Ward Products Site

MONTGOMERY COUNTY, NEW YORK

Site Management Plan

NYSDEC Site Number: 429004

Revisions to Final Approved Site Management Plan:

Revision #	Submitted Date	Summary of Revision	DEC Approval Date
2	1/23/2017	Amend sampling frequency, specific wells, and certain analytes, as detailed in 1/23/2017 letter to Barbara Littleton.	1/23/2017

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1	7/26/2011	Site has been cleaned up to substantive requirements of Commercial SCOs. This would allow the future use of the site to be industrial or commercial. Sections affected by this change are 1.5.6, 2.3, and 2.5.4.1	7/27/2011

AECOM Environment

Prepared for:
New Water Realty Corporation
(f/k/a/ Ward Products Corporation)
c/o 2900 Orchard Place
Orchard Lake, Michigan 48324

Prepared by:
AECOM
Latham, NY
Project 60155290
February 2011

Site Management Plan
Ward Products Site
Site # 4-29-004
Amsterdam, New York

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Site Management Plan
Ward Products Site
Site # 4-29-004
Amsterdam, New York

Prepared By: Reeti Doshi

Reviewed By: Scott Underhill, P.E.

Contents

List of Figures

List of Appendices

Engineering Certification

I, Scott A. Underhill, certify that I am currently a NYS registered professional engineer and that this Site Management Plan for the Ward Products Site (Site Number # 4-29-004) was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Respectfully submitted,
AECOM Technical Services Northeast, Inc.

Scott Underhill Date
Registered Professional Engineer
New York License No. 075332

1.0 Introduction

This Site Management Plan (SMP) has been developed for the Ward Products Site (Site) by AECOM Technical Services Northeast, Inc. (AECOM) for New Water Realty Corporation (NWR). The SMP has been prepared in accordance with the Record of Decision (ROD) issued by the New York State Department of Conservation (NYSDEC) in March 2007 and the Order on Consent between NWR and NYSDEC dated effective July 9, 2007, Index #A4-0588-0507. The ROD issued in response to a September 2006 Feasibility Study (FS) Report and Risk Assessment based on prior extensive investigations and interim remedial measures (IRMs) outlined in brief below.

The Site is located at 61 Edson Street in the Amsterdam Industrial Park, Amsterdam, Montgomery County, NY. The Site is listed in the Registry of Inactive Hazardous Waste Disposal Sites in New York State as Site Number 4-29-004 by the NYSDEC and was the subject of Orders on Consent Index #W4-0762-96-06 and #A4-0588-0507 between NWR and NYSDEC. The Site is near the eastern boundary of the City of Amsterdam within the Town of Amsterdam, approximately 3,300 feet northeast of the Mohawk River (see Figure 1). The Site encompasses approximately 8.6 acres and includes a 69,556 square foot single story building, a large paved parking lot, lawn areas, and approximately 3.5 acres of undeveloped land behind the building (Figure 2). There is no current use of the Site as the building is unoccupied, but its most significant historic use was industrial/commercial, although most recently the building was used, after notice to NYSDEC, for retail furniture sales. Possible future uses include industrial or commercial uses such as manufacturing, assembly, storage, sale and/or distribution of products and related uses such as office, research, and repair, and retail and service uses, but excludes residential uses.

Under the ROD the remedial activities for the Site included in-situ chemical oxidation (ISCO) with a supplemental groundwater extraction and treatment system (GWETS), clean-up and maintenance of the downstream sediment basins, and continued operation of the Sub-Slab Depressurization System (SSDS) when the building is occupied, unless future data warrants otherwise. These areas are shown on Figure 3.

As required by the ROD, this SMP includes an Engineering Controls/Institutional Controls (ECs/ICs) Plan, a Monitoring Plan, and an Operation and Maintenance (O&M) Plan for the Site and downstream sediment basins. The SMP does not supersede any federal, state, or local statutes, regulations, or ordinances pertaining to the environment, and current and future holders of interests of the Site will remain obligated to comply with the same. This SMP also outlines general soil management practices and should be followed during future construction activities at the Site.

