road (P.O. Box 66) Syracuse, NY 13214 Tel: 315.446.9120

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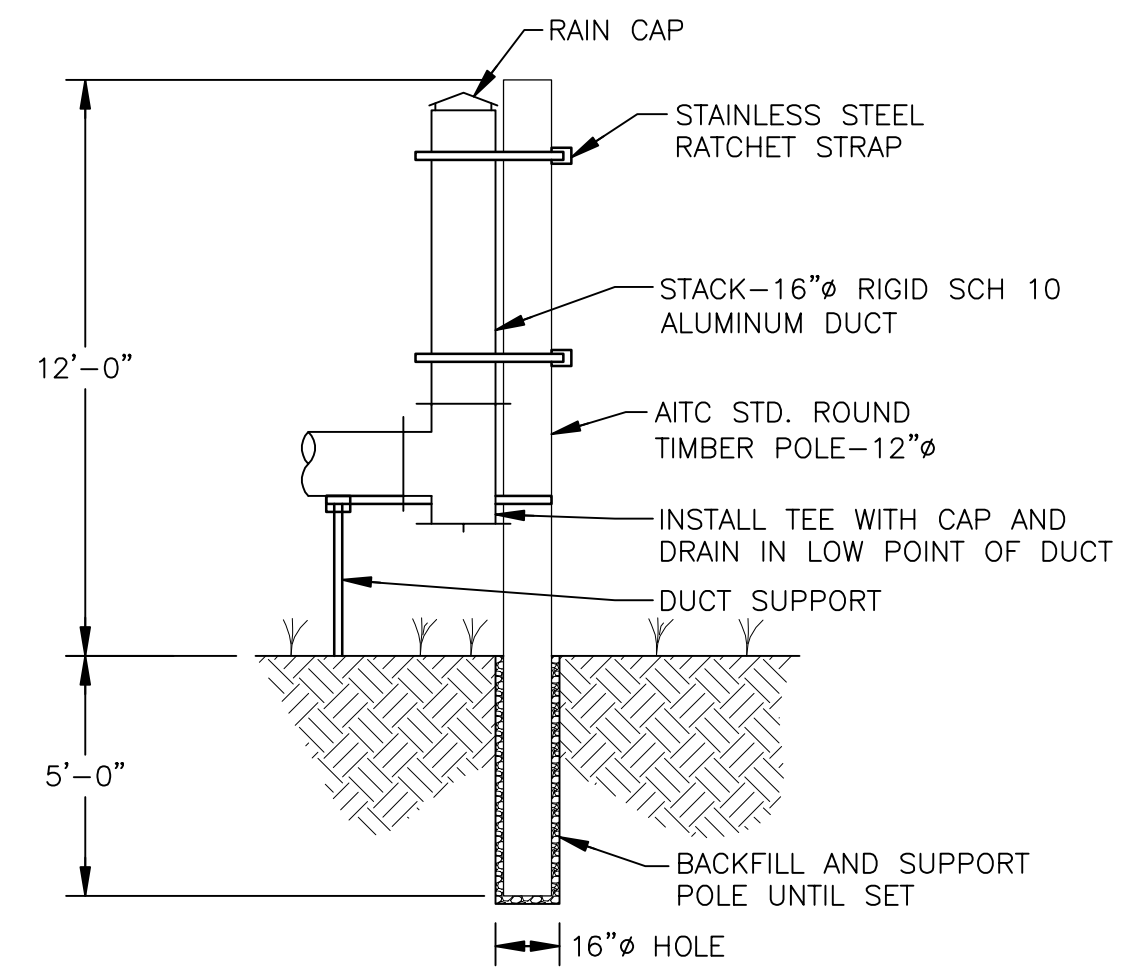


- NOTE:**
- ALL DUCTING WILL BE INSULATED WITH TRYMER 2000 FOAM INSULATION NOT SHOWN ON THIS DETAIL FOR CLARITY. SEE CONTRACT DRAWING 11 FOR SPECIFICATIONS.
 - ECU'S SHALL BE INSULATED.

DUCT PROFILE 1
 SCALE: 1/2"=1'-0"



INFLUENT PIPE PROFILE 2
 SCALE: 3/4"=1'-0"



- NOTE:**
- OTHER OPTIONS TO SUPPORT STACK WILL BE DETERMINED IN THE FIELD.

STACK DETAIL 5
 NOT TO SCALE

SCALE(S) AS INDICATED				
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Professional Engineer's Name WILLIAM S. WITTEK		
Professional Engineer's No. 080827		
State NY	Date Signed 8/28/08	Project Mgr. CSG
Designed by CDL	Drawn by BKD	Checked by TEM



NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
 OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS
MISCELLANEOUS SECTIONS AND DETAILS
 MECHANICAL

ARCADIS Project No. NY001464.1807.00003
Date AUGUST 2008
ARCADIS 6723 Towpath Road (P.O. Box 66) Syracuse, NY 13214 Tel: 315.446.9120

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INSTRUMENT SPECIFICATIONS:

1. FLOWMETERS SHALL BE 2-INCH (FIT-110, -140), 3-INCH (FIT-120, -130) or 4-INCH (FIT-700) MAGNETOFLW BADGER MAGNETIC WAFER-STYLE FLOWMETERS OR EQUAL WITH LINER SUITABLE FOR WATER SERVICE, 316 SS ELECTRODES, GROUNDING RINGS, AND INTEGRAL MOUNT ELECTRONICS WITH LOCAL RATE AND TOTAL DISPLAY.
2. LIQUID PRESSURE TRANSMITTERS (PT-110, -120, -130, -140, -700) SHALL BE FOXBORO MODEL IGP10-T22D1F-M1L1 GAUGE PRESSURE TRANSMITTER OR EQUAL WITH LOCAL DISPLAY, 10-300 PSI RANGE, STAINLESS STEEL WETTED MATERIAL, 4-20 MA OUTPUT, LOOP POWERED.
3. AIR PRESSURE TRANSMITTER (PT-500) SHALL BE FOXBORO MODEL IGP20-T22B21F-M1L1 GAUGE PRESSURE TRANSMITTER OR EQUAL WITH LOCAL DISPLAY, 3.5-200 INCHES H2O RANGE, STAINLESS STEEL WETTED MATERIAL, 4-20 MA OUTPUT, LOOP POWERED.
4. TEMPERATURE TRANSMITTERS (TT-500 - TT-900) SHALL BE FOXBORO MODEL RTT15-T1WCQNAF-L1 INSERTION-STYLE TEMPERATURE TRANSMITTER OR EQUAL WITH LOCAL DISPLAY, NEMA RATED ENCLOSURE, 3-INCH RTD WITH NO WELL, 4-20 MA OUTPUT, LOOP POWERED.
5. AIR FLOW METER (FIT-500) SHALL BE SIERRA MODEL 620S-L06M1EN2V4DD0 INSERTION-STYLE THERMA MASS METER OR EQUAL FOR AIR FLOW, 18-30 VDC, 3/8-INCH DIAMETER PROBE, 4-20 MA OUTPUT WITH DISPLAY.
6. TEMPERATURE INDICATORS (TI-501, -601) SHALL BE WIKA MODEL 232 OR EQUAL 3-INCH INSERTION-STYLE BIMETAL THERMOMETER WITH 4-INCH STEM, LOWER MOUNT, 316 SS WELL WITH U OF 2.5 INCHES, 0-140°F RANGE.
7. LIQUID PRESSURE GAUGES (PI-110, -120, -130, -140, -800) SHALL BE WIKA MODEL 232 OR EQUAL 4.5-INCH PROCESS GAUGE WITH LOWER MOUNT, 316 SS CONNECTION, 0-30 PSI RANGE.
8. AIR PRESSURE GAUGES (PI-501, -502, -601, -602, -603) SHALL BE WIKA MODEL 232 OR EQUAL 4.5-INCH LOW PRESSURE PROCESS GAUGE WITH LOWER MOUNT, 316 SS CONNECTION, 0-20 INCHES H2O RANGE.
9. LEVEL SWITCH (LSL-300) SHALL BE GEMS MODEL MBLU40T OR EQUAL FLOAT SWITCH, NORMALLY OPEN OUTPUT WITH 40' CABLE.
10. PRESSURE SWITCH (PSL-111, -121, -131, -141) SHALL BE ASHCROFT TYPE 400 B SERIES WITH WATER TIGHT ENCLOSURE AND DUAL SPDT SWITCHES. 15 PSI MAXIMUM RANGE.

CONTROL SYSTEM SPECIFICATIONS

1. CONTROL SYSTEM SHALL BE AN ALLEN-BRADLEY PLC CONTROL SYSTEM WITH THE FOLLOWING FEATURES:
 SLOT RACK
 SLC 5/04 CONTROLLER
 ETHERNET MODULE
 POWER SUPPLY
 ANALOG INPUT MODULES
 ANALOG OUTPUT MODULES
 DC INPUT MODULES
 DC OUTPUT MODULES
 UPS AND POWER-LOSS SENSOR
2. CONTROL SYSTEM USER INTERFACE SHALL BE AN ARISTA ARP-1715BP-RB103H-T PC WITH THE FOLLOWING FEATURES:
 STANDARD POWER COATED ALUMINUM
 15" ELO RESISTIVE TOUCH DISPLAY
 P4 2.8GHZ CPU
 RAM 1 GB
 HARD DRIVE 40 GB
 CD ROM
 OPERATING SYSTEM XP PROFESSIONAL
 AC POWER SUPPLY
 INCREASED CONTROL PANEL DEPTH
 ADDITIONAL PROGRAM AND TEST TIME ADDED
3. SYSTEM AUTODIALER SHALL BE A SENSAPHONE WITH TELULAR CELLULAR MODEM CELL MODEM SHALL INCLUDE AN EXTERNAL ANTENNA WITH 15' OF WHIP

MAJOR EQUIPMENT SPECIFICATIONS

1. WELL PUMPS (P-110, -140) SHALL BE GRUNDFOS MODEL 40S30-9 OR EQUAL SUBMERSIBLE WELL PUMPS WITH 3 HP, 460 V, 3 PHASE MOTORS CAPABLE OF 40 GPM AT 200 FEET TDH.
2. WELL PUMPS (P-120, -130) SHALL BE GRUNDFOS MODEL 75S75-9 OR EQUAL SUBMERSIBLE WELL PUMPS WITH 7.5 HP, 460 V, 3 PHASE MOTORS CAPABLE OF 85 GPM AT 200 FEET TDH.
3. AIR STRIPPER (AS-400) SHALL BE BISCO ENVIRONMENTAL/NEEP SYSTEMS MODEL 31261 SHALLOW TRAY SYSTEM OR EQUAL WITH 6 TRAYS, 316 SS CONSTRUCTION, WITH A MAXIMUM FLOW RATE OF 425 GPM, AND THE FOLLOWING COMPONENTS MOUNTED ON THE EQUIPMENT SKID:
 INDUCED-DRAFT BLOWER (B-400) WITH A 40 HP, 460V, 3 PHASE MOTOR CAPABLE OF 1800 CFM AT A PRESSURE OF 45" W.C.
 DISCHARGE PUMP (P-400) WITH A 7.5 HP, 460 V, 3 PHASE MOTOR CAPABLE OF 250 GPM AT 75 FEET TDH CONTROLLED BY A VARIABLE FREQUENCY DRIVE BASED ON LIQUID LEVEL IN THE STRIPPER SUMP.
 INSTRUMENTATION AS SHOWN ON CONTRACT DRAWING 4.
 LOCAL CONTROL PANEL WITH FAIL SAFE CIRCUITRY DRY CONTACTS OUTPUTS TO MAIN TREATMENT SYSTEM PLC; SEE CONTRACT DRAWING 6 FOR INTERLOCK REQUIREMENTS.
4. BAG FILTER VESSELS (BF-401, -402, -403, -404) SHALL BE FILTRATION SYSTEMS MODEL NC-223-V OR EQUAL BAG FILTER HOUSING OF CARBON STEEL CONSTRUCTION RATED AT 150 PSIG.
5. GRANULAR ACTIVATED CARBON VESSELS (C-501, -502) SHALL BE TIGG MODEL NB-8 VAPOR-PHASE ADSORBER OR EQUAL OF CARBON STEEL CONSTRUCTION CONTAINING 6,000 LBS. OF GAC PER VESSEL.
6. POTASSIUM PERMANGANATE VESSELS (PM-601, -602) SHALL BE TIGG MODEL NB-8 VAPOR-PHASE ADSORBER OR EQUAL OF CARBON STEEL CONSTRUCTION CONTAINING 12,000 LBS. OF POTASSIUM PERMANGANATE PER VESSEL.
7. BOOSTER PUMP (P-800) SHALL BE DAVEY MODEL HS12-40HT1 OR EQUAL WITH 304 SS CASING AND SHAFT, EPOXY-COATED STEEL PRESSURE TANK, AND 120 V, SINGLE PHASE, 0.9 KW MOTOR CAPABLE OF 12 GPM AT 40 PSI TDH.
8. EFFLUENT HOLDING TANK (T-800) SHALL BE CHEMTAINER MODEL TA35771A OR EQUAL WITH 300-GALLON CAPACITY AND LINEAR HIGH DENSITY POLYETHYLENE CONSTRUCTION.
9. SUMP PUMP (P-900) SHALL BE HYDROMATIC MODEL OSP50M1 OR EQUAL MANUALLY CONTROLLED SUMP PUMP WITH A 1/2 HP, 115 V, SINGLE PHASE MOTOR CAPABLE OF 30 GPM AT 20 FEET TDH.
10. PITLESS ADAPTER SHALL BE BAKER MANUFACTURING MODEL 3PS67WBWE22T3S 6-INCH STANDARD INDUSTRIAL PITLESS UNIT OR EQUAL WITH 3-INCH OUTLET, 2-INCH DROP PIPE AND 6-INCH LOWER AND 7-INCH UPPER WELDED CASING CONNECTIONS.

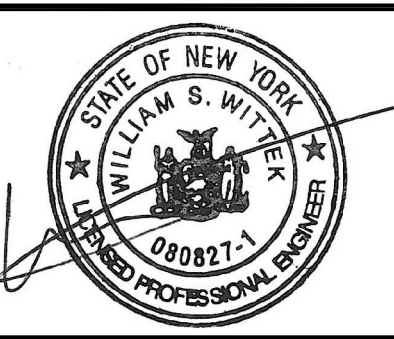
MECHANICAL SPECIFICATIONS

1. ALL ABOVE-GROUND PIPING SHALL BE PVC SCHEDULE 80.
2. ALL PVC PIPE JOINTS SHALL BE SOLVENT WELDED.
3. ALL UNDERGROUND HDPE PIPE SHALL BE HDPE SDR 17, UNLESS OTHERWISE SPECIFIED.
4. ALL HDPE PIPES SHALL BE BUTT-FUSED.
5. ALL PIPE SHALL BE INSTALLED AND PRESSURE TESTED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS. ZERO LEAKAGE IS ALLOWED FOR ALL JOINTS.
6. ALL PIPE SHALL BE SUPPORTED AT 7'-0" O.C. (MAX.) AND LOCATED 2'-0" FROM ALL JOINT LOCATIONS. PIPING SHALL BE SUPPORTED PRIMARILY BY THE BUILDING FLOOR SLAB.
7. BALL VALVES SHALL BE PVC TRUE UNION BALL VALVES WITH VITON O-RING SEAL, TEFLON SELF-LUBRICATING SEATS, TIGHT SHUTOFF IN EITHER DIRECTION, FULL PORT DESIGN, SOLVENT WELDED SOCKET ENDS AND OPERATING HANDLE. MANUFACTURER: HAYWARD, NIBCO, PLASTO-MATIC, OR EQUAL.
8. GLOBE VALVES SHALL BE ASAHI MANUAL CONTROL VALVES OF PVC CONSTRUCTION WITH EPDM SEALS, AND SOCKET CONNECTIONS.
9. MOTORIZED BLOCK VALVES (MBV-501, -502) SHALL CONSIST OF A BALL VALVE WITH HAYWARD SERIES EJM ELECTRIC ACTUATOR, 115VAC EQUIPPED WITH POSITION INDICATOR.
10. CHECK VALVES SHALL BE SWING CHECK TYPE WITH VITON SEATS. MANUFACTURER: HAYWARD, NIBCO, PLASTO-MATIC, OR EQUAL.
11. SAMPLE TAPS AND DRAIN VALVES SHALL CONSIST OF A 1/2" DIAMETER PVC PIPE EXTENSION, BALL VALVE AND NIPPLE. SAMPLE TAPS AND DRAIN VALVES SHALL BE LOCATED AT LOCATIONS SHOWN ON THE DRAWINGS AND AT ALL LOW ELEVATIONS IN THE PROCESS PIPING.
12. ALL FLOW METERS SHALL HAVE STRAIGHT PIPE AT A MINIMUM OF 10 PIPE DIAMETERS PRECEDING AND 5 PIPE DIAMETERS FOLLOWING, OR AS SPECIFIED BY THE MANUFACTURER.
13. SPOOL PIECES SHALL BE 16"Ø STAINLESS STEEL HEAVY DUTY AIR ISOLATION/CONTROL DAMPER WITH MANUAL ACTUATOR, AMERICAN HEATING & VENTILATION MODEL VC-56, MODIFIED FOR LOWER LEAK RATES AT HIGHER PRESSURE.
14. WELL VAULT ACCESS COVER SHALL BE BILCO MODEL J-2ALH20 OR EQUAL WITH 1/2" ALUMINUM DIAMOND PATTERN PLATE COVER, 1/2" ALUMINUM CHANNEL FRAME WITH RECESSED ANCHORS, CONTINUOUS EPDM DEBRIS GASKET, RATED FOR H2O LOADING.
15. DUCT SHALL BE 16"Ø SCH. 10 ALUMINUM DUCT WITH TRYMER 2000 FOAM INSULATION WITH WHITE PVC/POLYESTER COVER. COMBINED WEIGHT 9.25 POUNDS/ LINEAR FOOT WITH 1/4" THICK FLANGES, STAINLESS STEEL BOLTING, AND 1/8" NEOPRENE GASKETS.
16. ALL DUCT SHALL BE SUPPORTED AT 10'-0" C.C. (MAX.) AND LOCATED 2'-0" FROM ALL JOINT LOCATIONS. SUPPORTS SHALL BE ANCHORED TO THE EQUIPMENT SLAB AND PROTECTIVE SLEEVES SHALL BE USED FOR ALL INSULATED DUCT.
17. ECU'S SHALL BE INSULATED WITH 2-INCH RIGID STYROFOAM BOARDS FINISHED WITH STUCCO-EMBOSSED ALUMINUM JACKETING.

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Professional Engineer's Name WILLIAM S. WITTEK				
Professional Engineer's No. 080827				
State	Date Signed	Project Mgr.		
NY	8/28/08	CSG		
Designed by	Drawn by	Checked by		
CDL	KLS	TEM		



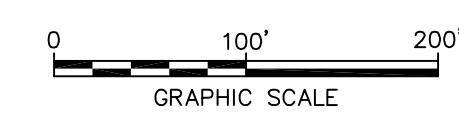
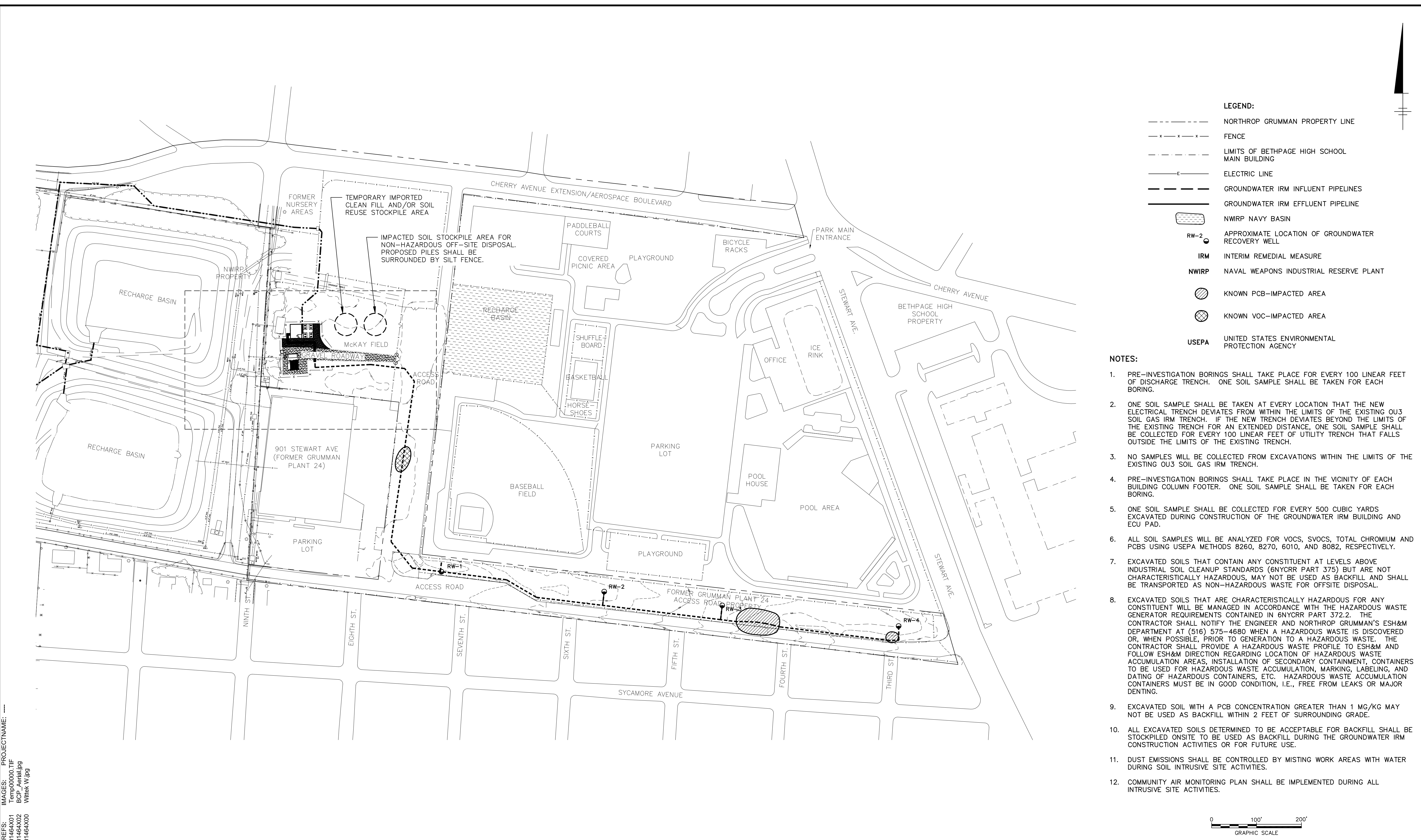
NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
 OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

SPECIFICATIONS

MECHANICAL

ARCADIS Project No. NY001464.1807.00003
Date AUGUST 2008
ARCADIS 6723 Towpath Road (P.O. Box 66) Syracuse, NY 13214 Tel: 315.446.9120

CITY: SYRACUSE DIV: GROUP: 85 DB: GHS: KFS LD: GHS: PIC: PM: TM: LYRONE: OFF: REF: G:\CAD\ACT\NY0014641807\00003\DWG\01464G09.dwg LAYOUT: 12 SAVED: 7/25/2008 4:14 PM ACADVER: 17.05 (LWS TECH) PAGES: 17 OF 17 PLOTTED: 8/28/2008 5:37 PM BY: STEINBERGER, GEORGE



EMISSIONS SHALL BE CONTROLLED BY MISTING DURING SOIL INTRUSIVE SITE ACTIVITIES.