The NYSDEC, its agents, employees, or other representatives of the government may enter and inspect the Site in a reasonable manner and at reasonable times following the access arrangements with the Site owners or their representative to assure compliance with the SMP. This SMP has been prepared as a mechanism to assure that consistent and effective inspection, maintenance and enforcement activities are occurring and will occur in the future at the Site. The objectives listed below will be primarily achieved through the implementation of ECs/ICs, groundwater monitoring and treatment, sediment monitoring, and O&M as required. Future owners of the property will be bound by the provisions of this SMP.

1.1 Objectives

Residual contamination is present at the Site and downstream sediment basins after completion of the remedial action. Engineering and/or Institutional Controls have been incorporated into the Site remedy to provide proper management of residual contamination to ensure future protection of public health and the environment. An Environmental Easement against the Site will be granted to the NYSDEC, and recorded with the Montgomery County Clerk, that provides an enforceable legal instrument to ensure compliance with this SMP and all ECs/ICs placed on the Site. The ICs place restrictions on Site use and mandate operation, maintenance, monitoring and reporting measures. This SMP specifies the methods necessary to ensure compliance with all ECs/ICs required by the Environmental Easement for contamination that remains at the Site. Once approved, this SMP may only be revised with the approval of the NYSDEC.

The SMP provides a detailed description of all procedures required to manage remaining contamination at the Site after completion of the Remedial Action as required by the ROD, including: (1) implementation and management of all ECs/ICs; (2) groundwater and sediment monitoring; (3) O&M of the GWETS and SSDS; (4) performance of periodic inspections, certification of results, and submittal of Periodic Review Reports (PRRs); and (5) defining criteria for termination of the GWETS and SSDS treatment system operations.

The specific objectives of this SMP include:

- Describing the binding and enforceable ECs/ICs that will facilitate future construction activities on the Site, if any;
- Establishing controls on groundwater use;
- Establishing long-term monitoring requirements at the Site; and,
- Outlining O&M requirements.

1.2 Site History

The Site building was initially constructed in 1957, although expanded thereafter, and was first occupied by the Gabriel Corporation, which manufactured car antennas. Ward Products (now NWR) purchased Gabriel's operation and the Site in 1959. As part of the manufacturing process, small metal parts were cleaned with solvents (vapor degreasing) prior to electroplating operations using nickel/chromium, zinc/cyanide, and cadmium/cyanide lines.

Between 1957 and 1973, untreated electroplating bath solutions containing chromium, zinc, cadmium, and nickel, and the degreasing solvent trichloroethene (TCE), were discharged to the nearby drainage ditch east of the Ward Products building. From 1973 through 1985, operations pretreated the plating solutions from the nickel/chromium line and dried the resulting sludge on an outdoor concrete pad prior to removal for off-site disposal. The spent cadmium/cyanide plating solution was discharged to an outdoor tank for both natural and mechanical evaporation and off-site disposal of the remaining sludges. The zinc/cyanide line was discontinued in 1973.

Ward Products (now NWR) connected to Amsterdam's sewer system in 1983 and then discontinued the vapor degreasing system. All electroplating operations at the Site were discontinued in 1985. In 1988 and 1989, the plant expanded with a new grinding shop built over the former sludge drying pad and a new warehouse area built to the north. The expansion of the manufacturing building over this area has eliminated the some of the contaminant mass and reduced the potential for migration of, or exposure to, the residuals remaining. The soils from the former sludge drying pad were

significantly excavated during the building expansion, stockpiled, and then removed from the Site during subsequent IRMs (see FS Report § 2.1.1).

In 1985, NYSDEC first listed the Site as a Class 2a site in the Registry of Inactive Hazardous Waste Disposal Sites in New York (the Registry). Class 2a was a temporary classification assigned to a site that had inadequate and/or insufficient data for inclusion in any of the other classifications. A hydrogeologic investigation of the Site took place in 1986 and again in 1988. The 1988 investigation included excavation of test pits east and southeast of the former electroplating and treatment operations. Surface water and sediment samples were collected from the drainage ditch. Shallow soil samples were also collected from beneath the sludge drying pad and analyzed for metals and VOCs. In 1989, NYSDEC listed the Site as a Class 2 site in the Registry. A Class 2 site is a site where hazardous waste presents a significant threat to the public health or the environment and action is required. Further hydrogeologic investigation of the Site in 1996 included the installation of four (4) groundwater monitoring wells and additional sediment sample collection from the drainage ditch.

Twenty-two (22) groundwater monitoring wells have been installed on and around the Site. Two additional water supply wells were found at the FGI facility next door. Four (4) on-site wells (MW-1 through MW-4) are installed in the shallow glacial aquifer and the remaining twenty (18) groundwater wells and two water supply wells are installed in the fractured bedrock. TCE had been consistently detected above the NYSDEC Standards, Criteria, and Guidelines (SCGs) Ambient Groundwater Quality Standard (5 µg/L) in samples collected from fourteen (14) of the twenty-four (24) wells. Other chlorinated VOCs (e.g. dichloroethene [DCE]) have also been detected in the groundwater. Chromium (predominantly hexavalent [Cr^{+6}]) had been consistently detected in the three (3) of the four (4) glacial till monitoring wells and in eight (8) of the fractured bedrock monitoring wells. There are currently no wells supplying drinking water in the impacted area and potential for ingestion of groundwater is minimal.

1.3 Summary of Remedial Investigation Findings

The Remedial Investigation (RI) was performed on the Site to determine the nature and extent of the contamination resulting from previous activities at the Site. The RI was conducted between August 1997 and May 2005. Soil samples were collected from extensive areas of the Ward Property from both the surface and subsurface. Surface water samples were collected from the intermittent drainage and sediment samples were collected from the Site near Mohawk River, located over 3,000 feet away from the Site. Groundwater monitoring wells were installed and sampled and the quality of air inside the Ward Products building was tested. During this period certain IRMs were conducted and reports concerning same submitted to NYSDEC.

Below is the summary of the findings of the RI paraphrased from the ROD.

1.3.1 Background Soil

The background soil samples collected during early investigation of the Site were found to contain elevated levels of electroplating metals and cyanide, indicating that the contamination extended beyond the area around the former sludge-drying pad. Subsequent soil samples collected from the Site were checked and considered to be background samples if they did not have any detectable cadmium, hexavalent chromium, or cyanide compounds which were not commonly found in uncontaminated soils. Twenty-three (23) soils samples met the criteria, and the results were averaged to establish Site background concentrations for the electroplating-related inorganic.

1.3.2 Surface Soil

Surface soil samples were collected from over ninety (90) locations across the Site, generally from a depth of 0-2 inches, but sometimes from 0-6 inches. In areas affected by past disposal activities, the contaminants found above recommended soil cleanup objectives consisted of inorganics associated with electroplating: cadmium, chromium, cyanide, lead, nickel, and zinc. In addition, PCBs were found at concentrations up to 11 ppm in the vicinity of large transformers located on the east side of the building. Fifteen (15) cubic yards of PCB-contaminated soil were removed in October and November 1999 as an Interim Remedial Measure (IRM).

The soil around the northeast corner of the Ward Products building, where the sludge-drying pad was located and soils were stockpiled during the 1988-89 facility expansion, exhibited extensive contamination. The lawn area east of the property and the small hill to the north were also believed to be contaminated during this expansion.

In the ninety (90) surface soil samples, total cadmium concentrations ranged from <0.25 ppm to <90 ppm compared to the recommended soil cleanup objective (SCO) of 1 ppm. Chromium concentrations ranged from the background level to 810 ppm compared to the SCO (Site background) of 17 ppm. Cyanide was detected in a few samples, up to 24 ppm compared to its SCO of <1 ppm. Lead was detected at concentrations up to 330 ppm compared to the SCO (Site background concentration) of 6.6 ppm.

Nickel was detected at concentrations from below the SCO of 16 ppm (Site background) to as high as 1,780 ppm. Total zinc concentrations ranged from below the SCO of 46 ppm (Site background) to 2,020 ppm.

Soils were analyzed for total concentrations of metals and also for Toxic Characteristic Leaching Procedure (TCLP), which examines the leachability of contaminants. Soil exceeding standards set for TCLP are considered hazardous waste. In TCLP testing, several metals were found at concentrations below their standards, but cadmium frequently exceeded the TCLP standard of 1 ppm.