COMMUNITY AIR MONITORING PLAN SHALL BE IMPLEMENTED DURING SOIL INTRUSIVE SITE ACTIVITIES.

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Professional Engineer's Name
WILLIAM S. WITTEK

Professional Engineer's No.
080827

State
NY

Date Signed
8/28/08

Project Mgr.
CSG

Designed by
CDL

Drawn by
BKD

Checked by
TEM



ARCADIS

ARCADIS OF NEW YORK, INC.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK

OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

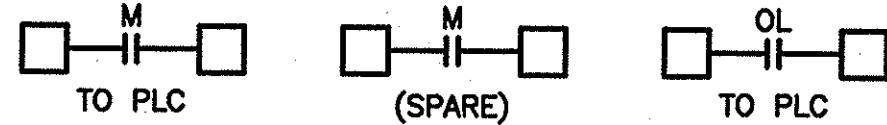
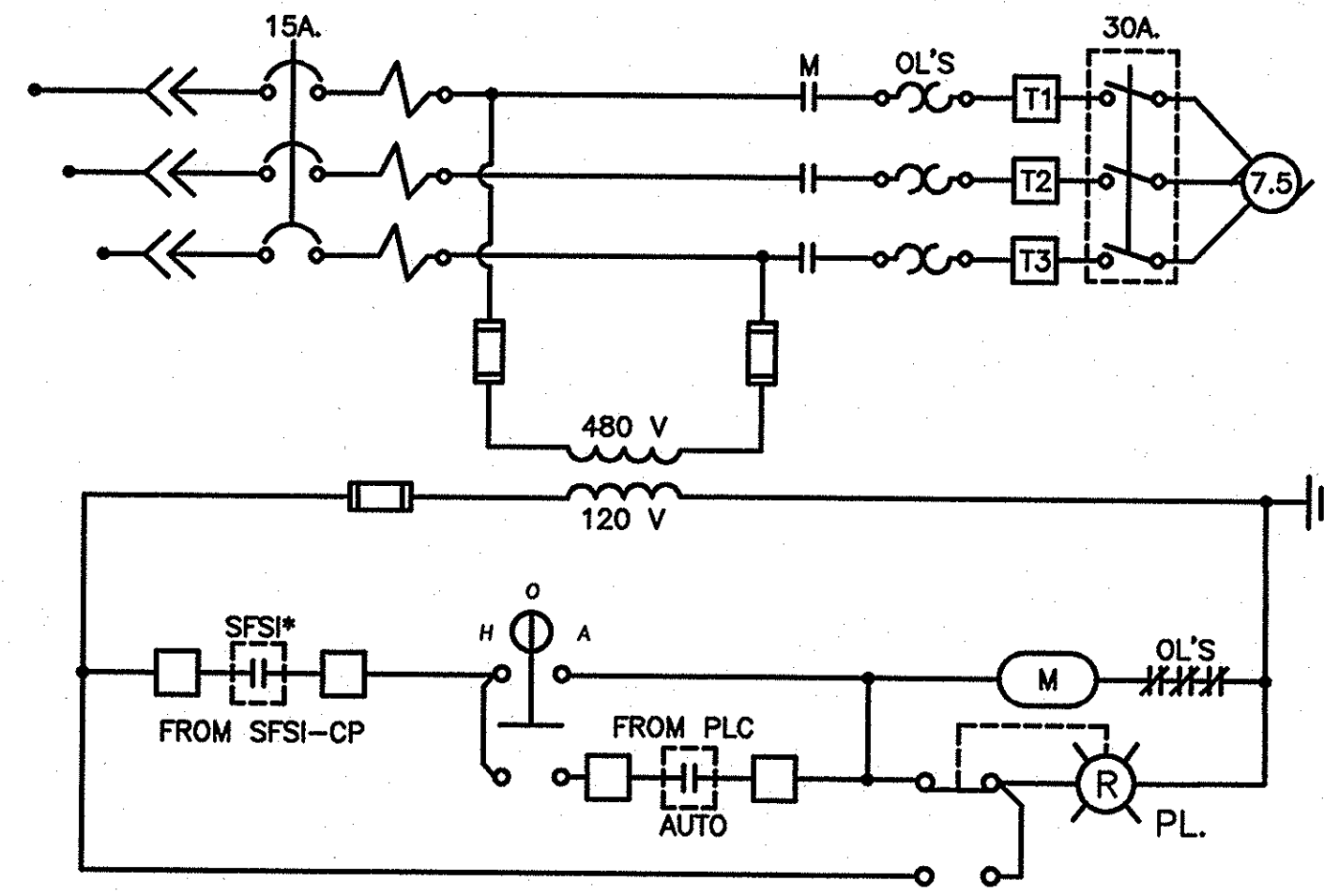
SOIL MANAGEMENT PLAN

ARCADIS Project No.
NY001464.1807.00003

Date
AUGUST 2008

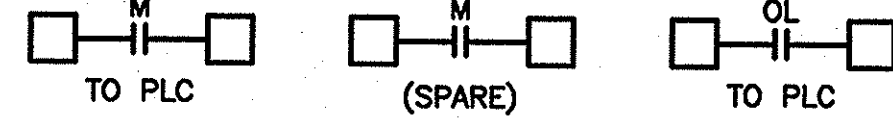
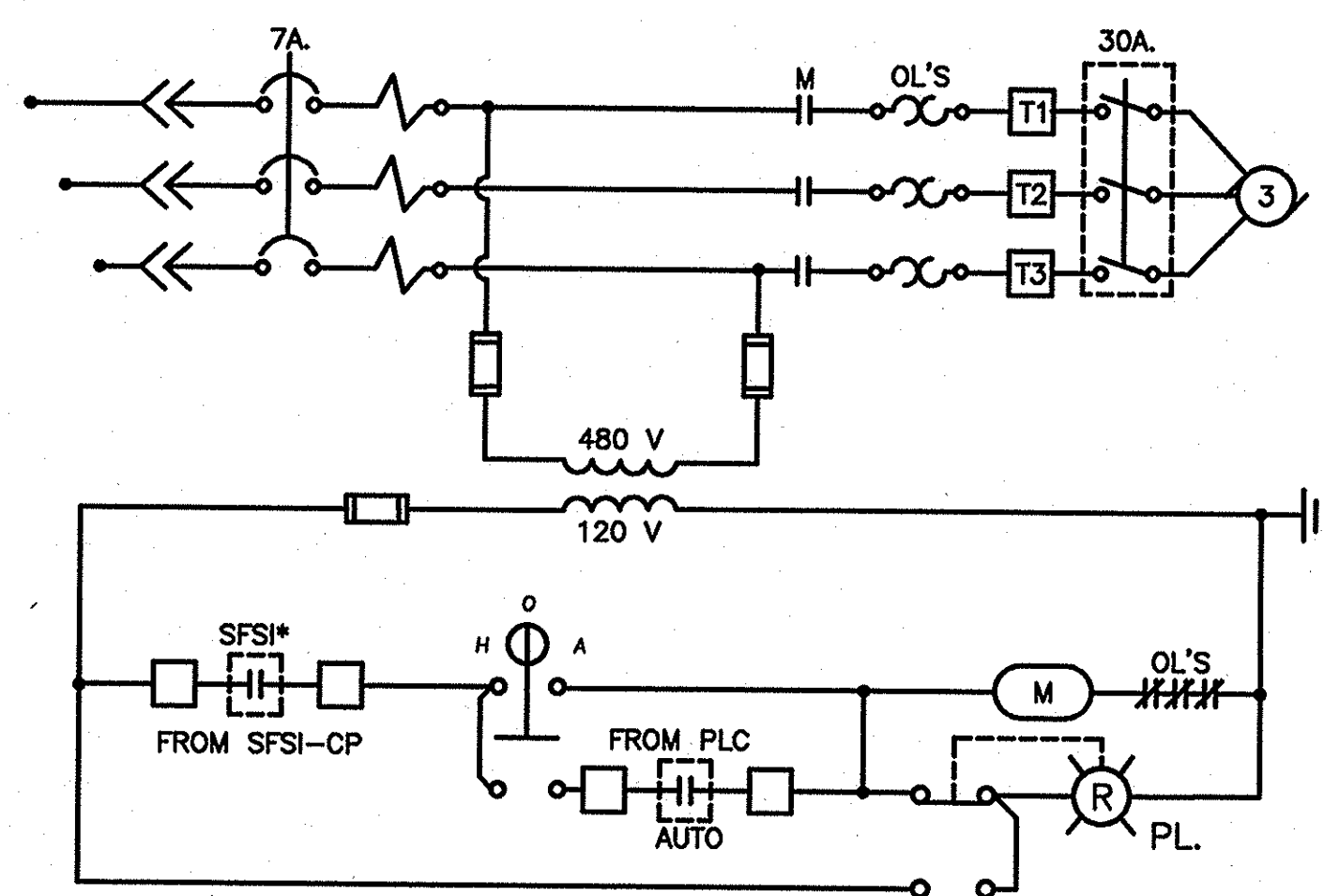
ARCADIS
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CITY:SYR-AY DIV/GRP:85 DB/GHS LD/GHS PIC: PM: TM: LYRONI=OFF=REF*
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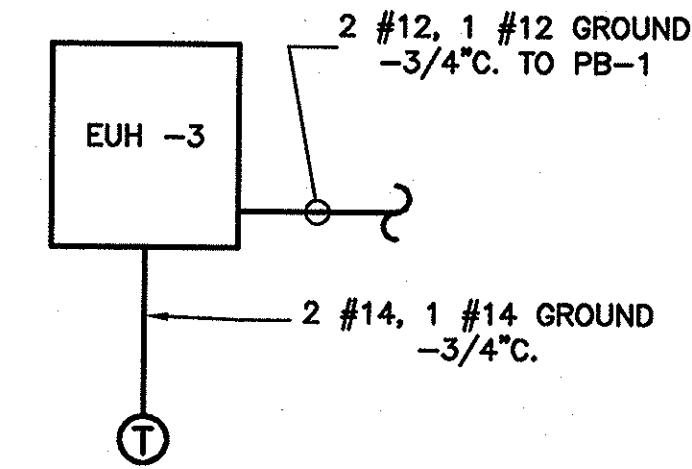
*SFSI = SECONDARY FAIL-SAFE INTERLOCK

SCHEMATIC RECOVERY WELL PUMP
(P-120 AND P-130 ARE SIMILAR)

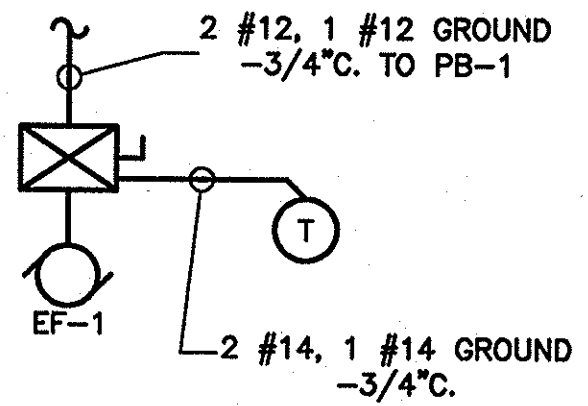


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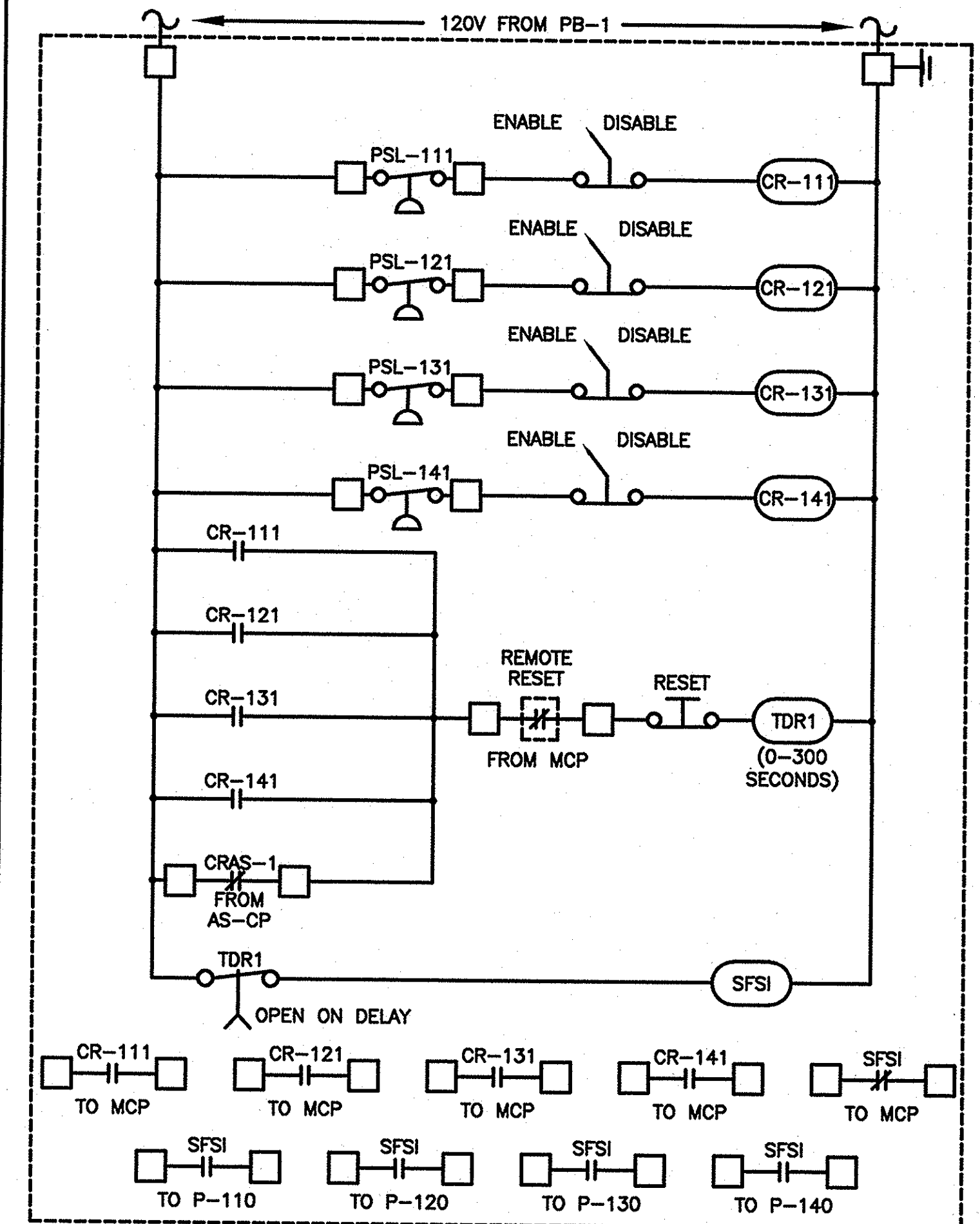
SCHEMATIC RECOVERY WELL PUMP
(P-110 AND P-140 ARE SIMILAR)



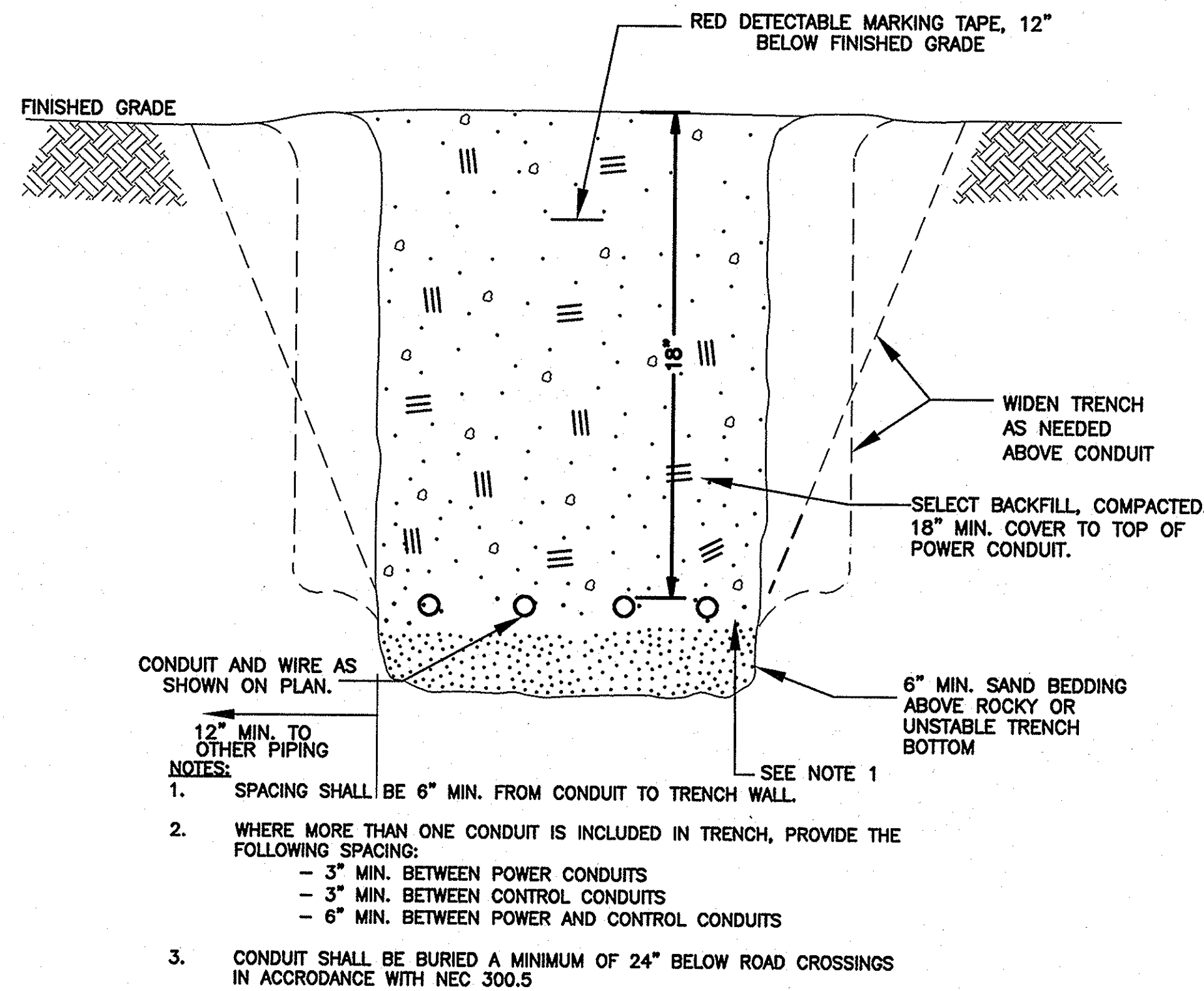
ELECTRIC UNIT HEATER (EUH-3) RISER DIAGRAM



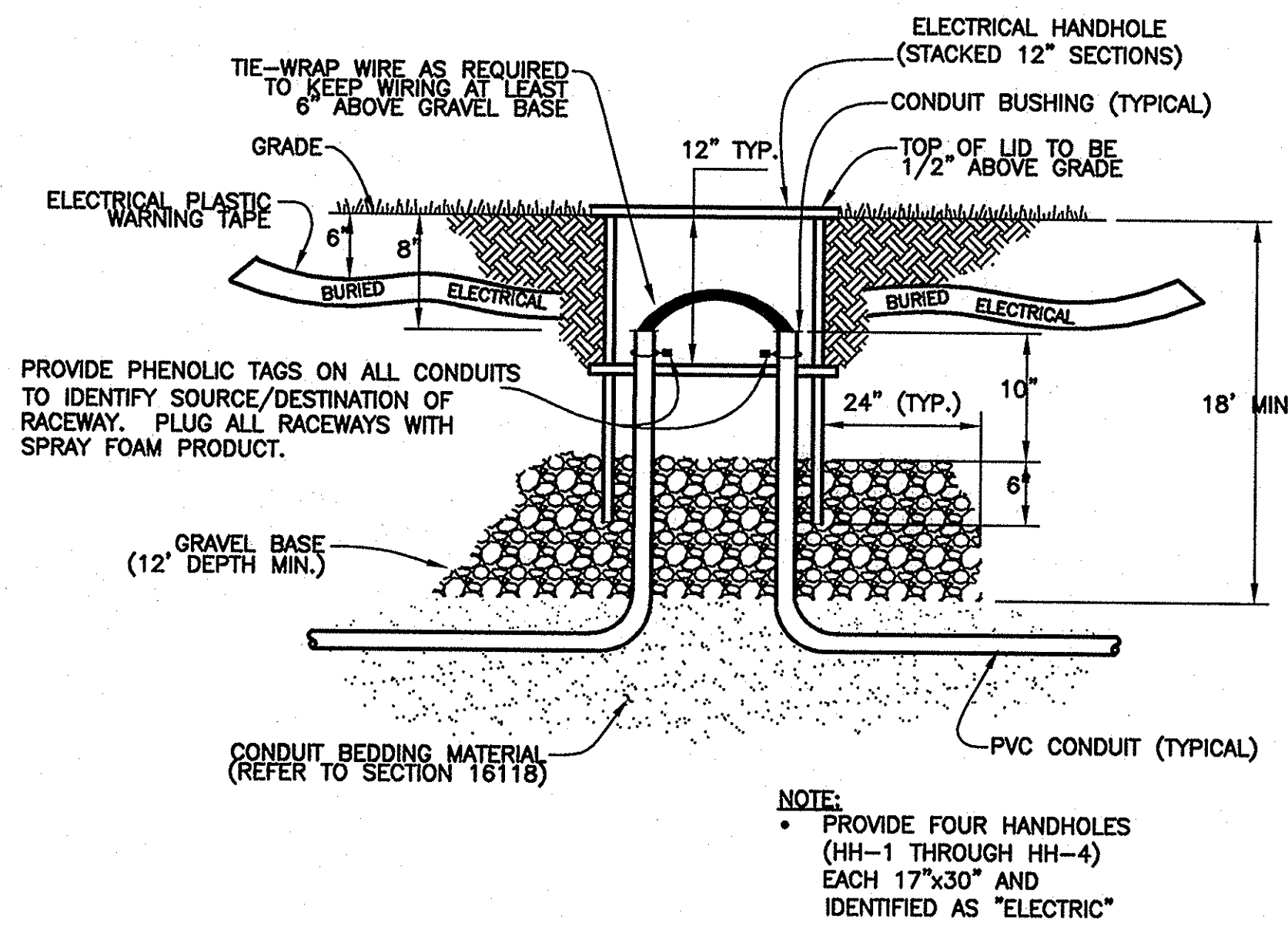
RISER EF-1
(EF-2 IS SIMILAR)