In 2004, 700 tons of contaminated soils around the Ward Products building and 350 tons of sediments from the on-site drainage ditch were removed as an IRM. The IRM didn't differentiate between the surface and subsurface soils though. After performing numerous TCLP analyses on soil samples, a total cadmium concentration of 30 ppm was set as a cleanup objective. This concentration was selected based on site-specific analytical data showing soil with cadmium below this value would not be expected to exceed the TCLP standard. In addition, areas with total chromium concentrations above 450 ppm were also targeted for removal. This chromium concentration in industrial soil was the USEPA Preliminary Remediation Goal for protection of human health. Areas so excavated by reason of either of these criteria also had high concentrations of nickel, lead, or zinc. At the northeast corner of the building, soil was removed in many places down to the underlying bedrock. In a few locations, post-excavation cadmium concentrations were higher than the cleanup level, but TCLP analysis revealed that the standard for leachable cadmium in those areas was not exceeded. Areas that were excavated were backfilled to the original elevation with clean soil, graded, and seeded.

The completion of this IRM removed the most highly contaminated soil from the Site, including soil which could have been classified as hazardous waste. However, some soils with metals concentrations above the recommended soil cleanup objectives remained on-site as identified during the RI/FS and were addressed under the IRM as discussed in Section 1.5.2.

1.3.3 Subsurface Soil

As with surface soil, subsurface soil samples were collected from over ninety (90) locations across the Site. These samples generally were taken from a depth of 2-12 inches, but at times went down to a depth of three feet, depending on overlying contamination or depth of soil overlying bedrock. Electroplating related metals concentrations were generally lower than that in the overlying surface soils.

Contaminated subsurface soil was removed during the 2004 IRM. This IRM did not discriminate between surface and subsurface soil, but removed all soil with cadmium concentrations greater than 30 ppm or chromium greater than 450 ppm.

An additional volume of soil in exceedance of SCOs is assumed for the purposes of this SMP to be present below the building's slab-on-grade foundation, primarily below the grinding room and warehouse sections (former vapor degreaser and sludge pad areas). Some of these soils potentially contain TCLP exceedances for cadmium but do not pose a risk to groundwater or human health. Assuming an average depth of 2 feet, the volume of impacted sub-slab soil could be in the magnitude of 700 cubic yards (FS Report). In the event of future building demolition, excavation and management of those soils will be required under this SMP, unless then demonstrated to be clean.

1.3.4 Groundwater

Twenty-two (22) groundwater monitoring wells were installed as part of the remedial investigation. Chromium was detected in the groundwater beneath the Site at concentrations as high as 33 ppm, exceeding its standard of 50 ppb (0.05 ppm) in 1997 and has decreased since then. During the later stage of the RI, the chromium concentration in the groundwater was detected to be below 0.5 ppm. Chromium in the groundwater is primarily in the hexavalent form, which is more mobile in water with a pH greater than 7, a condition which existed at the Site.

Chromium in off-site groundwater was not been detected above the standard. Other electroplating related metals were not found in the groundwater above the standards. This was probably a result of the carbonate content and high pH of the soil, which tends to limit the migration of these metals into the groundwater by chemically binding them into insoluble forms. On-site and off-site groundwater was contaminated with TCE and, to a lesser extent, its breakdown products (i.e., 1,1-dichloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene). The groundwater standard for each of these chlorinated solvents is 5 ppb. TCE was detected at the Site at concentrations as high as 140 ppm (140,000 ppb) in a monitoring well near the outfall pipe. Due to the nature of the groundwater at the Site (i.e., occurring in joints and fractures in the bedrock), contaminant concentrations in one monitoring well can be quite different than those in an adjacent well, depending on which fractures are intercepted. TCE concentrations exceeded the groundwater standard beyond the Ward Products property boundary.