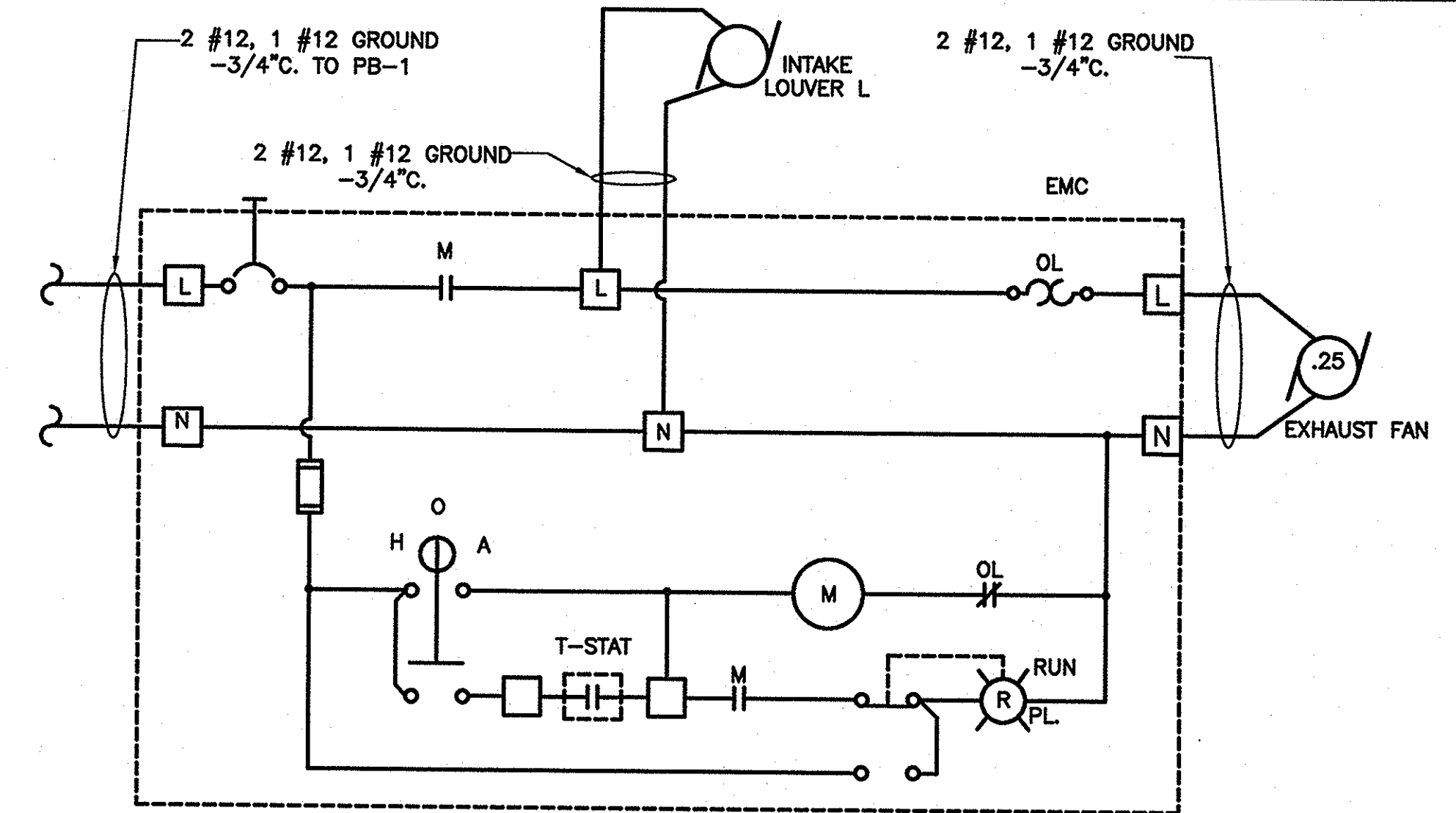
SECONDARY FAIL-SAFE INTERLOCK CONTROL PANEL (SFSI-CP)



ELECTRIC - TRENCH DETAIL
NO SCALE



SECTION ELECTRICAL HANDHOLE DETAIL
NO SCALE



EXHAUST FAN SCHEMATIC
(EF-1 AND EF-2 ARE SIMILAR)

NO SCALE

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING.

USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name
THOMAS P. ARMSTRONG JR.
 Professional Engineer's No.
 085236
 State
 NY
 Date Signed
 8-29-08
 Project Mgr.
 CSG
 Designed by
 TPA
 Drawn by
 EK
 Checked by
 TEM/WSW



NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
 OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

EQUIPMENT DETAILS AND SCHEMATICS

MECHANICAL

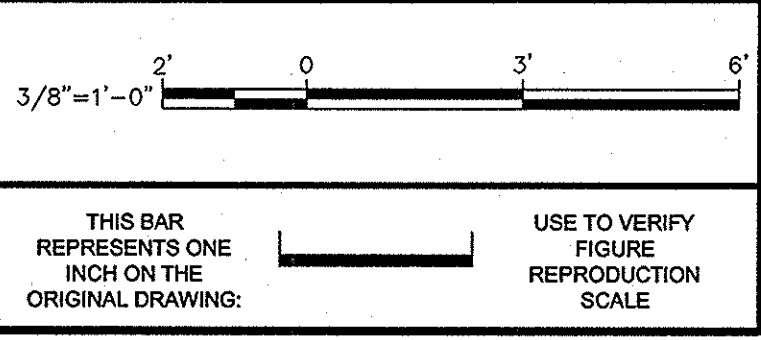
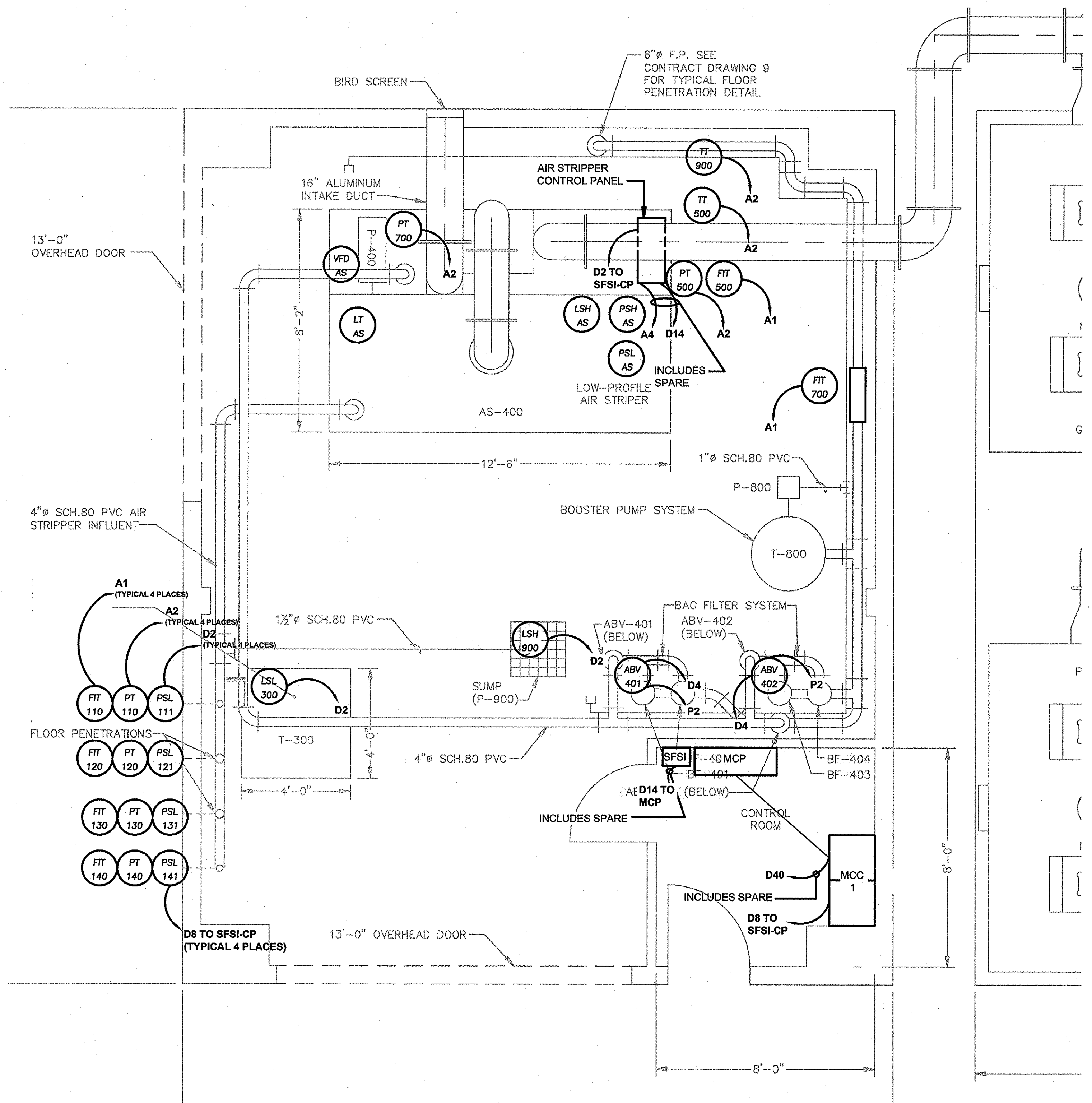
ARCADIS Project No.
 NY001464.1607.0003
 Date
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CITY: SYRACUSE DIV: GROUP: 06 DB: GHS LD: GHS PIC: PM: TM: LYRON: OFF: REF: C:\projects\001464\1401\elec\drawings - Recovery Well\AutoCAD Drawings\7-25-08\16 Electrical Plan Instrumentation\7-22-08.dwg LAYOUT: 16 SAVED: 7/25/2008 1:55 PM ACADVER: 17.15 (LMS TECH) PAGES: 16 BETHPAGE 06E 04X22 PLOTSTYLE: CTB PLOTTED: 8/29/2008
 PROJECT NAME: ---
 IMAGES: 01464X00 Equipment Layout
 XREFS:

CONDUCTOR WIRE			
SYMBOL	CONTROL WIRE	GROUND	CONDUIT
D2	2#14	1#14	3/4"
D4	4#14	1#14	3/4"
D8	8#14	1#14	3/4"
D14	14#14	1#14	3/4"
D40	40#14	1#14	1 1/4"
A1	(1) PR #18	1#14	3/4"
A2	(2) PR #18	1#14	3/4"
A4	(4) PR #18	1#14	3/4"
P2	2 #12	1#12	3/4"

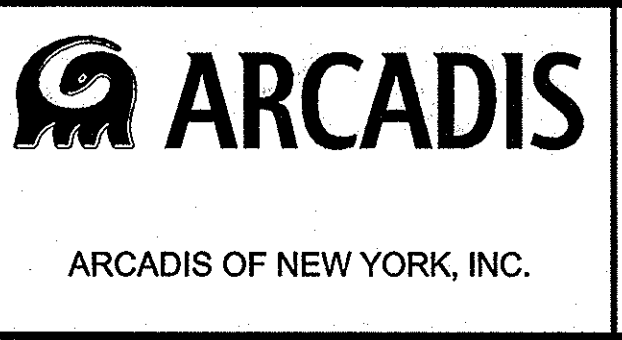
- NOTES**
- ALL CONTROL WIRE HOMERUNS SHALL TERMINATE IN MAIN CONTROL PANEL (MCP), UNLESS OTHERWISE NOTED.
 - REFER TO SHEET 14 FOR POWER CIRCUITING AND CONDUCTOR REQUIREMENTS.
 - SFSI-CP SHALL BE LOCATED ADJACENT TO MCP.
 - DISCRETE HOMERUNS MAY BE COMBINED IN ONE CONDUIT PROVIDED CONDUIT IS NO MORE THAN 40% FULL.
 - ANALOG HOMERUNS MAY BE COMBINED IN ONE CONDUIT PROVIDED CONDUIT IS NO MORE THAN 40% FULL.

- DESIGN ASSUMPTIONS**
- AUTODIALER IS INCLUDED IN MAIN CONTROL PANEL (MCP). THEREFORE, HARDWIRING TO AUTODIALER IS NOT SHOWN ON THESE DRAWINGS.
 - PLC ALARM INDICATION LIGHTS ARE INCLUDED WITHIN THE MCP. THEREFORE, HARDWIRING TO INDICATION LIGHTS ARE NOT SHOWN ON THESE DRAWINGS.
 - AIR STRIPPER INSTRUMENTATION WIRING BETWEEN DEVICES AND AIR STRIPPER CONTROL PANEL ARE PROVIDED BY AIR STRIPPER EQUIPMENT MANUFACTURER. THEREFORE, HARDWIRING FOR THESE DEVICES TO AIR STRIPPER CONTROL PANEL IS NOT SHOWN.



No.	Date	Revisions	By	Ckd

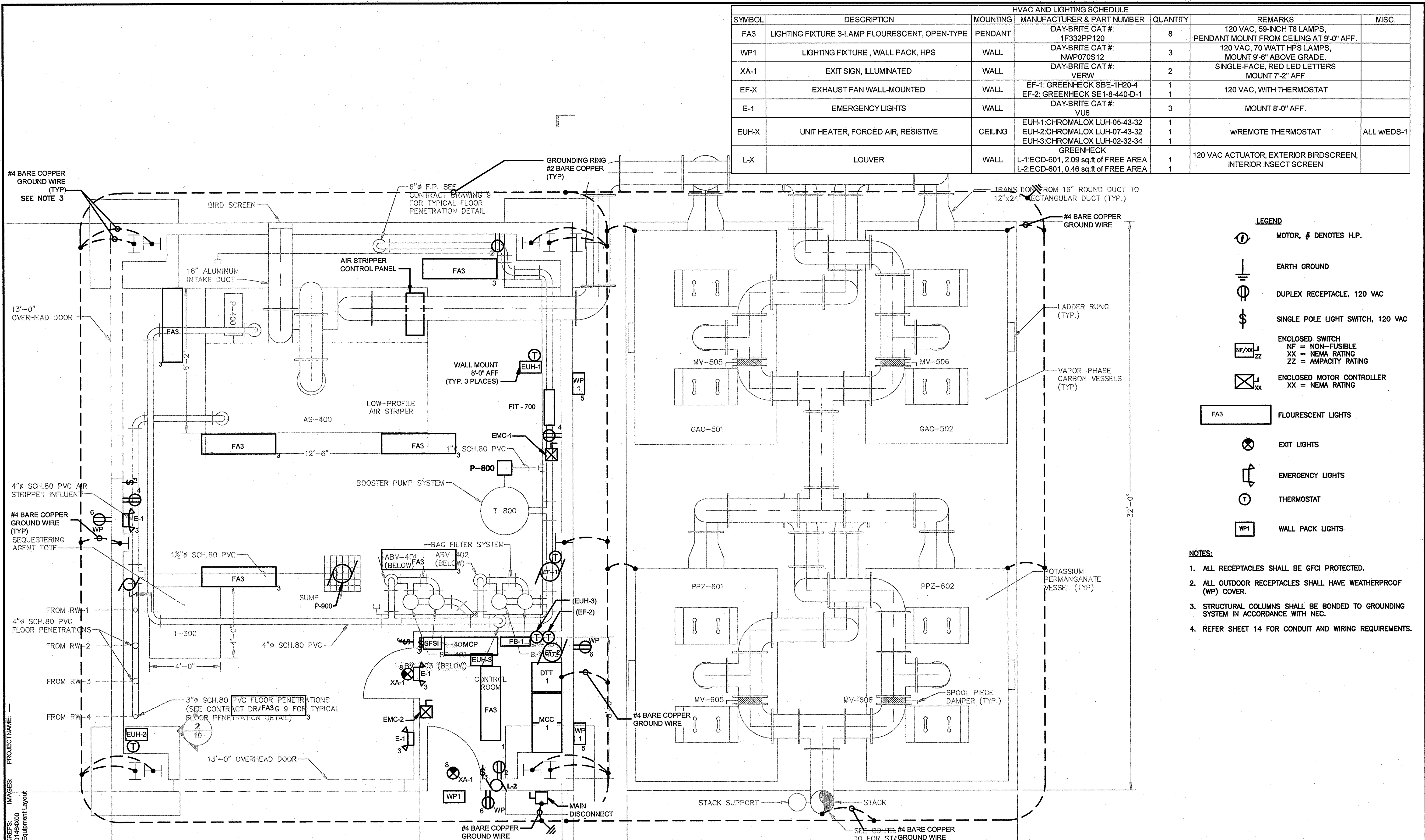
Professional Engineer's Name
THOMAS P. ARMSTRONG JR.
 Professional Engineer's No.
 085236
 State NY Date Signed 8-29-08 Project Mgr. CSG
 Designed by TPA Drawn by EK Checked by TEM/WSW



NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
 OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS
EQUIPMENT LAYOUT - INSTRUMENTATION
 MECHANICAL

ARCADIS Project No.
 NY001464.1807.00003
 Date
 JULY 2008
 ARCADIS
 6723 Towpath Road
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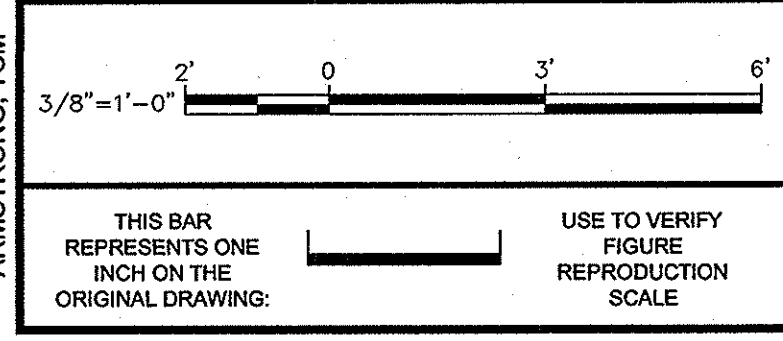
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HVAC AND LIGHTING SCHEDULE						
SYMBOL	DESCRIPTION	MOUNTING	MANUFACTURER & PART NUMBER	QUANTITY	REMARKS	MISC.
FA3	LIGHTING FIXTURE 3-LAMP FLOURESCENT, OPEN-TYPE	PENDANT	DAY-BRITE CAT #: 1F332PP120	8	120 VAC, 59-INCH T8 LAMPS, PENDANT MOUNT FROM CEILING AT 9'-0" AFF.	
WP1	LIGHTING FIXTURE, WALL PACK, HPS	WALL	DAY-BRITE CAT #: NWP070S12	3	120 VAC, 70 WATT HPS LAMPS, MOUNT 9'-6" ABOVE GRADE.	
XA-1	EXIT SIGN, ILLUMINATED	WALL	DAY-BRITE CAT #: VERW	2	SINGLE-FACE, RED LED LETTERS MOUNT 7'-2" AFF	
EF-X	EXHAUST FAN WALL-MOUNTED	WALL	EF-1: GREENHECK SBE-1H20-4 EF-2: GREENHECK SE1-8-440-D-1	1	120 VAC, WITH THERMOSTAT	
E-1	EMERGENCY LIGHTS	WALL	DAY-BRITE CAT #: VU6	3	MOUNT 8'-0" AFF.	
EUH-X	UNIT HEATER, FORCED AIR, RESISTIVE	CEILING	EUH-1: CHROMALOX LUH-05-43-32 EUH-2: CHROMALOX LUH-07-43-32 EUH-3: CHROMALOX LUH-02-32-34	1	w/REMOTE THERMOSTAT	ALL w/WEDS-1
L-X	LOUVER	WALL	L-1: ECD-601, 2.09 sq.ft of FREE AREA L-2: ECD-601, 0.46 sq.ft of FREE AREA	1	120 VAC ACTUATOR, EXTERIOR BIRDSCREEN, INTERIOR INSECT SCREEN	

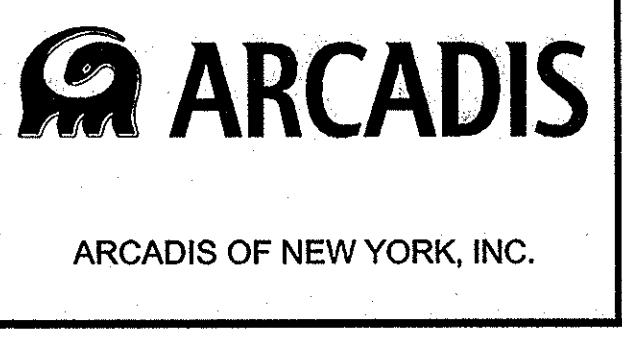
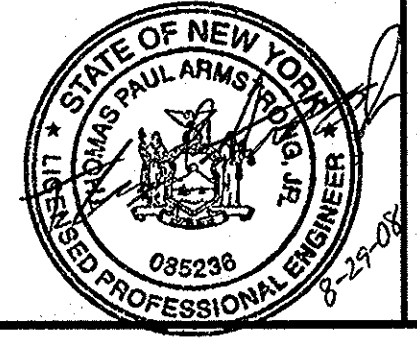
- LEGEND**
- MOTOR, # DENOTES H.P.
 - EARTH GROUND
 - DUPLEX RECEPTACLE, 120 VAC
 - SINGLE POLE LIGHT SWITCH, 120 VAC
 - ENCLOSED SWITCH
NF = NON-FUSIBLE
XX = NEMA RATING
ZZ = AMPACITY RATING
 - ENCLOSED MOTOR CONTROLLER
XX = NEMA RATING
 - FA3 FLOURESCENT LIGHTS
 - EXIT LIGHTS
 - EMERGENCY LIGHTS
 - T THERMOSTAT
 - WP1 WALL PACK LIGHTS

- NOTES:**
- ALL RECEPTACLES SHALL BE GFCI PROTECTED.
 - ALL OUTDOOR RECEPTACLES SHALL HAVE WEATHERPROOF (WP) COVER.
 - STRUCTURAL COLUMNS SHALL BE BONDED TO GROUNDING SYSTEM IN ACCORDANCE WITH NEC.
 - REFER SHEET 14 FOR CONDUIT AND WIRING REQUIREMENTS.