In 2004, NWR became aware of the existence of two production wells at the FGI facility east of the Site. At the time, only one well was being used on a limited basis. When the wells were first sampled in December 2004, the one closer to Ward Products was found to be contaminated with TCE at a concentration of 440 ppb. Both wells were re-sampled in May 2005, when water was being pumped from the well farther from Ward Products. The results showed TCE in both wells, with a concentration of 1,100 ppb in the closer FGI well. The wells were again sampled in September 2005, when FGI ceased pumping from them. Once pumping stopped, TCE concentrations dropped dramatically. It was apparent that a hydraulic connection exists between the

contaminated areas on the Ward property and the two FGI wells. The FGI wells probably intercept the same large fracture, and facilitate the flow of contaminated groundwater away from the Site toward the wells when they are pumped. NWR entered into an agreement with FGI on September 18, 2006, under which FGI ceased groundwater use and disconnected the wells from FGI plumbing. Subsequent sampling of those wells indicated that all COC were below NYSDEC standards and with NYSDEC approval, those wells were later decommissioned.

Consequently, remaining groundwater contamination identified during the RI/FS was further addressed under the ROD.

1.3.5 Surface Water

Surface water at the Site is intermittent in the drainage ditch, generally occurring only during rain events or as spring runoff. A few surface water samples had concentrations of chromium exceeding the surface water standard, but likely due to suspended sediments. After the removal of areas of surface soil and sediments with high chromium or cadmium concentrations in early 2004, surface water has not shown any exceedances. No Site-related surface water contamination of concern was identified during the RI/FS.

1.3.6 Sediments

As a result of years of discharging electroplating wastes into the ditch, concentrations of chromium, cadmium, zinc, lead, nickel, and cyanide in on-site sediment (in the drainage ditch) exceeded the sediment guidance levels. Three hundred fifty (350) tons of sediments with cadmium concentrations above 50 ppm were removed from the on-site drainage ditch and 50 to 100 feet downstream in 2004. This concentration was selected based on Site-specific analytical data showing sediment with cadmium below this value would not be expected to exceed the TCLP standard.

Sediments downstream of the Site were also contaminated, although concentrations of cyanide, lead, and zinc drop below guidance levels within a few hundred feet of the property line. Higher concentrations of cadmium, chromium, and nickel, however, continue downstream along the drainage ways, sometimes as far as the Mohawk River.

Approximately 3,475 tons of metals impacted sediments were removed from the drainage ways downgradient from the Ward Product Site from December 2008 to February 2009 (post-ROD). A discussion of the post-ROD remedial action work for the downstream sediments is provided in Section 1.5.2.

1.3.7 Soil Vapor/Sub-Slab Vapor/Indoor Air

At the request of NYSDEC and New York State Department of Health (NYSDOH), indoor air from the Ward Products building was sampled and compared to soil vapor collected from beneath the concrete slab and outdoor air. For the indoor air, TCE was detected at concentrations ranging from 6.4 to13 $\mu g/m^3$, exceeding the NYSDOH's guidance level of 5 $\mu g/m^3$. Sub-slab concentration of TCE ranged from 1,500 to 1,800 $\mu g/m^3$, and cis-1,2-dichloroethene was found at 940 $\mu g/m^3$.

Indoor air contamination identified during the RI/FS was addressed during the 2005 indoor air interim remedial measure (IRM), discussed in Section 1.5.1.

1.4 Record of Decision

Following the RI/FS (September 2006) the NYSDEC issued a ROD for the Site in March 2007. The ROD specified as its remediation goals to eliminate or reduce to the extent practicable:

- Exposures of persons at or around the Site to electroplating-related metals in soil and sediments;
- Exposures of persons at or around the Site to chromium, or TCE and other VOCs in groundwater;
- Environmental exposures of flora or fauna to electroplating-related metals in the soil and sediments;
- The release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards; and
- The release of contamination from the subsurface soil under buildings into indoor air through soil vapor intrusion.

Further, the ROD also specified remediation goals for the Site include attaining to the extent practicable:

- Ambient groundwater quality standards; and
- Lowest effect level (LEL) sediment guidance values in the NYSDEC "Technical Guidance for Screening Contaminated Sediments."

The selected remedy for sediments include removal of approximately 400 cubic yards of contaminated sediments from the eastern branch of the tributary draining from the Site and removal of approximately 700 cubic yards of contaminated sediment from the Mohawk River at the mouth of the tributary. In addition, two sedimentation basins were to be constructed. The LEL and severe exposure limits (SEL) for the four main COCs in sediments are listed below.