No.	Date	Revisions	By	Ckd

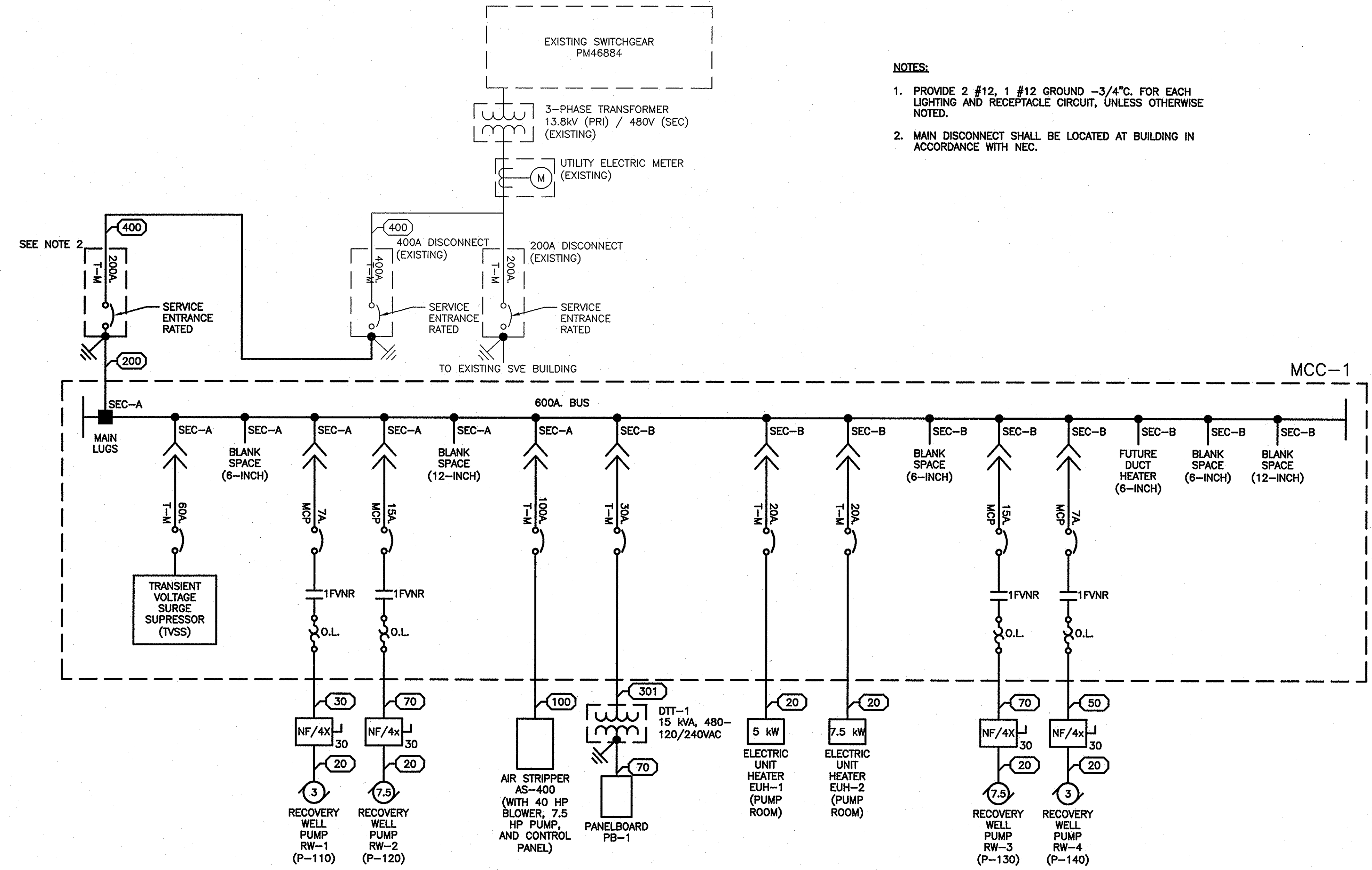
Professional Engineer's Name
THOMAS P. ARMSTRONG JR.
 Professional Engineer's No.
 085236
 State NY Date Signed 8-29-08 Project Mgr. CSG
 Designed by TPA Drawn by EK Checked by TEM/WSW



NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
 OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS
EQUIPMENT LAYOUT - ELECTRICAL
 MECHANICAL

ARCADIS Project No. NY001464.1807.00003
 Date JULY 2008
 ARCADIS 6723 Towpath Road Box 66 Syracuse, NY 13214 Tel: 315-446-9120

CITY:SYR-NY DIV/GROUP:85 DB:GHS LD:GHS PIC: PM: TH: LYR:ONE-OFF-REF- GIP:Project\NY001484_1407ElectDrawings-Recovery Well\AutoCAD Drawings\7-25-08\14 One-Line.dwg LAYOUT: 14. SAVED: 7/25/2008 1:55 PM ACADVER: 17.14 (LMS TECH) PAGES: 17. PLOTTED: 8/29/2008 6:28 PM BY: ARMSTRONG, TOM



- NOTES:**
- PROVIDE 2 #12, 1 #12 GROUND -3/4" C. FOR EACH LIGHTING AND RECEPTACLE CIRCUIT, UNLESS OTHERWISE NOTED.
 - MAIN DISCONNECT SHALL BE LOCATED AT BUILDING IN ACCORDANCE WITH NEC.

ABBREVIATIONS

1FVNR	FULL VOLTAGE, NON-REVERSING (SIZE 1) STARTER
A.F.F.	ABOVE FINISHED FLOOR
A	AMPERES
DTT	DRY TYPE TRANSFORMER
EF	EXHAUST FAN
EUH	ELECTRIC UNIT HEATER
HP	HORSEPOWER
kVA	KILOVOLT-AMPS
kW	KILOWATT
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR CIRCUIT BREAKER
O.L.	OVERLOAD
PB	PANELBOARD
T-M	THERMAL MAGNETIC CIRCUIT BREAKER
V	VOLTS
VAC	VOLTS AC

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
	ELECTRIC UTILITY METER CABINET
	ENCLOSED SWITCH
	NF = NON-FUSIBLE XX = NEMA RATING ZZ = AMPACITY RATING
	CONDUCTOR SYMBOL

CONDUCTOR SCHEDULE

SYMBOL	QUANTITY	WIRE SIZE	GROUND	CONDUIT	COMMENTS
20	3	#12	1 #12	3/4"	
30	3	#10	1 #10	1"	
50	3	#6	1 #6	1"	
70	3	#4	1 #6	1 1/2"	
100	3	#2	1 #6	1 1/4"	
200	4	#3/0	1 #4	2 1/2"	PROVIDE TYPE "USE-2" OR "XHHW-2"
400	(2 SETS) 4	#3/0	1 #1/0	(2) 2 1/2"	PROVIDE TYPE "USE-2" OR "XHHW-2"

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

VOLTS: 120 / 240, PHASE: 1, WIRE: 3W, 10,000 AIC, 60A. C/B, FEED: TOP

LOAD SERVED	LOAD (KVA)		BREAKER		CKT	PH	BREAKER		LOAD (KVA)		LOAD SERVED
	A	B	AMPS	POLE			POLE	AMP	A	B	
LIGHTS - CONTROL ROOM	0.1		20	1	1	A	2	1	20	0.6	RECEPTACLES - A
LIGHTS - PUMP ROOM	0.6		20	1	3	B	4	1	20	0.4	RECEPTACLES - B
LIGHTS - OUTDOOR	0.4		20	1	5	A	6	1	20	0.4	RECEPTACLES - OUTDOOR
MAIN CONTROL PANEL		1.0	20	1	7	B	8	1	20	0.1	EXIT LIGHTS
SUMP PUMP (P-900)	0.7		20	1	9	A	10	1	20	0.6	6 FLOW METERS (FIT)
EUH-3 (CONTROL ROOM)	1.3		20	2	11	B	12	1	20	1.1	BOOSTER PUMP (P-800)
					13	A	14	1	20	0.4	EF-1 / L1
SFSLCP	0.2		20	1	15	B	16	1	20	0.4	EF-2 / L2
SPARE			20	1	17	A	18	1	20		SPARE
BLANK			20	1	19	B	20	1	20		BLANK
BLANK			20	1	21	A	22	1	20		BLANK
BLANK			20	1	23	B	24	1	20		BLANK
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	2.5	3.1								2.0	2.0
TOTAL CONNECTED KVA:										A: 4.4	
										B: 5.1	
										TOTAL: 9.5	

ELEVATION MCC-1

MAIN LUGS (200A)	TRANS. PRIMARY	EUH-1
6" BLANK SPACE		6" BLANK SPACE
TVSS	EUH-2	
RW-1		RW-3
RW-2		RW-4
12" BLANK SPACE	FUTURE DUCT HEATER	6" BLANK SPACE
AIR STRIPPER		12" BLANK SPACE

NO SCALE

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING.

USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name
THOMAS P. ARMSTRONG JR.

Professional Engineer's No.
085236

State
NY

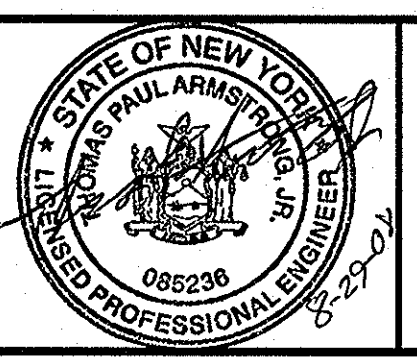
Date Signed
8-27-08

Project Mgr.
CSG

Designed by
TPA

Drawn by
EK

Checked by
TEM/MSW



ARCADIS

ARCADIS OF NEW YORK, INC.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

ONE-LINE DIAGRAM

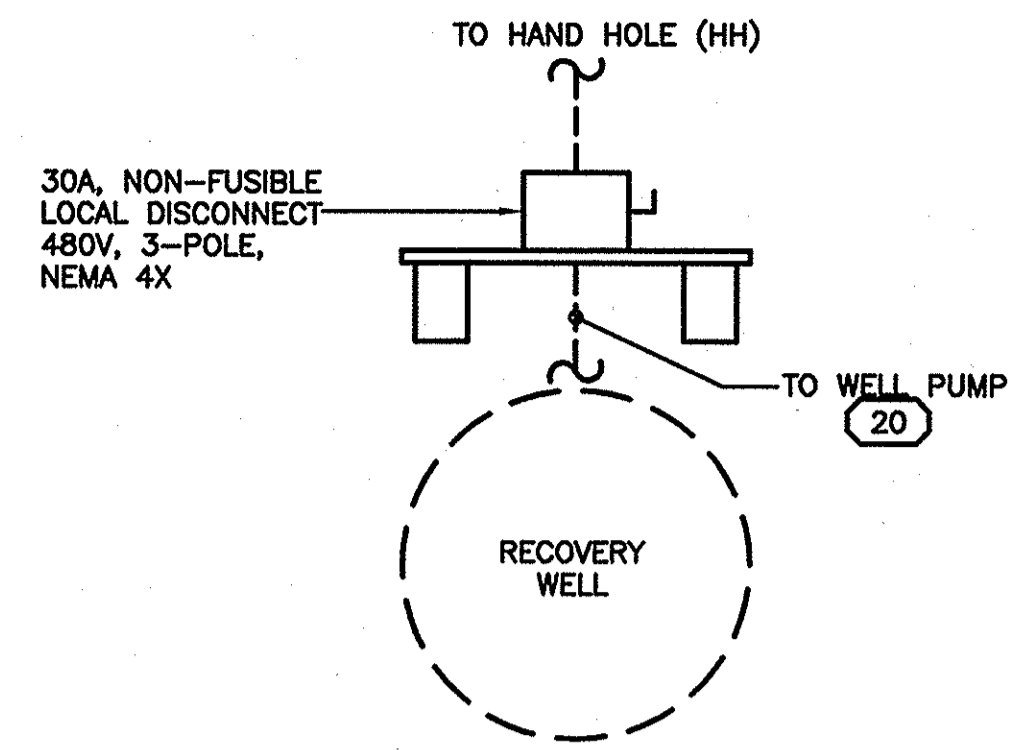
ELECTRICAL

ARCADIS Project No.
NY001464.1807.00003

Date
JULY 2008

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CITY:SYRNY; DIV:GROUP:85; DB:GHS; LD:GHS; PIC: PM: TM: LYR:ONE-OFF-REF; G:\projects\1001464\1407\ElectricalDrawings - Recovery Well\CAD Drawings\17-25-08\13 Electrical Site.dwg LAYOUT: 13; SAVER: 7/25/2008 1:55 PM; ACADVER: 17.1S (LMS TECH); PAGES: 13; BETA: 08/28/2008 6:28 PM; BY: ARMSTRONG, TOM



TYPICAL LOCAL DISCONNECT PLAN
NO SCALE

CONDUCTOR SCHEDULE					
SYMBOL	WIRE		GROUND	CONDUIT	COMMENTS
	QUANTITY	SIZE			
20	3	#12	1 #12	3/4"	
30	3	#10	1 #10	1"	
50	3	#6	1 #6	1"	
70	3	#4	1 #6	1 1/2"	
400	(2 SETS) 4	#3/0	1 #1/0	(2) 2 1/2"	PROVIDE TYPE "USE-2" OR "X-HW-2"

NOTES:

- SEE CONTRACT DRAWING 14 FOR ONE-LINE DIAGRAM.
- SEE CONTRACT DRAWING 17 FOR ELECTRIC HANDHOLE AND TRENCHING DETAILS.
- CONDUIT TRENCH TO BE INSTALLED WITHIN LIMITS OF EXISTING O-U3 SG PIPE TRENCH WHERE POSSIBLE.

LEGEND

- (#) CONDUCTOR SYMBOL - REFER TO SCHEDULE
- HH-# ELECTRIC HANDHOLE
- RW-# RECOVERY WELL
- ELECTRIC CONDUCTOR

ELECTRICAL SPECIFICATIONS:

GENERAL

- ALL ELECTRICAL EQUIPMENT SHALL BE U.L. LISTED AND LABELED.
- ALL ELECTRICAL WORK SHALL BE IN ACCORDANCE WITH THE LATEST REVISION OF NFPA-70 NEC.

RIGID METAL CONDUIT (RGS)

- GALVANIZED STEEL, HOT-DIPPED ZINC, ANSI STANDARD C80.1 AND C80.4.
- MANUFACTURER SHALL BE ALLIED TUBE & CONDUIT CORPORATION, TRIANGLE WIRE AND CABLE INC., OR EQUAL.

NONMETALLIC (PVC) CONDUIT

- NONMETALLIC RIGID CONDUIT AND FITTINGS SHALL BE SCHEDULE 40, POLYVINYL CHLORIDE AND SHALL BE RESISTANT TO CORROSION.
- CONDUIT AND FITTINGS SHALL BE IN ACCORDANCE WITH NEMA STANDARD TC-2 AND TC-3, LATEST REVISION.
- MANUFACTURER SHALL BE CARLON ELECTRIC CONDUIT CO., TRIANGLE PVC CO., OR EQUAL.

JUNCTION BOXES

JUNCTION BOXES AND FITTINGS SHALL BE OF GALVANIZED STEEL OR COPPER FREE ALUMINUM.

WIRES AND CABLES

- GENERAL
 - ALL CONDUCTORS, UNLESS OTHERWISE NOTED, SHALL BE STRANDED COPPER, CONSTRUCTED OF SOFT DRAWN OR ANNEALED COPPER.
 - CONDUCTORS INSULATION SHALL BE COLOR CODED, WITH COLOR OF INSULATION ONE COLOR THROUGHOUT THE ENTIRE RUN.
 - 120/240 VAC, SINGLE PHASE, 3 WIRE
 - CONDUCTOR 1 - BLACK
 - CONDUCTOR 2 - RED
 - NEUTRAL - WHITE
 - GROUND - GREEN
- LOW VOLTAGE CONDUCTORS
 - ALL CONDUCTORS FOR POWER, LIGHTING AND 120 VAC CONTROL SHALL BE RATED A MINIMUM 600 VAC.
 - CONDUCTORS SHALL BE CONSTRUCTED OF UNCOATED CLASS C COPPER CONCENTRIC-LAY-STRANDED WIRES.
 - POWER AND LIGHTING CONDUCTORS SHALL BE TYPE THHN-90C/THWN-2-90C WITH PVC INSULATION AND NYLON JACKET.
- INSTRUMENTATION CABLES

TWISTED PAIR OF NO. 18 AWG TINNED COATED CLASS C COPPER CONCENTRIC LAY STRANDED WIRES WITH AN ALUMINUM POLYESTER SHIELD AND COPPER DRAIN. RATED FOR 600V AND COLOR COATED PVC OUTER JACKET.
- CONNECTORS
 - PIGTAIL SPLICING #10 AND SMALLER, USE TAPERED SPRING WIRE NUTS. MANUFACTURER SHALL BE IDEAL WING NUT, BUCHANAN B-CAP, T&B PIGGIES, OR EQUAL.
 - FOR TERMINATION OF #14 CONTROL WIRES TO TERMINALS, USE INSULATED COMPRESSION SPADE TYPE CONNECTORS. MANUFACTURER SHALL BE BURNDY HYDENT, T&B STA-KON, OR EQUAL.
 - SPLICERS AND TERMINALS FOR #8 AND LARGER SHALL BE COPPER COMPRESSION TYPE. MANUFACTURER SHALL BE BURNDY HYDENT OR HYLUG, T&B, STA-CON, OR EQUAL.
 - FIXTURE CONNECTIONS MANUFACTURER SHALL BE T&B STA-KON SERIES PT-66M, IDEAL CRIMP SLEEVE NO. 410 WITH LONG BARREL, OR EQUAL.

GROUNDING

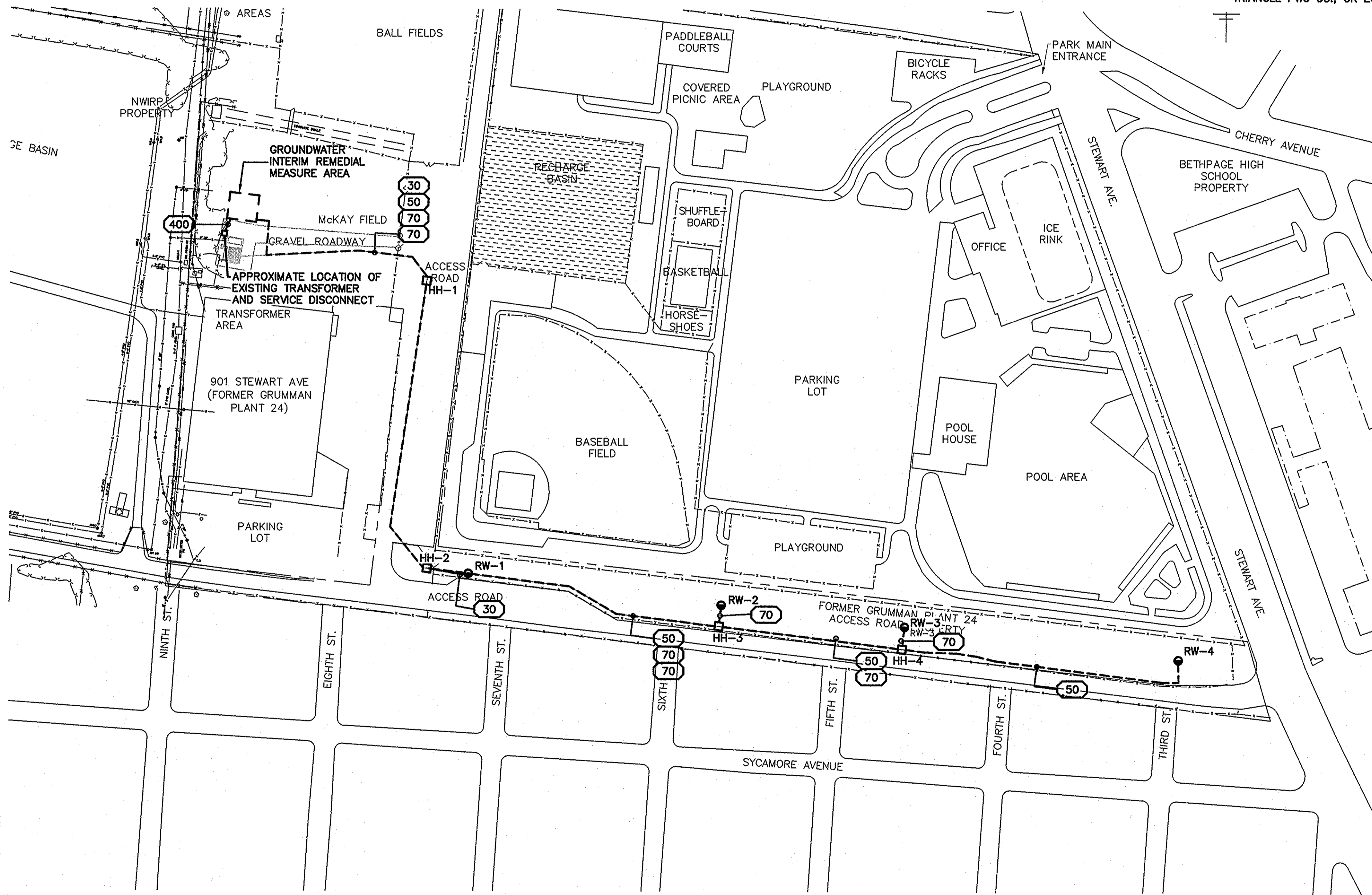
- GROUNDING OF ELECTRICAL SYSTEMS AND EQUIPMENT SHALL, AT A MINIMUM, MEET THE REQUIREMENTS OF THE NEC ARTICLE 250 OR SHALL EXCEED ARTICLE 250 AS HEREIN SPECIFIED.
- ALL CONDUITS SHALL HAVE AN INTERNAL GROUND CONDUCTOR. THIS GROUND CONDUCTOR SHALL BE PROVIDED ALTHOUGH IT MAY NOT BE SHOWN OR SCHEDULED ON THE PLANS.
- GROUNDING ELECTRODE CONDUCTORS SHALL BE A MINIMUM OF NO. 6 AWG STRANDED COPPER.
- GROUND RODS SHALL BE 3/4" DIAMETER, 10 FEET LONG, STEEL CORE WITH COPPER MOLTEN WELDED OR ELECTROLYTICALLY BONDED TO EXTERIOR.
- ALL CONNECTIONS SHALL BE MADE WITH COMPRESSION OR CADWELD CONNECTORS.

ENCLOSURE

- ENCLOSURES SHALL BE NEMA RATED FOR LOCATION UNLESS OTHERWISE NOTED.
- WET LOCATIONS OR OUTDOORS, ENCLOSURES SHALL BE NEMA TYPE 4, STAINLESS STEEL.
- ENCLOSURES SHALL HAVE NAMEPLATE ON THE EXTERIOR IDENTIFYING THE APPLICATION FUNCTION OF THE EQUIPMENT ENCLOSED.

WIRING DEVICES

- RECEPTACLES MARKED AS GFCI SHALL BE OF THE GROUND FAULT CIRCUIT INTERRUPTER TYPE. MANUFACTURER SHALL BE GE TYPE TGTR 20, OR EQUAL.
- SWITCHES
 - LIGHTING SWITCHES SHALL BE RATED 20 AMPERES AT 277 VAC, TOGGLE OPERATED, PLASTIC ENCLOSED, SINGLE POLE, THREE-WAY OR FOUR-WAY AS SHOWN OR REQUIRED. MANUFACTURER SHALL BE P&S SERIES 20AC1 SPECIFICATION GRADE, OR EQUAL.
 - SWITCHES SHALL HAVE SILVER ALLOY CONTACTS AND PROVISIONS FOR SIDE AND BACK WIRING.
 - EACH SWITCH SHALL BE SUITED FOR FULL-RATED CAPACITY ON TUNGSTEN FILAMENT AND FLUORESCENT LAMP LOADS.
- FACEPLATE AND COVERS
 - FINISHED AREAS SHALL HAVE STAINLESS STEEL TYPE 302 ALLOY COVERS.
 - WET AND CORROSIVE AREAS SHALL BE WEATHERPROOF COVERS WITH GASKETS.



PROJECT NAME: BCP_Aerial.jpg

XREFS: 01464X00, 01464G03, 01464X01, 01464X02



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No.	Date	Revisions	By	Ckd

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Professional Engineer's Name
THOMAS P. ARMSTRONG JR.

Professional Engineer's No.
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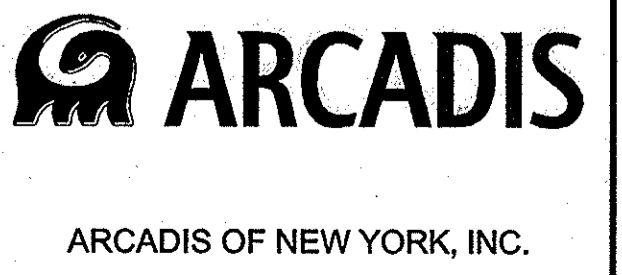
Date Signed
8-29-08

Project Mgr.
CSG

Designed by
TPA

Drawn by
EK

Checked by
TEM/WSW



NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

ELECTRICAL SITE PLAN

ELECTRICAL

ARCADIS Project No.
NY001464.1807.00003

Date
JULY 2008

ARCADIS
6723 Towpath Road
Box 66
Syracuse, NY 13214
Tel: 315-446-9120

PRE-ENGINEERED BUILDING

- 1.1 DESIGN REQUIREMENTS
- A. APPLICABLE BUILDING CODE: NEW YORK STATE BUILDING CODE 2007.
 - B. DESIGN WALL AND ROOF PANEL SYSTEM TO WITHSTAND SPECIFIED LOADS WITH DEFLECTION OF 1/240TH OF SPAN, MAXIMUM.
 - C. ANCHOR RODS: FURNISH DESIGN CRITERIA FOR ANCHOR BOLTS FURNISHED BY OTHERS, TO RESIST THE LOADS INDUCED BY THE DESIGN LOADS ON THE STRUCTURE.
- 1.2 SUBMITTALS
- A. DESIGN DATA: PROVIDE DETAILED DESIGN CRITERIA AND CALCULATIONS.
 - B. CERTIFICATION: MANUFACTURER CERTIFICATION THAT THE BUILDING CONFORMS TO THE CONTRACT DOCUMENTS AND MANUFACTURER'S STANDARD DESIGN PROCEDURES.
 - C. SHOP DRAWINGS: SHOW BUILDING LAYOUT, PRIMARY AND SECONDARY FRAMING MEMBER SIZES AND LOCATIONS, CROSS-SECTIONS, AND PRODUCT AND CONNECTION DETAILS.
 - D. PRODUCT DATA: INFORMATION ON MANUFACTURED PRODUCTS TO BE INCORPORATED INTO THE PROJECT.
 - E. COLOR CHARTS: FOR SELECTION OF COLORS.
 - F. ANCHOR ROD INSTALLATION DRAWINGS: LAYOUTS WITH BOLT DIAMETERS.
 - G. REACTIONS: SUBMIT REACTIONS FOR DESIGN OF FOUNDATION.
 - H. SPECIMEN WARRANTY.
- 1.3 QUALITY ASSURANCE
- A. DESIGN STRUCTURAL COMPONENTS, DEVELOP SHOP DRAWINGS, AND PERFORM SHOP AND SITE WORK UNDER DIRECT SUPERVISION OF A PROFESSIONAL ENGINEER EXPERIENCED IN DESIGN OF THIS WORK AND LICENSED IN THE STATE OF NEW YORK.
 - B. DESIGN DATA AND SHOP DRAWINGS SUBMITTED FOR REVIEW SHALL BEAR THE SEAL OF A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW YORK.
 - C. QUALIFICATIONS:
 - 1. MANUFACTURER: COMPANY SPECIALIZING IN MANUFACTURING PRODUCTS SPECIFIED IN THIS SECTION WITH MINIMUM 5 YEARS DOCUMENTED EXPERIENCE.
 - 2. ERECTOR: COMPANY SPECIALIZING IN PERFORMING WORK OF THIS SECTION WITH MINIMUM 5 YEARS DOCUMENTED EXPERIENCE AND APPROVED BY MANUFACTURER.
- 1.4 WARRANTY
- A. PROVIDE MANUFACTURER'S STANDARD WARRANTY FOR:
 - 1. PANEL FINISH: 20 YEARS.
 - 2. WEATHER-TIGHTNESS: 20 YEARS
- PART 2 PRODUCTS
- 2.1 MANUFACTURERS
- A. NUCOR BUILDING SYSTEMS.
 - B. OR AS APPROVED.
- 2.2 METAL MATERIALS
- A. STRUCTURAL STEEL PLATE, BAR, SHEET, AND STRIP FOR USE IN BOLTED AND WELDED CONSTRUCTIONS: ASTM A572, A570, A529, OR A36, WITH MINIMUM YIELD STRENGTH OF 50,000 PSI.
 - B. STRUCTURAL STEEL MATERIAL FOR USE IN ROLL FORMED OR PRESS BROKEN SECONDARY STRUCTURAL MEMBERS: ASTM A570, OR A607 WITH MINIMUM YIELD STRENGTH OF 55,000 PSI.
 - C. GALVANIZED STEEL SHEET FOR ROLL-FORMED OR PRESS BROKEN ROOF AND WALL COVERINGS, TRIM AND FLASHING: ASTM A653, WITH MINIMUM YIELD STRENGTH OF 50,000 PSI.
 - D. HOT-ROLLED STEEL SHAPES: W, M AND S SHAPES, ANGLES, RODS, CHANNELS AND OTHER SHAPES; ASTM A992 OR ASTM A36 AS APPLICABLE; WITH MINIMUM YIELD STRENGTHS REQUIRED FOR THE DESIGN.
 - E. STRUCTURAL BOLTS AND NUTS USED WITH PRIMARY FRAMING: HIGH STRENGTH, ASTM A325.
 - F. BOLTS AND NUTS USED WITH SECONDARY FRAMING MEMBERS: ASTM A307.
- 2.3 FRAMING COMPONENTS
- A. PRIMARY FRAMING: RIGID FRAME SOLID WEB FRAMING CONSISTING OF TAPERED OR UNIFORM DEPTH RAFTERS RIGIDLY CONNECTED TO TAPERED OR UNIFORM DEPTH COLUMNS. PROVIDE A CLEAR SPAN THAT SUPPORTS THE LOADS AT BAY SPACINGS INDICATED.
 - B. ENDWALL FRAMING: PORTAL FRAME FRAMING.
 - C. PURLINS: Z-SHAPED; DEPTH AS REQUIRED; WITH MINIMUM YIELD STRENGTH OF 55,000 PSI; SIMPLE SPAN OR CONTINUOUS SPAN AS REQUIRED FOR DESIGN.
 - D. GIRTS: Z- OR C-SHAPED; DEPTH AS REQUIRED; WITH MINIMUM YIELD STRENGTH OF 55,000 PSI; SIMPLE SPAN OR CONTINUOUS SPAN AS REQUIRED FOR DESIGN.
 - E. WIND BRACING: PORTAL, TORSIONAL, DIAGONAL BRACING OR DIAPHRAGM IN ACCORDANCE WITH MANUFACTURER'S STANDARD DESIGN PRACTICES; UTILIZING RODS, ANGLES, AND OTHER MEMBERS, WITH MINIMUM YIELD STRENGTHS AS REQUIRED FOR DESIGN.
 - F. PRIMARY FRAME FLANGE BRACING: ATTACHED FROM PURLINS OR GIRTS TO THE PRIMARY FRAMING, MINIMUM YIELD STRENGTH AS REQUIRED FOR DESIGN.
 - G. BASE ANGLES: 2 INCH BY 3 INCH BY 0.059 INCH STEEL ANGLES, WITH MINIMUM YIELD STRENGTH OF 55,000 PSI.
 - H. DOOR HEADERS AND JAMBS: Z- OR C-SHAPED; DEPTH AS REQUIRED; WITH MINIMUM YIELD STRENGTH OF 55,000 PSI.
 - I. SAG ANGLES AND BRIDGING: STEEL ANGLES WITH MINIMUM YIELD STRENGTH OF 36,000 PSI.
 - J. FABRICATION: FABRICATE ACCORDING TO MANUFACTURER'S STANDARD PRACTICE
 - 1. FABRICATE STRUCTURAL MEMBERS MADE OF WELDED PLATE SECTIONS BY JOINING THE FLANGES AND WEBS BY CONTINUOUS AUTOMATIC SUBMERGED ARC WELDING PROCESS.
 - 2. ALL WELDING OPERATORS AND PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH THE AMERICAN WELDING SOCIETY "STRUCTURAL WELDING CODE", AWS D1.1.
 - 3. FIELD CONNECTIONS: PREPARE MEMBERS FOR BOLTED FIELD CONNECTIONS BY MAKING PUNCHED, DRILLED, OR REAMED HOLES IN THE SHOP.
 - K. SHOP COATING: FINISH ALL STRUCTURAL STEEL MEMBERS USING ONE COAT OF MANUFACTURER'S STANDARD SHOP COAT, AFTER CLEANING OF OIL, DIRT, LOOSE SCALE AND FOREIGN MATTER.
- 2.4 ROOF AND WALL PANEL COMPONENTS
- A. ROOF PANELS: 36 INCH WIDE NET COVERAGE WITH 1-1/4 INCH MAJOR RIBS AT 12 INCHES ON CENTER WITH MINOR RIBS SPACED BETWEEN THE MAJOR RIBS.
 - 1. MATERIAL: GALVANIZED STEEL WITH G90 COATING.
 - 2. THICKNESS: 26 GAGE.
 - 3. SIDE LAPS: AT LEAST ONE FULL MAJOR RIB, WITH A SUPPORTING MEMBER BEARING EDGE ON THE LOWER PANEL AND AN ANTI-CAPILLARY GROOVE ON THE UPPER PANEL.
 - 4. LENGTH: CONTINUOUS FROM EAVE TO RIDGE.
 - 5. ENDLAPS WHERE REQUIRED: 6 INCHES WIDE, LOCATED AT A SUPPORT MEMBER.
 - 6. FINISH: KYNAR 500 PRE-PAINTED FINISH ON EXTERIOR SURFACE, WASH COAT ON INTERIOR SURFACE. COLOR SELECTED BY OWNER FROM MANUFACTURER'S FULL LINE.
 - 7. THE ROOF SHALL BE TESTED AND CERTIFIED TO MEET UNDERWRITERS LABORATORIES, INC., UPLIFT RATING: UL 90.
 - B. WALL PANELS: 36 INCH WIDE NET COVERAGE WITH 1-1/4 INCH MAJOR RIBS AT 12 INCHES ON CENTER WITH MINOR RIBS SPACED BETWEEN THE MAJOR RIBS.
 - 1. MATERIAL: GALVANIZED STEEL WITH G90 COATING.
 - 2. THICKNESS: 26 GAGE.
 - 3. SIDE LAPS: TWO FULLY OVERLAPPING MAJOR RIBS SECURED TOGETHER WITH 1/4 INCH DIAMETER COLOR-MATCHED CARBON STEEL FASTENERS.
 - 4. LENGTH: CONTINUOUS FROM SILL TO EAVE.
 - 5. ENDLAPS WHERE REQUIRED: 4 INCHES WIDE, LOCATED AT A SUPPORT MEMBER.
 - 6. CRIMP PANELS AT THE BASE AND NOTCH TO MAKE ROOF PANEL CONFIGURATION AT THE EAVE.
 - 7. CUT PANELS SQUARE AT EACH END; PROVIDE BASE TRIM AT SILL.
 - 8. FINISH: KYNAR 500 PRE-PAINTED FINISH ON EXTERIOR SURFACE, WASH COAT ON INTERIOR SURFACE. COLOR SELECTED BY OWNER FROM MANUFACTURER'S FULL LINE.
 - C. PANEL FASTENERS:
 - 1. FOR ROOF PANELS: STAINLESS STEEL-CAPPED CARBON STEEL FASTENERS WITH INTEGRAL SEALING WASHER.
 - 2. FOR WALL PANELS: COATED CARBON STEEL.
 - 3. COLOR OF EXPOSED FASTENER HEADS TO MATCH THE WALL PANEL FINISH.

PRE-ENGINEERED BUILDING (CONT.)

- 4. CONCEALED FASTENERS: SELF-DRILLING TYPE, OF SIZE AS REQUIRED.
- 5. PROVIDE FASTENERS IN QUANTITIES AND LOCATION AS REQUIRED BY THE MANUFACTURER.
- D. FLASHING AND TRIM: MATCH MATERIAL AND COLOR OF ADJACENT COMPONENTS. PROVIDE TRIM AT RAKES, INCLUDING PEAK AND CORNER ASSEMBLIES, HIGH AND LOW EAVES, CORNERS, BASES, FRAMED OPENINGS AND AS REQUIRED OR SPECIFIED TO PROVIDE WEATHER-TIGHTNESS AND A FINISHED APPEARANCE.
- E. PLASTIC PARTS: GLASS FIBER-REINFORCED RESIN OR THERMO-FORMED ABS.
 - 1. ABS: MINIMUM 1/8 INCH THICK.
 - 2. COLOR: MANUFACTURER'S STANDARD COLOR.
- F. SEALANTS, MASTICS AND CLOSURES: MANUFACTURER'S STANDARD TYPE.
 - 1. PROVIDE AT ROOF PANEL ENDLAPS, SIDELAPS, RAKE, EAVE, TRANSITIONS AND ACCESSORIES AS REQUIRED TO PROVIDE A WEATHER-RESISTANT ROOF SYSTEM; USE TAPE MASTIC OR GUNNABLE SEALANT AT SIDELAPS AND ENDLAPS.
 - 2. PROVIDE AT WALL PANEL RAKES, EAVES, TRANSITIONS AND ACCESSORIES.
 - 3. CLOSURES: FORMED TO MATCH PANEL PROFILES; CLOSED CELL ELASTIC MATERIAL, MANUFACTURER'S STANDARD COLOR.
 - 4. TAPE MASTIC: PRE-FORMED BUTYL RUBBER-BASED, NON-HARDENING, NON-CORROSIVE TO METAL; WHITE OR LIGHT GRAY.
 - 5. GUNNABLE SEALANT: NON-SKINNING SYNTHETIC ELASTOMER BASED MATERIAL; GRAY OR BRONZE.
- G. BLANKET INSULATION: GLASS FIBER WITH FACTORY-LAMINATED FACING MATERIAL:
 - 1. GLASS FIBER: ODORLESS; NEUTRAL-COLORED, LONG FILAMENT, FLEXIBLE RESILIENT, PRODUCED IN COMPLIANCE WITH THE NAIMA 202 SPECIFICATIONS.
 - 2. THERMAL RESISTANCE: TO MEET R=19 AT 75 DEGREES F MEAN TEMPERATURE.
 - 3. FLAME SPREAD INDEX: 25 OR LESS, WHEN TESTED IN ACCORDANCE WITH UL 723.
 - 4. SMOKE DEVELOPED INDEX: 50 OR LESS, WHEN TESTED IN ACCORDANCE WITH UL 723.
 - 5. UL CLASSIFIED.
 - 6. FACING: WHITE VINYL SCRIM POLYESTER; 0.0025 INCH THICK PVC FILM, GLASS FIBER SCRIM REINFORCING, 0.0005 INCH THICK POLYESTER FILM; PERMEANCE 0.02 PERMS. COMPOSITE FIBERGLASS AND FACINGS TO MEET FLAME SPREAD OF 25 OR LESS, SMOKE DEVELOPED OF 50 OR LESS, WHEN TESTED IN ACCORDANCE WITH UL 723.
 - 7. PROVIDE FACING 3 INCHES WIDER ON BOTH EDGES THAN BLANKET.
 - 8. WIDTH: AS REQUIRED FOR INSTALLATION.
- H. USE BLANKET INSULATION AT ROOF AND WALLS.
- 2.5 WALL ACCESSORIES
 - A. SERVICE DOORS.
 - B. SECTIONAL OVERHEAD DOORS.
 - C. PROVIDE FRAMED OPENINGS FOR LOUVERS.
- 2.6 ROOF ACCESSORIES
 - A. EAVE GUTTERS: ROLL-FORMED 26 GAGE STEEL SHEET, WITH GUTTER STRAPS, FASTENERS AND JOINT SEALANT; SAME COLOR AS WALL PANELS.
 - 1. DOWNSPOUTS: 4 BY 5 INCHES IN 10 FOOT LENGTHS WITH DOWNSPOUT ELBOWS AND DOWNSPOUT STRAPS; SAME COLOR AS WALL PANELS.
 - B. SNOWGUARDS:
 - 1. MANUFACTURERS: SNOWAX, INC., OR AS APPROVED.
 - 2. FABRICATED FROM CLEAR POLYCARBONATE.
 - 3. PROVIDE ADHESIVE FOR SECURING SNOWGUARDS TO ROOF PANELS.
 - 4. CONSULT MANUFACTURER FOR SPACING RECOMMENDATIONS.
 - C. PROVIDE FRAMED OPENINGS FOR FANS.
- 2.7 DOORS
 - A. OVERHEAD DOORS TO BE COILING TYPE, STEEL CONSTRUCTION, INSULATED. CURTAIN SLATS MIN 20 GA EXTERIOR AND 24 GA BACK COVER. LOCKING MECHANISM REQUIRED. PROVIDE COUNTERBALANCING MECHANISM WITH HELICAL TORSIONAL SPRINGS. PLACE HOOD EXTERIOR OF BUILDING.
 - B. INTERIOR MANDOOK - 20 GA., HONEY COMB CORE, WITH 16 GA. FRAME AND LOCKS.
 - C. EXTERIOR MANDOOK - 18 GA., INSULATED CORE, STANDARD KEYING, BALL BEARING HINGES, AND 16 GA. FRAME.