Sediments Cleanup Guidance

Contaminant of Concern	LEL (ppm)	SEL (ppm)
Cadmium	0.6	9
Chromium	26	110
Nickel	16	50
Zinc	120	270

The selected remedy for groundwater treatment included the pilot testing of potassium permanganate injection into the bedrock aquifer followed by full scale implementation of potassium permanganate injection into the bedrock aquifer (the first of which occurred on and about June 15, 2009, and the second of which occurred on and about May 10, 2010) in conjunction with the installation of a single well GWETS. Remedial goals for the on-site groundwater are based on the New York State Groundwater Standards and Guidance Values (NYSDEC, June 2008) listed below, to be pursued until the remedial objectives have been achieved or the Department determines that continued operation is technically impracticable or not feasible.

Groundwater Cleanup Standards

Contaminant of Concern	Groundwater Cleanup Objective (µg/L)
Total Chromium	50
cis1,2-Dichloroethene	5
Tetrachloroethene	5
Trichloroethene	5
Vinyl Chloride	2

1.5 Summary of Remedial Actions

Remedial actions at the Site consisted of a series of interim remedial measures (IRMs) prior to issuance of the ROD and series of remedial actions required by the ROD. Each are listed below and discussed in further detail in the following sections.

The IRMs performed between 1997 and 2005, prior to the issuance of the ROD in 2007, include:

- Removal of 30 cubic yards contaminated soil stockpiled at the Site in 1997;
- Removal of 15 cubic yards of contaminated soil from the Site in 1999;
- Removal of contaminated sediment from an on-Site discharge pipe in 2000;
- Removal of 700 tons of contaminated soil on-Site and 350 tons contaminated sediment from on-Site and off-Site drainage ditches; and,
- Installation of a SSDS at the Ward Products Building in 2005.

The remedial actions performed following issuance of the ROD include:

- Removal of 3,475 tons of impacted sediments from the drainage ways downgradient from the Site between December 2008 to February 2009;
- Installation of a GWETS on Site consisting of a single recovery well and treatment system in June 2009; and,
- Injections of ISCO the weeks of June 15, 2009 and May 10, 2010.

1.5.1 Interim Remedial Measures

In 1997, Ward Products removed 30 cubic yards of contaminated soil stockpiled during the plant expansion of 1988-89. This soil exceeded the TCLP standard for cadmium (defining it as hazardous waste) and contained high concentrations of other electroplating-related metals.

In 1999, 15 cubic yards of soil were excavated from next to the Ward Products building in the vicinity of the fenced-in transformers. This soil contained low concentrations of polychlorinated biphenyls (PCBs, highest concentration of 11 ppm) as well as electroplating metals.

Since the plant connected to the municipal sewer in 1983, the main outflow pipe, previously used to discharge plant effluent to the ditch on the eastern property line, has been used to direct stormwater runoff from the roof away from the building. However, examination of the inside of the pipe revealed sediment deposits which contained significantly elevated metals and VOC concentrations. These

sediments were removed in an IRM performed in 2000. In addition, a poorly constructed pipe junction was replaced with a manhole.

In 2004, 700 tons of contaminated soil around the Ward Products building and 350 tons of sediments from the on-site and off-site drainage ditch were removed. The cleanup objectives for this IRM were 30 ppm cadmium for soil and 50 ppm cadmium for sediment. Soil and sediment removed during this IRM also had elevated concentrations of chromium, cyanide, lead, nickel, and zinc. In addition to areas adjacent to the Site, NWR excavated two downstream depositional areas located upstream of where the drainages enter culverts under Sam Stratton Road. The residual contaminated sediments in the drainage ditch and depositional areas are covered with armor stone (i.e., large, angular rocks) and the residual contamination in the soil around the building is covered by a clean soil cap.