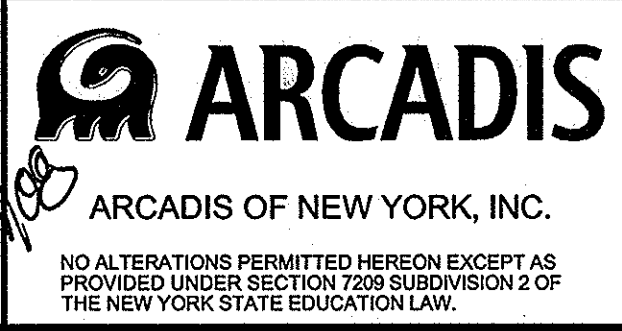
COLD FORMED METAL FRAMING

- 1.1 MATERIALS
- A. STEEL SHEET: ASTM A653/A 653M, STRUCTURAL STEEL, ZINC COATED, OF GRADE AND COATING AS FOLLOWS:
 - 1. GRADE: 33 OR 50, CLASS 1 OR 2 AS REQUIRED BY STRUCTURAL CALCULATIONS.
 - 2. COATING: G60 (Z180).
- 1.2 FRAMING ACCESSORIES
- A. FABRICATE STEEL-FRAMING ACCESSORIES OF THE SAME MATERIAL AND FINISH USED FOR FRAMING MEMBERS, WITH MINIMUM YIELD STRENGTH OF 33,000 PSI (230 MPa).
 - B. PROVIDE ACCESSORIES OF MANUFACTURER'S STANDARD THICKNESS AND CONFIGURATION.
- 1.3 MISCELLANEOUS MATERIALS
- A. GALVANIZING REPAIR PAINT: SSPC-PAINT 20 OR DOD-P21035, ASTM A780.
- 1.4 FASTENERS
- A. SCREWS: CORROSION-RESISTANT COATED, SELF-DRILLING, PAN OR HEX WASHER HEAD. PROVIDE SCREW TYPE AND SIZE AS REQUIRED BY STRUCTURAL DESIGN CALCULATIONS FOR THE CONDITION AND THICKNESS OF MATERIALS BEING JOINED.
- 1.5 FABRICATION
- A. FABRICATE ASSEMBLIES TO SIZE AND CONFIGURATION REQUIRED.
 - B. CUT ALL FRAMING COMPONENTS SQUARE FOR ATTACHMENT TO PERPENDICULAR MEMBERS, OR AS REQUIRED FOR AN ANGULAR FIT AGAINST ABUTTING MEMBERS.
 - C. FASTEN COMPONENTS WITH SELF-DRILLING SCREWS OR WELDING. FURNISH SCREWS OF SIZES TO BE SUFFICIENT TO INSURE STRENGTH OF CONNECTION. TOUCH UP ALL WELDS WITH ZINC-RICH PRIMER. MECHANICAL FASTENERS, EITHER POWDER ACTUATED OR PNEUMATICALLY DRIVEN, ARE PROHIBITED.
 - D. REINFORCE AND BRACE ASSEMBLIES TO WITHSTAND HANDLING STRESSES.
 - E. COLD-FORMED METAL FRAMING MAY BE SHOP OR FIELD FABRICATED FOR INSTALLATION, OR IT MAY BE FIELD ASSEMBLED.
 - F. INSTALL COLD-FORMED METAL FRAMING ACCORDING TO ASTM C1007, UNLESS MORE STRINGENT REQUIREMENTS ARE INDICATED.
 - G. INSTALL COLD-FORMED METAL FRAMING AND ACCESSORIES PLUMB, SQUARE, AND TRUE TO LINE, AND WITH CONNECTIONS SECURELY FASTENED, ACCORDING TO MANUFACTURER'S WRITTEN RECOMMENDATIONS AND REQUIREMENTS IN THIS SECTION.
 - 1. CUT FRAMING MEMBERS BY SAWING OR SHEARING; DO NOT TORCH CUT.
 - 2. FASTEN COLD-FORMED METAL FRAMING MEMBERS BY WELDING OR SCREW FASTENING, AS STANDARD WITH FABRICATOR. WIRE TYING OF FRAMING MEMBERS IS NOT PERMITTED.
 - H. INSTALL STUDS AT SPACING AS SHOWN ON DRAWINGS AND AS REQUIRED BY STRUCTURAL DESIGN CALCULATIONS, AT EACH SIDE OF OPENINGS AND NOT MORE THAN 2 INCHES FROM ABUTTING WALLS.
 - a. FRAME CORNERS WITH THREE STUDS.
 - b. FRAME WALL OPENINGS WIDER THAN STUD SPACING WITH DOUBLE STUD AT EACH JAMB.
 - I. INSTALL SUPPLEMENTARY FRAMING OR BLOCKING TO SUPPORT WORK ATTACHED TO FRAMING.
- 1.6 TOLERANCES
- A. STUDS: VERTICAL ALIGNMENT (PLUMBNESS), 1/960 (1/8 INCH IN 10 FEET).
 - B. WALLS: HORIZONTAL ALIGNMENT (LEVELNESS), 1/960 (1/8 INCH IN 10 FEET).
 - C. STUD SPACING: 1/8 INCH FROM DESIGNATED SPACING PROVIDING THAT THE CUMULATIVE ERROR DOES NOT EXCEED REQUIREMENTS OF FINISHING MATERIALS.

CITY/SYRACY DIV/GRUPP/48 DE/CHS LD/CHS FC: PM: TM: LYRON+OFF+REF: 10165FIDat/Project/101464.1407/Drawings/Current/Drawings/General/Notes.dwg LAYOUT: 22 SAVED: 7/24/2008 9:58 PM ACADVER: 17.05 (LMS TECH) PAGESETUP: BETHPAGE.DCE 34X22 PLOTSTYLETABLE: PLTCOUNT1.CTB PLOTTED: 8/29/2008 9:39 AM BY: HUNT, AARON
 PROJECTNAME: 01464X00-AAH.FE
 XREFS: 01464X00-AAH.FE
 IMAGES:

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 Professional Engineer's No.
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 CSG
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 AAH
 Drawn by
 AAH
 Checked by
 TEM/WSW



NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
 OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

STRUCTURAL NOTES AND SYMBOLS #2

STRUCTURAL

ARCADIS Project No.
 NY001484.1807.00003
 Date
 AUGUST 2008
 ARCADIS
 6723 Towpath Road
 Box 66
 Syracuse, NY 13214
 Tel: 315-446-9120

GENERAL

- QUALITY OF CONSTRUCTION REQUIRED, PERFORMANCE LEVELS OF WORKMANSHIP, MANUFACTURING AND INDUSTRY STANDARDS, STRENGTH AND PHYSICAL REQUIREMENTS OF MATERIALS, CONFORMANCE TO CODES AND REGULATIONS, GUARANTEES AND OTHER PROJECT REQUIREMENTS ARE SPECIFIED IN THE PROJECT MANUAL.
- IF MATERIALS, QUANTITIES, STRENGTHS OR SIZES INDICATED BY THE DRAWINGS OR SPECIFICATIONS ARE NOT IN AGREEMENT WITH THESE NOTES, THE BETTER QUALITY AND/OR GREATER QUANTITY, STRENGTH OR SIZE INDICATED, SPECIFIED, OR NOTED SHALL BE PROVIDED.
- PERFORM ALL WORK IN COORDINATION WITH ALL DRAWINGS AND INFORMATION RELATED TO STRUCTURAL WORK. ANY CHANGES TO THE EQUIPMENT REQUIRING CHANGES TO THE STRUCTURAL SYSTEMS SHALL BE REDESIGNED BY A PROFESSIONAL ENGINEER AT NO COST TO THE OWNER AND SUBMITTED TO THE ENGINEER. SUBMITTAL SHALL BE ACKNOWLEDGED IN WRITING BEFORE BEGINNING CONSTRUCTION.
- IT IS SOLELY THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE TO INSURE THE SAFETY OF THE STRUCTURE AND ITS COMPONENT PARTS DURING ERECTION. THIS INCLUDES, BUT IS NOT LIMITED TO, THE ADDITION OF WHATEVER TEMPORARY BRACING, GUYS OR TIE-DOWNS MAY BE NECESSARY. SUCH MATERIAL SHALL BE REMOVED AND SHALL REMAIN THE PROPERTY OF THE CONTRACTOR AFTER COMPLETION OF THE PROJECT.
- FACILITIES HAVE BEEN DESIGNED FOR DESIGN LOADS SHOWN OR SPECIFIED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FACILITIES SUBJECT TO CONSTRUCTION LOADS EXCEEDING THE DESIGN LOADS AND SHALL NOTIFY THE ENGINEER OF ANY SUCH ADDITIONAL LOADS.
- ALL DIMENSIONS AND ELEVATIONS NOTED THUS (*) ON STRUCTURES SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE VERIFIED BY THE CONTRACTOR IN THE FIELD OR WITH THE EQUIPMENT MANUFACTURER AND SHALL CONFORM TO THOSE SHOWN ON OTHER DRAWINGS.
- DESIGN LOADS: BASED ON NEW YORK STATE 2007 BUILDING CODE. SEE ELEVATION VIEW FOR LOAD VALUES.

FOUNDATIONS

- THE CONTRACTOR SHALL BECOME FAMILIAR WITH THE SURVEY AND THE SUBSURFACE INVESTIGATION REPORT BEFORE BEGINNING CONSTRUCTION.
- NOTIFY THE ENGINEER AS SOON AS POSSIBLE OF ANY UNUSUAL SOIL CONDITIONS OR SOIL CONDITIONS IN VARIANCE WITH TEST BORINGS, SUCH AS UNEXPECTED SPRING OR SEEPAGE WATER, MATERIAL DIFFERING FROM TEST BORINGS, OR SOIL OF QUESTIONABLE BEARING CAPACITY.
- SET FOUNDATIONS AT ELEVATIONS SHOWN. THE CONTRACTOR SHALL VERIFY WITH THE ENGINEER THAT EACH FOOTING PLACED IS BEARING ON DESIGN MATERIAL.
- CONCRETE GENERAL NOTES APPLY TO FOUNDATIONS.
- FOOTINGS SHALL REST ON UNDISTURBED SOIL OR COMPACTED SELECT OR CONCRETE FILL OR ROCK.
- LEVELS OF BACKFILL AGAINST CONCRETE WALLS SHALL NOT DIFFER BY MORE THAN 2"-0" ON EITHER SIDE OF WALLS UNLESS ADEQUATELY BRACED.
- PROTECT EXCAVATION FROM FLOODING UNTIL ALL WALLS AND FLOOR FRAMING UP TO AND INCLUDING GRADE LEVEL FLOORS ARE IN PLACE AND BACKFILLING HAS BEGUN. WATER LEVEL SHALL BE MAINTAINED BELOW EXCAVATION AT ALL TIMES.

CAST-IN-PLACE CONCRETE

- CONCRETE SHALL HAVE THE FOLLOWING MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS: 4,000 POUNDS PER SQUARE INCH (PSI) WITH ENTRAINED AIR FOR ALL CONCRETE UNLESS SPECIFICALLY NOTED OTHERWISE IN SPECIFICATIONS OR ON CONTRACT DRAWINGS.
- ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH "THE BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE" ACI 318. TOLERANCES SHALL BE IN ACCORDANCE WITH ACI 347, SECTION 3.3.1, TOLERANCES FOR REINFORCED CONCRETE BUILDINGS.
- ALL REINFORCING STEEL SHALL BE NEW DOMESTIC DEFORMED BILLET STEEL CONFORMING TO ASTM A-615 GRADE 60.
- ALL REINFORCING DETAILS SHALL CONFORM TO "DETAILS AND DETAILING OF CONCRETE REINFORCEMENT", ACI 315, UNLESS DETAILED OTHERWISE ON THE STRUCTURAL DRAWINGS.
- CONTRACTOR SHALL REVIEW ALL DRAWINGS FOR SIZE AND LOCATION OF EMBEDDED ITEMS, SLEEVES, SLAB DEPRESSIONS, REQUIRED. THESE ITEMS SHALL BE FURNISHED AND INSTALLED PRIOR TO PLACEMENT OF CONCRETE.
- WHERE BAR LENGTHS ARE GIVEN ON THE DRAWINGS, THE LENGTH OF ANCHOR HOOK, IF REQUIRED, IS NOT INCLUDED.
- FOUNDATION WALLS AND SLABS SHALL BE CAST MONOLITHICALLY, EXCEPT FOR REQUIRED CONSTRUCTION JOINTS. CONTRACTOR SHALL SUBMIT ANY AND ALL ALTERNATE AND ADDITIONAL CONSTRUCTION JOINT LOCATIONS AND DETAILS.
- CONSTRUCTION JOINTS REQUIRED BY THE ENGINEER ARE SHOWN ON THE DRAWINGS. REINFORCEMENT SHALL BE CONTINUOUS ACROSS CONSTRUCTION JOINTS. SUBMIT ALL CONSTRUCTION JOINT LOCATIONS WITH REINFORCING STEEL SHOP DRAWINGS.
- CLEARANCES FOR REINFORCING STEEL SHALL CONFORM TO THE FOLLOWING: TYPICAL REINFORCING BAR CLEARANCE TABLE CONCRETE CAST AGAINST EARTH 3" SURFACES EXPOSED TO EARTH OR WEATHER 2" SURFACES NOT EXPOSED EARTH OR WEATHER 1-1/2"
- WELDING OF REINFORCING STEEL IS NOT PERMITTED.
- CALCIUM CHLORIDE SHALL NOT BE PERMITTED NOR SHALL ANY ADMIXTURE CONTAINING CALCIUM CHLORIDE BE PERMITTED THAT RESULTS IN A TOTAL CONCRETE MIX IN WHICH THE PRESENCE OF CHLORIDE IONS EXCEED 0.15 PERCENT BY WEIGHT OF CEMENT.
- ALUMINUM PIPE SHALL NOT BE USED WITH CONCRETE PUMPS.
- CONCRETE SHALL BE DISCHARGED AT THE SITE WITHIN 75 MINUTES AFTER WATER HAS BEEN ADDED TO THE CEMENT AND AGGREGATES. ADDITION OF WATER TO THE MIX AT THE PROJECT SITE WILL NOT BE ALLOWED. ALL WATER MUST BE ADDED AT THE BATCH PLANT.
- REINFORCING BARS REQUIRED FOR PROPER SUPPORT OF PRINCIPAL REINFORCING SHALL BE DETAILED AND SUPPLIED BY THE CONTRACTOR WHETHER OR NOT THEY ARE INDICATED ON THE DRAWINGS.
- REINFORCING BAR LAP SPLICES, EMBEDMENT, AND HOOK LENGTHS SHALL CONFORM WITH "REINFORCEMENT LAP SPLICE, EMBEDMENT, AND STANDARD HOOKS TABLE".
- BOND BREAKER MATERIAL SHALL BE 15 POUNDS FELT PAPER, UNLESS NOTED OTHERWISE.
- JOINT FILLER: ASTM D1752; PRE-MOLDED SPONGE RUBBER FULLY COMPRESSIBLE WITH RECOVERY RATE OF MINIMUM 95 PERCENT; W.R. MEADOWS SPONGE RUBBER, OR AS APPROVED.
- PROVIDE 1" CHAMFER ON ALL EXPOSED EDGES.

STRUCTURAL STEEL

- STRUCTURAL STEEL SHALL CONFORM TO THE AISC "SPECIFICATIONS FOR DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS" LATEST EDITION.
- WELDED CONNECTIONS SHALL CONFORM TO THE LATEST REVISED CODE THE AMERICAN WELDING SOCIETY, AWS D1.
- BOLTS AND BOLTED CONNECTIONS SHALL CONFORM TO THE REQUIREMENTS OF THE "SPECIFICATIONS FOR STRUCTURAL JOINTS USING ASTM A325 BOLTS" AS APPROVED BY THE COUNCIL ON RIVETED AND BOLTED JOINTS.
- ANCHOR RODS: ASTM F1554 GRADE 36 KSI, EMBEDMENT, DIAMETER, AND QUANTITY TO BE DETERMINED BASED ON BUILDING MANUFACTURER APPROVED SHOP DRAWINGS.
- STRUCTURAL STEEL:
 ROLLED STEEL PLATES, SHAPES (EXCEPT WIDE FLANGE SECTIONS), BARS & RODS; ASTM A36
 WIDE FLANGE SECTIONS; ASTM A992
 STEEL PIPE OR STRUCTURAL TUBING; ASTM A53; TYPE E OR S, GRADE B OR A 501.
- WELDING ELECTRODES SHALL BE E-70XX. FOR WELDING SYMBOLS WITH NO LENGTH DIMENSION GIVEN, THE WELDING SHALL BE CONTINUOUS BETWEEN ABRUPT CHANGES IN DIRECTION. NO INTERMITTENT WELDS SHALL BE PERMITTED, UNLESS OTHERWISE NOTED.

REINFORCEMENT LAP SPLICE, EMBEDMENT LENGTH AND STANDARD HOOKS

BAR SIZE	MIN. LAP LENGTHS FOR BEAMS *		MIN. LAP LENGTHS FOR SLABS AND WALLS **		MIN. LAP LENGTHS FOR COLUMNS	MIN. EMBEDMENT LENGTHS		MIN. STD. HOOKS			
	CLASS B		CLASS B			STRAIGHT BARS*		90°		135°	
	TOP***	OTHERS	TOP***	OTHERS		TOP***	OTHERS	WITH STANDARD HOOKS	A OR G	A OR G	H
#3	25	19	16	16	12	19	15	5	6	4	2.5
#4	33	25	20	16	15	25	19	7	8	4.5	3
#5	41	31	25	19	19	31	24	9	10	5.5	3.75
#6	49	37	29	23	23	37	29	10	12	8	4.5
#7	71	54	43	33	27	54	42	12	14	9	5.25
#8	81	62	49	37	30	62	48	14	16	10.5	6
#9	91	70	60	46	34	70	54	15	19	-	-
#10	102	79	74	57	39	79	61	17	22	-	-
#11	114	87	89	69	43	87	67	19	24	-	-

REINFORCEMENT LAP SPLICE, EMBEDMENT LENGTH AND STANDARD HOOKS TABLE IS BASED ON A MINIMUM CONCRETE COMPRESSIVE STRENGTH OF 4000 PSI AND 60000 PSI REINFORCEMENT (WITH NO EPOXY COATING).

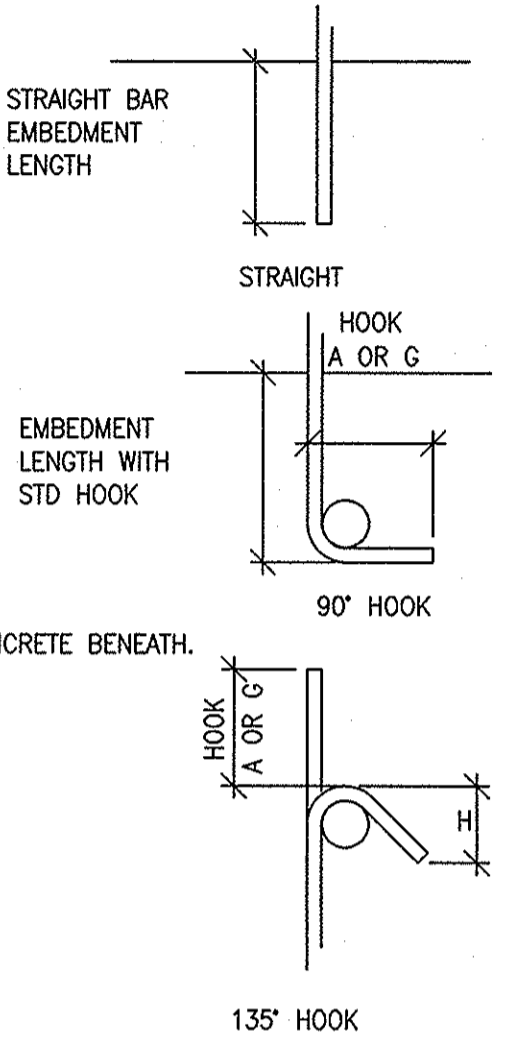
ALL LAP SPLICES SHALL BE CLASS B SPLICES.

* THE MINIMUM LAP LENGTH FOR BEAMS AND STRAIGHT EMBEDMENTS ARE BASED ON A 3 BAR DIAMETER MINIMUM CENTER TO CENTER BAR SPACING AND A 2 INCH BAR COVER. IF THE SPLICE AND/OR EMBEDMENT DOES NOT CONFORM TO THESE REQUIREMENTS, THEN CONTRACTOR SHALL APPLY APPROPRIATE FACTORS IN COMPLIANCE WITH ACI 318 WITH APPROVAL BY ENGINEER.

** THE MINIMUM LAP LENGTH FOR SLABS AND WALLS IS BASED ON A 6 INCH BAR SPACING AND A 2 INCH BAR COVER. IF THE LAP CONDITION DOES NOT CONFORM TO THESE REQUIREMENTS, THEN USE BEAM LAP LENGTHS; OR COMPLY WITH LAP REQUIREMENTS OF ACI 318 WITH APPROVAL BY ENGINEER.

*** TOP BARS ARE DEFINED AS ALL WALL, BEAM, OR SLAB HORIZONTAL BARS WITH 12" OR MORE FRESH CONCRETE BENEATH.

WHERE SPLICES ARE INDICATED BETWEEN BARS OF DIFFERENT SIZES, THE SPLICE LENGTH SHALL BE BASED ON THE SMALLER BAR SIZE.



SYMBOLS		ABBREVIATIONS			
	GRATING	AB - ANCHOR BOLT	DWG. - DRAWING	LLV - LONG LEG VERTICAL	STD. - STANDARD
	EARTH	AC - ACRE	DWL - DOWEL	LONG. - LONGITUDINAL	STL. - STEEL
	STEEL	ADD'L. - ADDITIONAL	EA. - EACH	LP - LOW POINT	STR. - STRUCTURAL
	GROUT	ADJ. - ADJUSTABLE	EE - EACH END	LW - LIGHT WEIGHT	SUP. - SUPPORT
	NEW BRICK	ALT. - ALTERNATE	EF - EACH FACE	MACH. - MACHINED	SYM. - SYMMETRICAL
	EXISTING BRICK	ALUM. - ALUMINUM	EJ - EXPANSION JOINT	MAS. - MASONRY	T. - TREAD
	NEW BLOCK	ANCH. - ANCHOR	EL. - ELEVATION	MAX. - MAXIMUM	T/O - TOP OF
	EXISTING BLOCK	& - AND	E. - EAST	MFG. - MANUFACTURER	T/B - TOP AND BOTTOM
	NEW CONCRETE	ARCH. - ARCHITECT OR ARCHITECTURAL	EMBD. - EMBEDDED	MID. - MIDDLE	TEMP. - TEMPORARY
	EXISTING CONCRETE	ASTM - AMERICAN SOCIETY FOR TESTING MATERIALS	EW - EACH WAY	MIN. - MINIMUM	THK. - THICK
	COMPACT FILL	@ - AT	EQ. - EQUAL	MK. - MARK	TOM - TOP OF MASONRY
	GRAVEL BASE	BSMT. - BASEMENT	EXIST. - EXISTING	MO - MASONRY OPENING	TOS - TOP OF STEEL
	ROCK	BITUM. - BITUMINOUS	EXP. - EXPANSION	NA - NOT APPLICABLE	TYP. - TYPICAL
		B/W - BETWEEN	EXT. - EXTERIOR	N. - NORTH	UON - UNLESS OTHERWISE NOTED
		BOT. - BOTTOM	FDN. - FOUNDATION	NF - NEAR FACE	VERT. - VERTICAL
		BOS. - BOTTOM OF STEEL	FE - FIRE EXTINGUISHER	NTS - NOT TO SCALE	W/ - WITH
		B. - BUILDING LINE	FIN. - FINISH	OC - ON CENTER	W. - WEST
		BLDG. - BUILDING	FL - FINISH LINE	OD - OUTSIDE DIAMETER	W/O - WITHOUT
		BLK. - BLOCK	FLR. - FLOOR	OH. - OVERHEAD	WP - WORK POINT
		BM - BEAM	FRP - FIBERGLASS REINFORCED	OPNG. - OPENING	WS. - WATER STOP
		B PL. - BASE PLATE	FF - FAR FACE	PL - PLATE	WT - WEIGHT
		BRG. - BEARING	FTG. - FOOTING	PC - PRECAST	
		BT PL. - BENT PLATE	FT. - FOOT	PSF - POUNDS PER SQUARE FOOT	
		C/G - CENTER TO CENTER	GA. - GAGE	PPAWS - PREFORMED PLASTIC ADHESIVE WATERSTOP	
		CJ - CONSTRUCTION JOINT	GALV. - GALVANIZED		
		CL - CENTERLINE	GR. - GRADE	RAD. - RADIUS	
		CHKD. - CHECKERED	GRD. - GROUND	R. - RISER	
		CLR. - CLEAR	GYP BD - GYPSUM BOARD	REINF. - REINFORCING	
		CMU - CONCRETE MASONRY UNIT	HORIZ. - HORIZONTAL	REQ'D. - REQUIRED	
		COL. - COLUMN	HP - HIGH POINT	REQ'MTS. - REQUIREMENTS	
		CONC. - CONCRETE	HHP - HIGH HIGH POINT	RM. - ROOM	
		CONST. - CONSTRUCTION	HR. - HANDRAIL	RO - ROUGH OPENING	
		CONT. - CONTINUOUS	HT. - HEIGHT	S. - SOUTH	
		CONTL. - CONTROL	HS. - HIGH STRENGTH	SCHED. - SCHEDULE	
		CTR. - CENTER	ID - INSIDE DIAMETER	SECT. - SECTION	
		CTSK - COUNTERSUNK	IF - INSIDE FACE	SF - SQUARE FEET	
		DEPR. - DEPRESSION	INT. - INTERIOR	SHT. - SHEET	
		DET. - DETAIL	INV. - INVERT	SIM. - SIMILAR	
		DI - DUCTILE IRON	INSUL. - INSULATION	SJ - STEEL JOIST	
		DIA. - DIAMETER	JT. - JOINT	SLBB - SHORT LEG BACK-TO-BACK	
		DIM. - DIMENSION	K. - KIP (1000 POUNDS)	SLV - SHORT LEG VERTICAL	
		DL - DEAD LOAD	LB. - POUNDS	SPA. - SPACES OR SPACING	
		DIST. - DISTANCE	LFT. - LINEAR FEET	SPRD. - SPREAD	
		D.S. - DROP SHAFT	LL - LIVE LOAD	SS - STAINLESS STEEL	
			LLBB - LONG LEG BACK-TO-BACK	SQ. FT. - SQUARE FEET	
			LONG - LONG	STA. - STATION	
			LLH - LONG LEG HORIZONTAL		

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
 OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

STRUCTURAL NOTES AND SYMBOLS #1

STRUCTURAL

ARCADIS Project No.
 NY001464.1807.0003

Date
 AUGUST 2008

ARCADIS
 6723 Towpath Road
 Box 66
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Professional Engineer's Name
AARON A HUNT
 Professional Engineer's No.
 083766

State
 NY

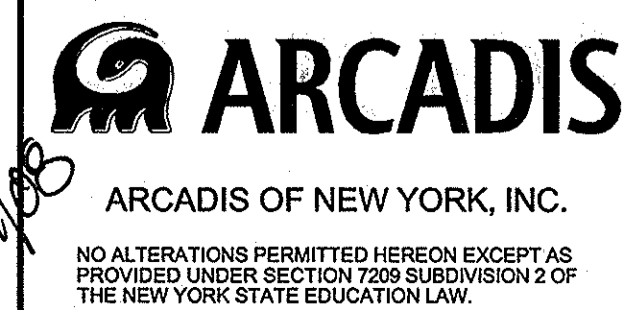
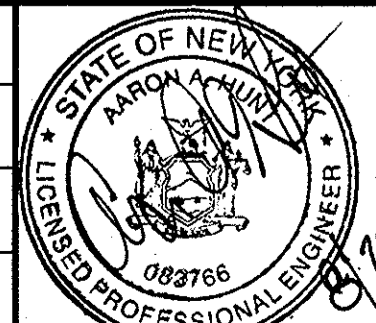
Date Scaled
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Project Mgr.
 CSG

Designed by
 AAH

Drawn by
 AAH

Checked by
 TEM/MSW



NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

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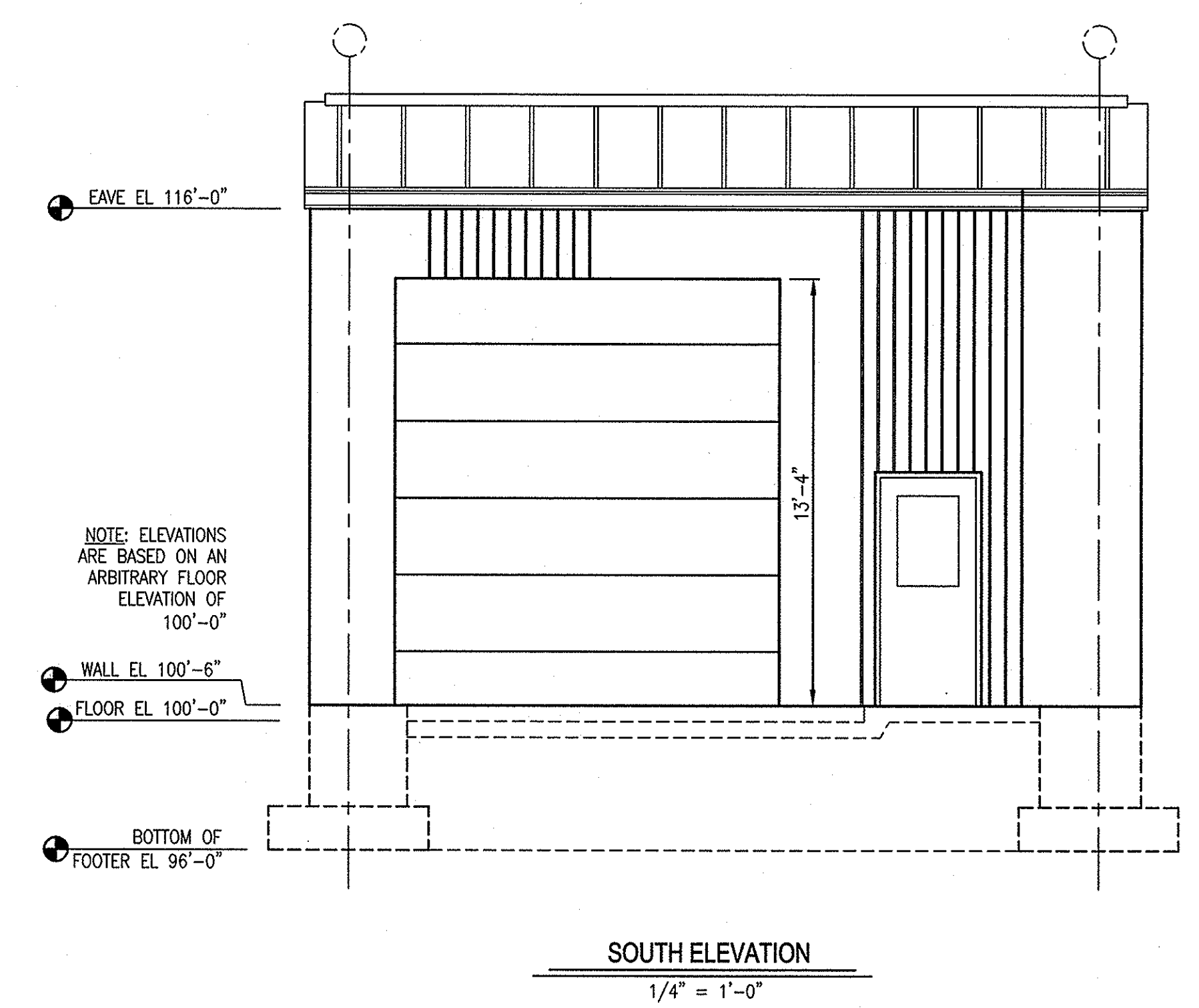
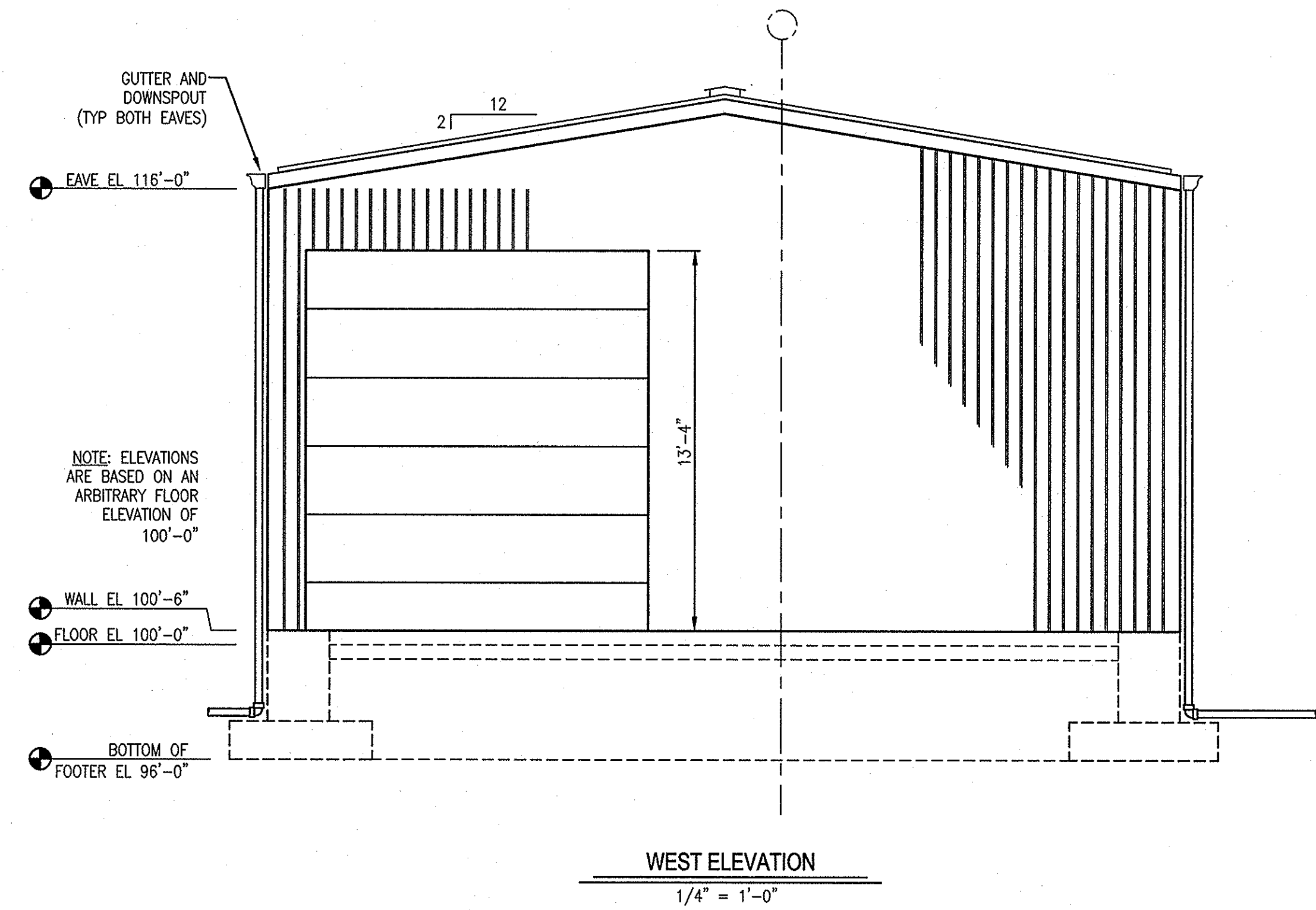
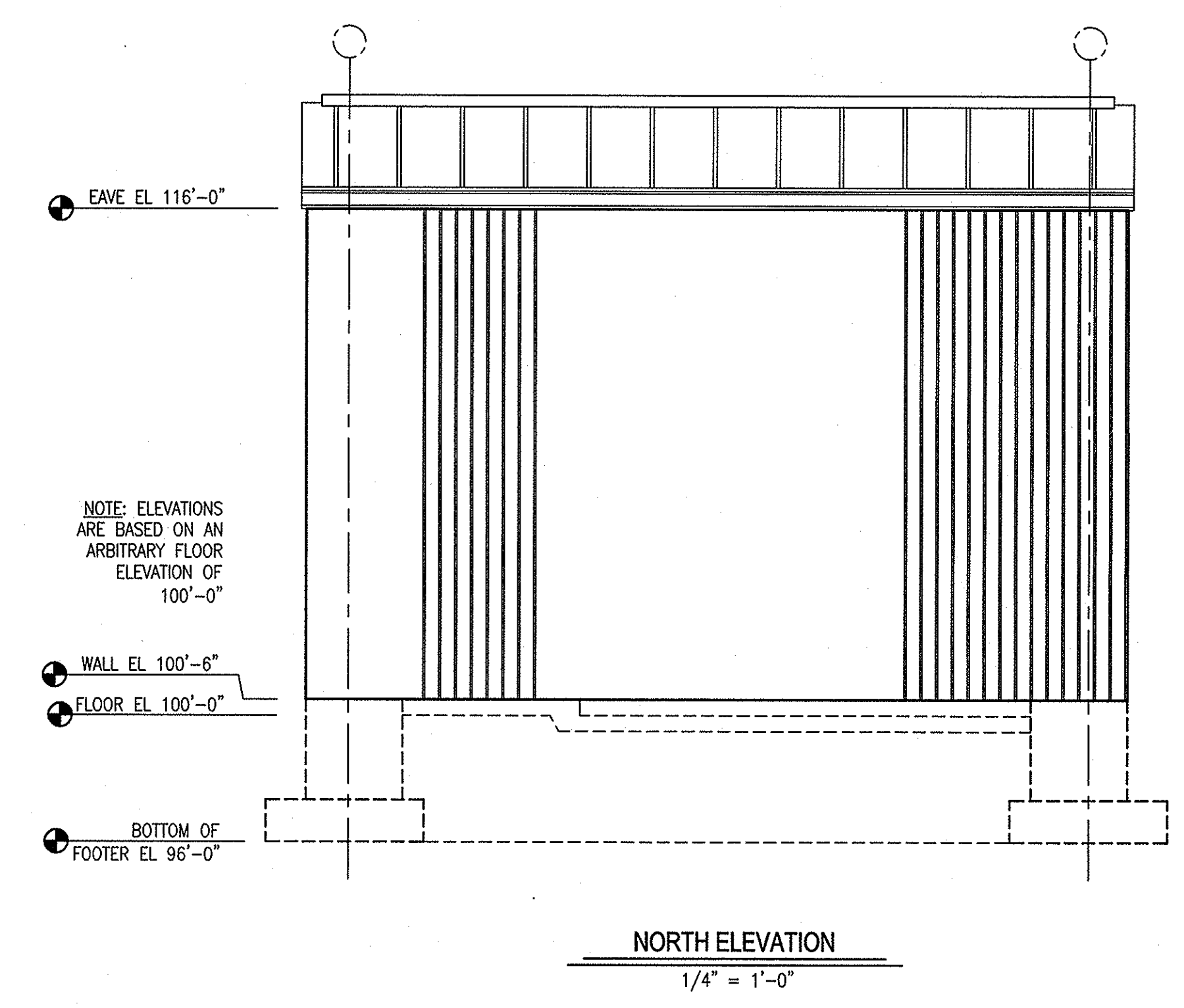
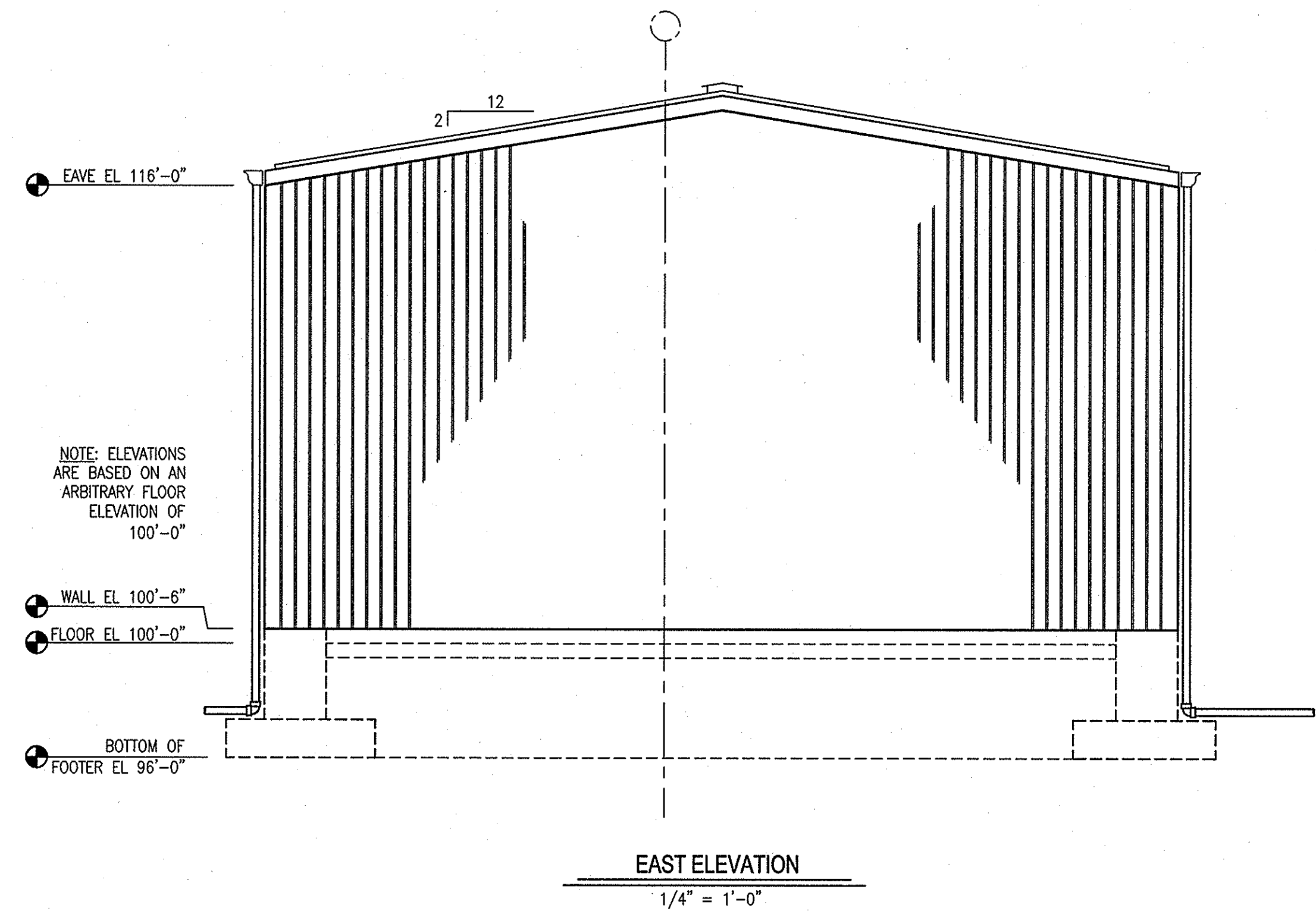
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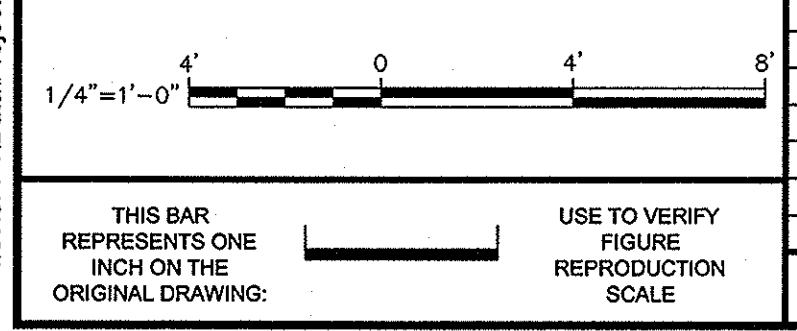
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 XREFS: 01464X00-AAH PE
 IMAGES: 01464X00-AAH PE
 PAGES: 17 OF 17
 PLOT: 8/29/2008 9:39 AM BY: HUNT, AARON

NOTE: THE PRE-ENGINEERED METAL BUILDING SHALL BE INCLUSIVE OF TWO 16" ROUND DUCT PENETRATION POINTS. PLEASE SEE APPROXIMATE LOCATION OF DUCT PENETRATION POINTS ON CONTRACT DRAWING 7. WALL PENETRATION KITS WILL BE PROVIDED BY THE BUILDING MANUFACTURER AND SHALL BE INSTALLED AS DIRECTED BY THE INSTALLATION INSTRUCTIONS ALSO PROVIDED BY THE BUILDING MANUFACTURER