Finally, mitigation measures were taken at the Ward Products building in 2005 to address then current human exposures (via inhalation) to volatile organic compounds associated with soil vapor intrusion. A sub-slab depressurization system was installed to create a negative pressure gradient below the slab, thus minimizing infiltration into the building. The SSDS consists of 14 slab penetrations with riser pipes manifolded to six soil vapor vent fans. All soil vapor vent pipes and fittings, except flow control valves were made of 4-inch Schedule 40 PVC. The flow control valves were 3-inch diameter PVC. The vent pipes were fastened to the structure of the building with hangers. The vent fans were RadonAway Model GP502 and were sized to provide the pressure differential and airflow characteristics necessary to achieve sub-slab depressurization. The vent fans are mounted on the exterior of the building in a watertight protective housing and were secured to the vent pipes with flexible couplings. A manometer and a ¼ -inch female NPT vapor sampling port were installed on each vertical vent pipe to evaluate system performance. The locations of the slab penetrations and the vent fans are shown on the Figure attached in Appendix B.

1.5.2 Post-ROD Sediment and Soil Remediation

Approximately 3,475 tons of metals impacted sediments were removed from the drainage ways downgradient from the Ward Product Site from December 2008 to February 2009. The sediment and soil remediation was performed in general accordance with the ROD (March 2007), Order on Consent (Index #A4-0588-0507, June 2007), and the Remedial Design/Remedial Action Work Plan (December 2007). All soils within the removal limits indicated in the FS and ROD were removed during the remediation, however some impacted material above LEL and SEL remains in the drainages. These areas have been capped with at least 18 inches of clean soil or 12 inches of armor stone to prevent exposures to and/or erosion of soils containing Site related contaminants. The sediment and soil remediation also included the construction of two sediment basins, one along the east branch drainage and one along the west branch drainage.

The excavation/removal of impacted sediments and soils was conducted in four different areas, which are named after the nearby roads and/or geographic features. Each of the four areas exhibited cadmium, chromium, zinc and nickel concentrations in the sediments and soils above the LEL and SEL. The four removal areas are identified in Figure 3 and are:

Area 1: Mohawk River/Quist Road Removal Area

A total of 1,581 tons of sediment and soil was removed from the Mohawk River and Quist Areas and disposed of off-Site. The removal area was backfilled with run of bank gravel to restore the channel to pre-existing grades as well as providing an 18 inch to 30 inch thick surface cap.

Disturbed vegetative areas were backfilled with clean soil, six inches of topsoil, and hydro-seeded.

For further information regarding the remediation and restoration of the Mohawk River/Quist Road removal area, refer to the Final Remediation Report - Sediment and Soil Remediation, Ward Products Site, February 2010.

Area 2: Route 5 Removal Area

A total of 1,310 tons of soil was removed from the Route 5 Area and disposed of off-Site. Impacted material was left in place above the National Grid gas main along the Northern portion of the Route 5 Area to avoid damaging the utility during the excavation process. The entire Route 5 Removal Area has been capped with a layer of 8 ounce non-woven geotextile, followed by a 6 inch layer of NYSDOT light stone, and then a 6 inch layer of NYSDOT fine stone fill.

A sedimentation basin was constructed at the southern portion of the Route 5 Area to allow impacted sediments to settle out, preventing migration of impacted sediments downgradient. The detention basin was constructed by placing a crushed stone spillway structure within the flow channel. The spillway was constructed of crushed stone to allow water to pass through but filter out any suspended sediment. During periods of high flow the stormwater would be detained within the basin for a period of time, allowing sediments to settle out.

For further information regarding the remediation and restoration of the Route 5 removal area, refer to the Final Remediation Report - Sediment and Soil Remediation, Ward Products Site, February 2010.

Area 3: Chapman Drive Removal Area

A total of 235 tons of soil was removed from the Chapman Drive Removal Area and disposed off-Site. The area was backfilled with crushed fine stone fill to provide a cap with minimum thickness of approximately 36 inches.

A sedimentation basin was constructed at the Chapman Drive Area, along the West Branch drainage to allow impacted sediments to settle out, preventing migration of impacted sediments downgradient. The detention basin comprises a 42 inch perforated corrugated steel riser section, with a 24 inch corrugated steel culvert pipe tied into the existing laid up stone culvert. A trash rack was provided atop the riser pipe to prevent debris from entering and clogging the culvert.