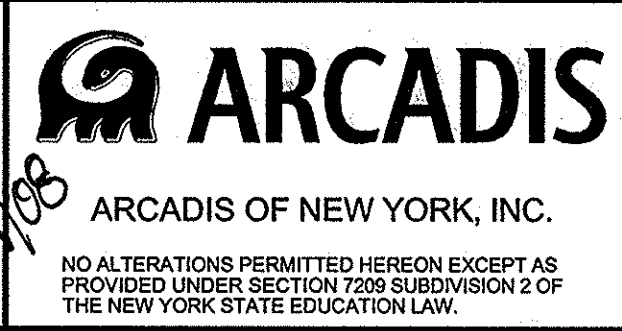


DESIGN INFORMATION (NYSBC 2007)	
DESIGN ROOF LIVE LOAD	20 psf
DESIGN ROOF COLLATERAL LOAD (APPLY PURLINS AND FRAMES)	10 psf
NET ALLOWABLE DESIGN SOIL BEARING PRESSURE (PRESUMED BEARING PRESSURE)	1000 psf MIN (VERIFY DURING CONSTRUCTION)
DESIGN SNOW LOAD	
NYSBC 2007 SECTION 1608	
GROUND SNOW LOAD	20 PSF
SNOW EXPOSURE FACTOR, Ce	0.9
SNOW LOAD IMPORTANCE FACTOR, Is	1.1
THERMAL FACTOR, Ct	1.0
FLAT ROOF SNOW LOAD, Pf	13.9 psf
SLOPED ROOF SNOW LOAD, Ps	13.9 psf
DESIGN WIND LOAD	
NYSBC 2007 SECTION 1609	
BASIC WIND SPEED	110 MPH
WIND LOAD IMPORTANCE FACTOR = 1.15	
BUILDING CATEGORY III	
WIND EXPOSURE B	
INTERNAL PRESSURE COEFFICIENT 0.18	
COMPONENTS AND CLADDING LOADS	
ROOF:	
ZONE 4 +10.2 PSF, -42 PSF	
WALLS:	
ZONE 4 +25 PSF, -27.1 PSF	
DESIGN SEISMIC LOADS	
NYSBC 2007 SECTION 1613	
SEISMIC LOAD IMPORTANCE FACTOR = 1.25	
MAPPED SPECTRAL RESPONSE ACCELERATIONS	
So 0.30	
S1 0.07	
SITE CLASS D	
SPECTRAL RESPONSE COEFFICIENTS	
Sds 0.312	
Sd1 0.112	
SEISMIC DESIGN CATEGORY B	
BASIC SEISMIC FORCE RESISTING SYSTEM	
ORDINARY STEEL MOMENT FRAMES	
DESIGN BASE SHEAR	
STEEL "BUILDING" BASE SHEAR 5 KIPS	
SEISMIC RESPONSE COEFFICIENT Cs	
Cs STEEL 0.111 (MOMENT FRAMES)	
RESPONSE MODIFICATION FACTOR	
R STEEL MOMENT FRAME 3.5	
ANALYSIS PROCEDURE USED: EQUIVALENT LATERAL FORCE PROCEDURE	



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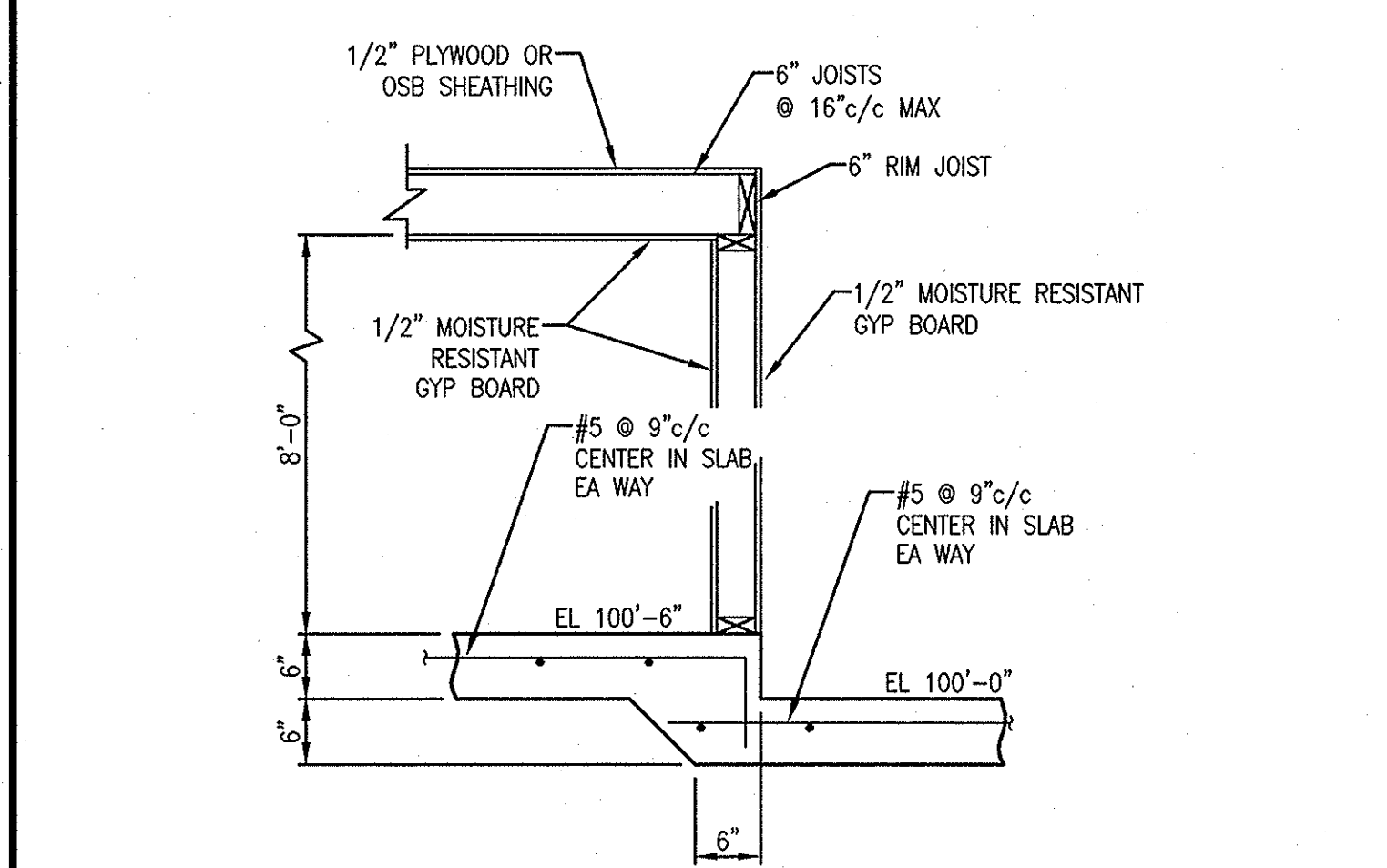
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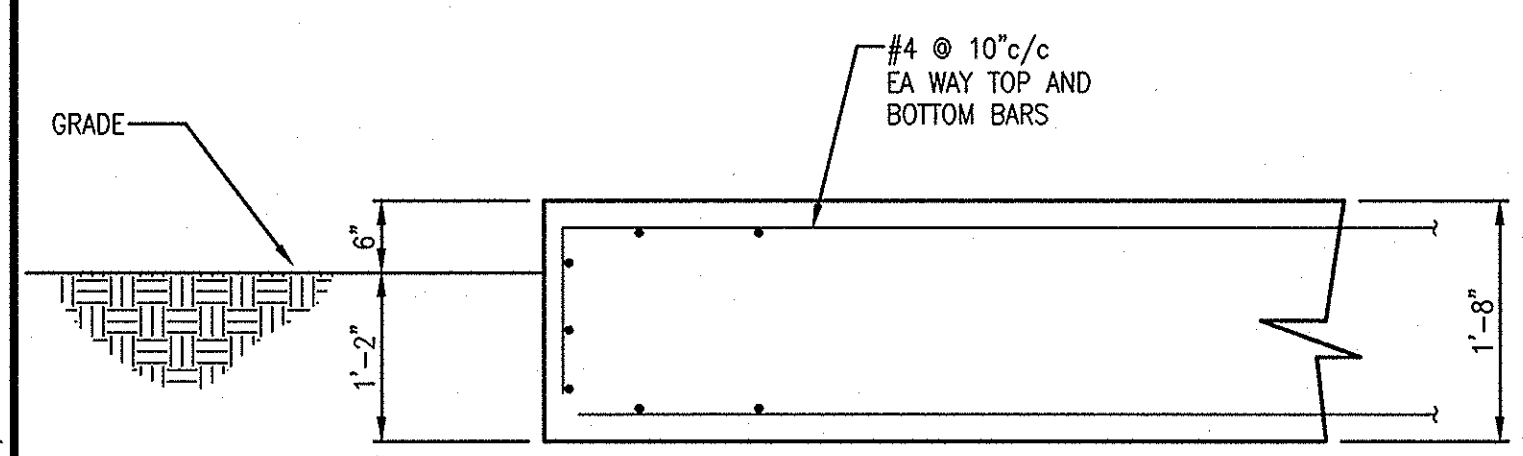
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BUILDING ELEVATIONS
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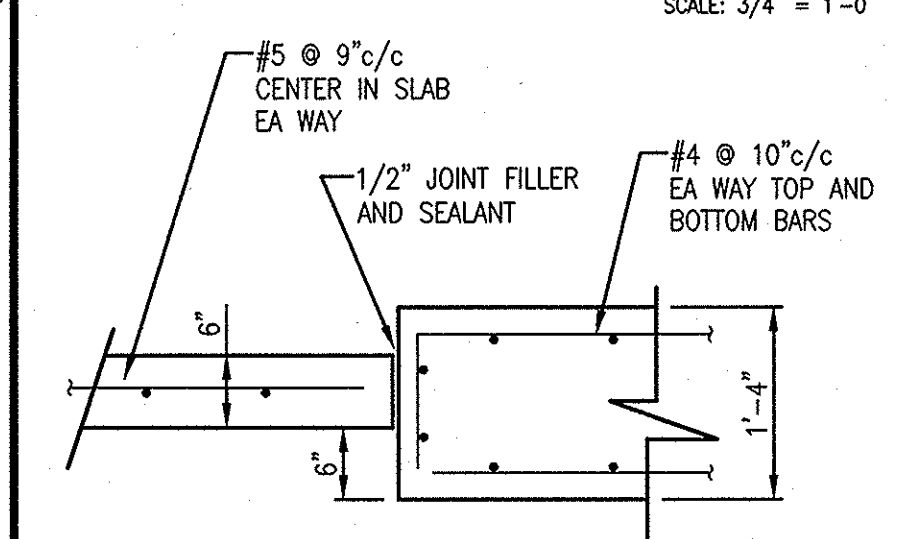
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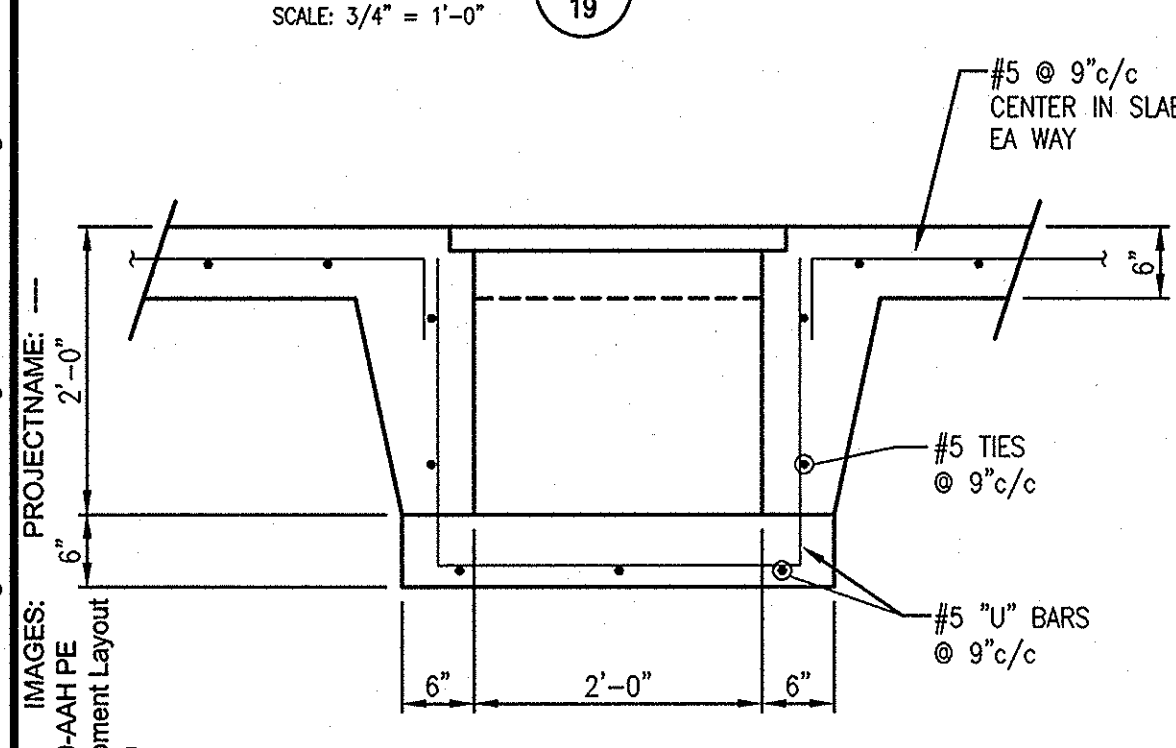
DETAIL C
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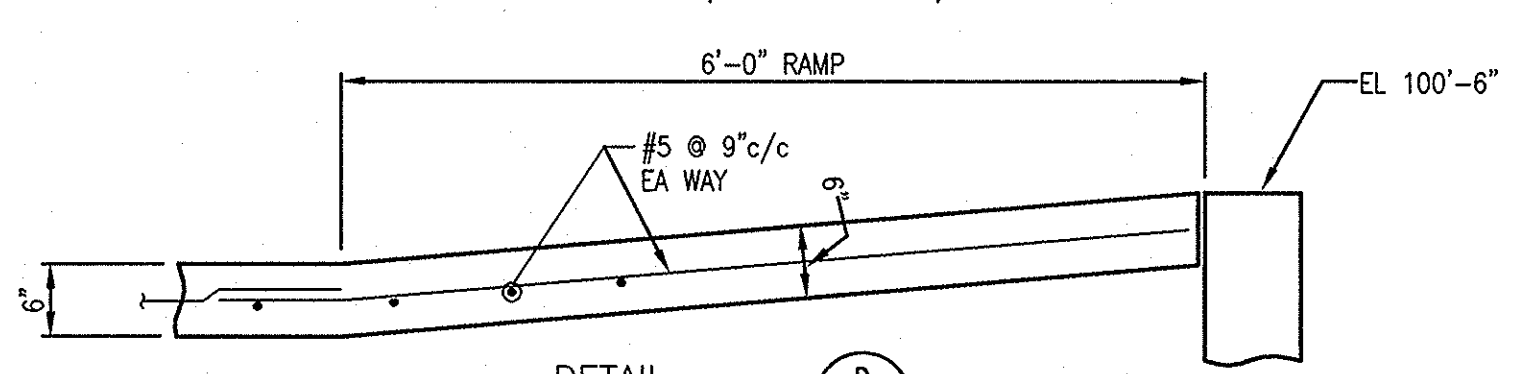
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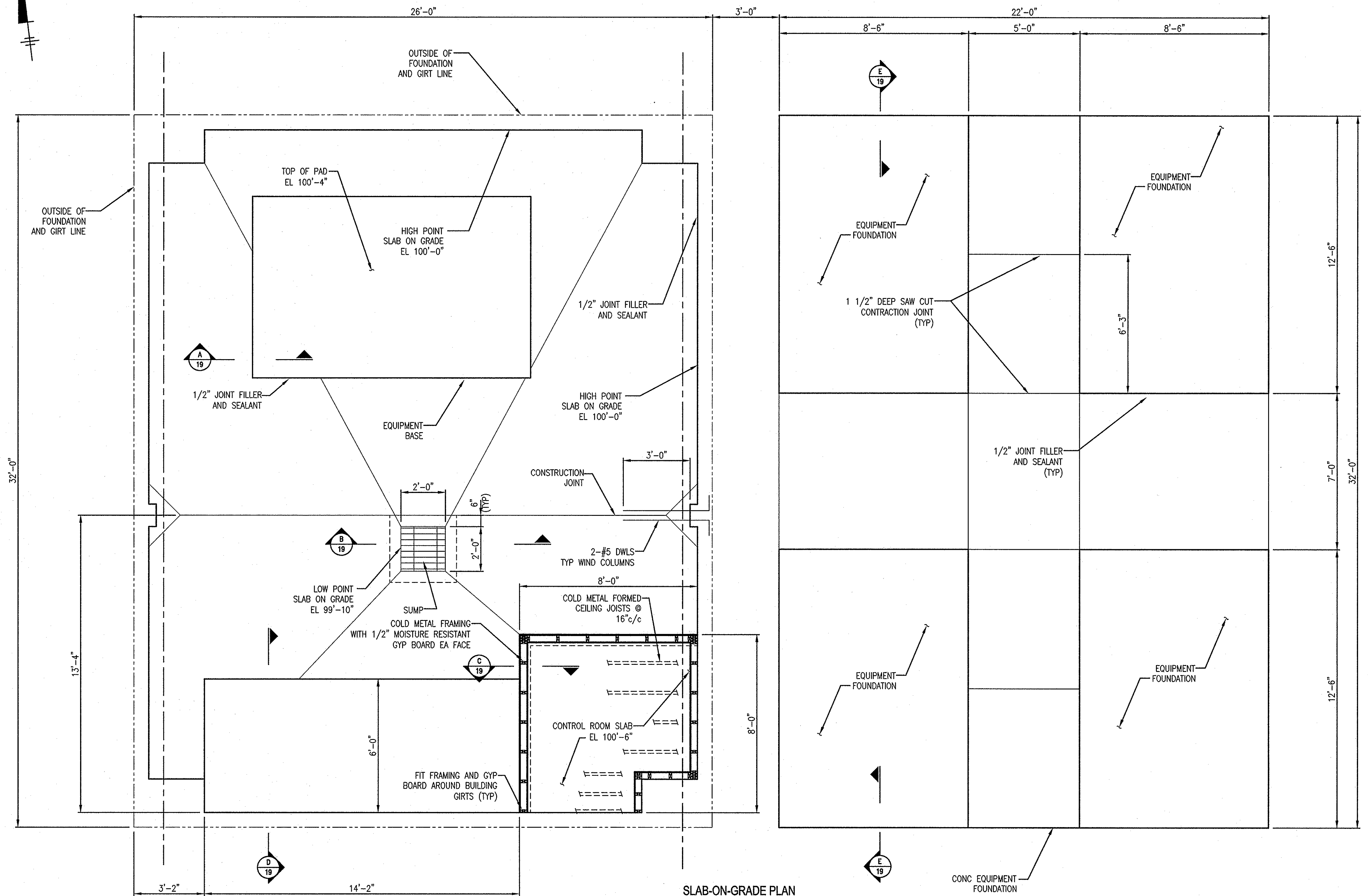
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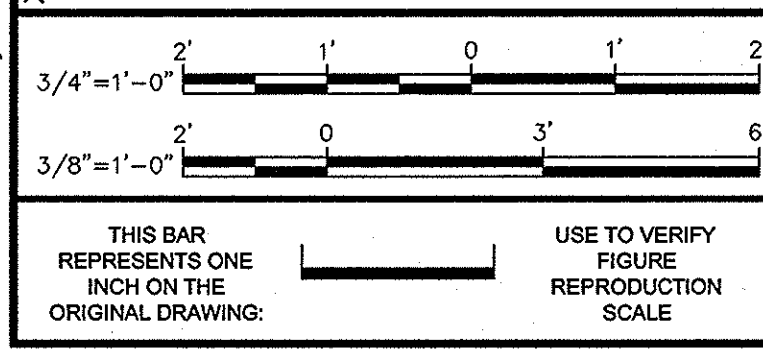
DETAIL B
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DETAIL D
 SCALE: 3/4" = 1'-0"

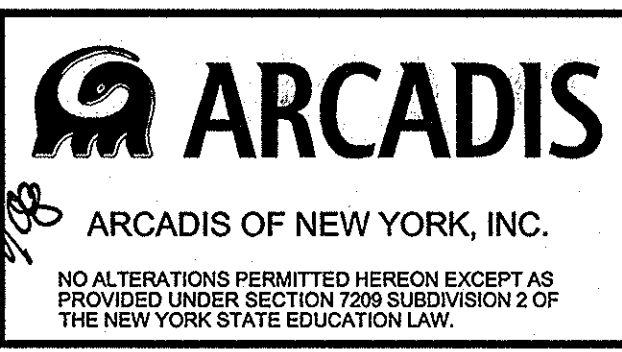
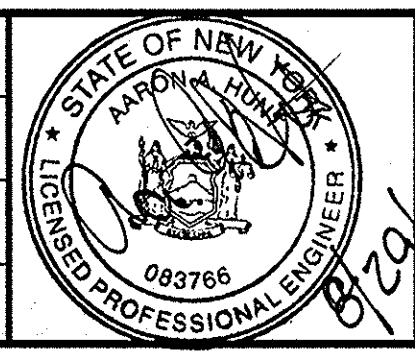


SLAB-ON-GRADE PLAN
 3/8" = 1'-0"



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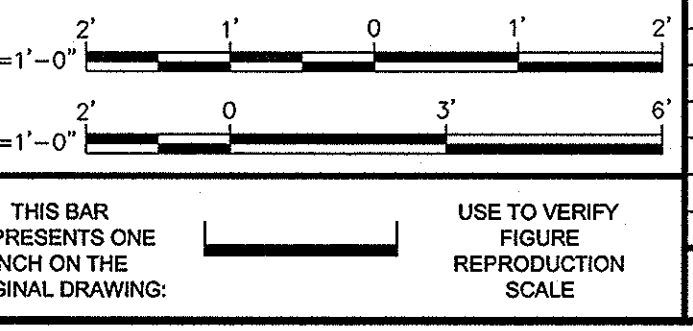
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NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
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SLAB ON GRADE PLAN VIEW AND DETAILS
 STRUCTURAL

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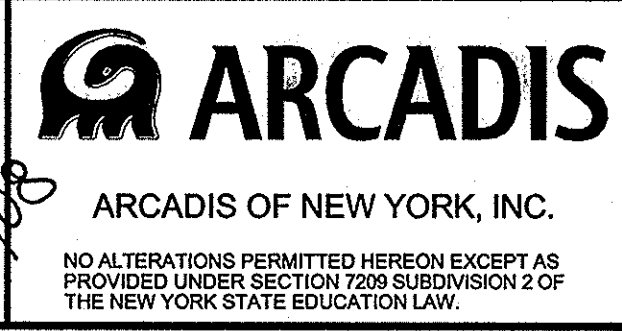
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Professional Engineer's Name
AARON A HUNT
 Professional Engineer's No.
 083766
 State NY Date Signed 8/21/08 Project Mgr. CSG
 Designed by AAH Drawn by AAH Checked by TEM/WSW



NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
 OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS
FOUNDATION PLAN VIEW AND DETAILS
 STRUCTURAL

ARCADIS Project No. NY001464.1807.0003
 Date AUGUST 2008
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