For further information regarding the remediation and restoration of the Chapman Drive removal area, refer to the Final Remediation Report - Sediment and Soil Remediation, Ward Products Site, February 2010.

Area 4: Sam Stratton Road Removal Area (or Basin Area)

A total of 198 tons of soil was removed from the Stratton Road Area and disposed of off-Site. The soils were removed from the existing stormwater detention pond/basin.

Based on the verification sample results, the Stratton Road Removal Area was left in its excavated state and was not backfilled. The basin owner indicated that they had planned to dredge the remaining unexcavated portion of the detention basin in the near term. The gravel access road was removed and replaced with topsoil and hydro-seeded.

For further information regarding the remediation and restoration of the Sam Stratton Road removal area, refer to the Final Remediation Report - Sediment and Soil Remediation, Ward Products Site, February 2010.

The list of the owners or parties responsible for each of the detention basins and utilities affected by the project is as follows:

- National Grid access agreement for gas line easement at the Route 5 Removal Area
- Amsterdam Industrial Development Agency for basin to the south of Sam Stratton Road as well as the Chapman Drive Removal Area.
- The City of Amsterdam for the Mohawk River/Quist Road Removal Area
- Property Owner at 344 Chapman Drive for the Chapman Drive Removal Area.
- Lamar Advertising Company for the Route 5 Removal Area.

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1.5.3 Groundwater Extraction and Treatment System

A GWETS was installed outside the southeast portion of the Ward Products building located on 61 Edson Street to reduce on-site source of contaminants in groundwater and to reduce future migration from the Site. The system was installed in June 2009 and started up on June 15, 2009. The system was shut down after the ISCO injection to provide time for the oxidant to continue to react with the contaminated groundwater. The system was restarted on August 11, 2009.

The treatment system is located in a shed as shown on Figure 4 and treats groundwater extracted from a single recovery well (RW-01). The recovery well is constructed of a 6-inch diameter PVC, 80-feet deep and screened within bedrock from 20 to 80 feet below ground surface. The 6-inch PVC casing is placed within a 8.25-inch bedrock borehole, without sand pack. The recovery well head is fitted with a flush mount vault, approximately 24-inches square and 24-inches deep.

The system flow rate is set at approximately 2 gallons per minute (gpm) to avoid pumping the well dry. The static water level is approximately 11 feet below ground surface and is approximately 19 to 21 feet below ground surface while the pump is operational. A pump protector was also installed on the pump which shuts the pump down for 200 minutes when the water level falls below the pump intake. Extracted groundwater is treated by an air stripper and discharged to the City of Amsterdam Publicly Owned Treatment Works (POTW) under a long-term Permit obtained from the City of Amsterdam on April 1, 2009.

1.5.4 In Situ Chemical Oxidation Injections

A limited ISCO program has been concurrently implemented with the intent of reducing the contaminant mass in the source area. The ISCO program is intended to reduce TCE concentration within the area of MW-4R, MW-6, and MW-10, in accordance with the FS, the ROD, and the Order on Consent of July 2007. As specified in the ROD, up to three injections of oxidants may be performed.

Four ISCO wells were installed in a grid encompassing the source area near MW-4R, MW-6, and MW-10 as shown on Figure 2. Bedrock elevations in these areas are 12 to 16 feet below ground surface. The ISCO wells are 2-inch diameter PVC and screened within bedrock with a steel isolation casing extending 2 feet into the bedrock surface. The wells are flush mounted at the ground surface and the top of the PVC casing has a threaded coupling. The 2-inch PVC casing was

placed within a 4-inch bedrock borehole, without sand pack, for the purpose of maintaining open bedrock boreholes.

The total depth of the injection wells IW-02 through IW-04 is 80 feet below ground surface. The total depth of IW-01 is 45.5 feet as the casing could not be held in place due to change in the geology. IW-02 through IW-04 were screened within the bedrock from 20 to 80 feet below ground surface and IW-01 was screened from 30.5 to 45.5 feet below ground surface.

The first two ISCO injections were performed the weeks of June 15, 2009 and May 10, 2010. During the first injection, each injection well (IW-01 through IW-04) was injected with 25 lbs of potassium permanganate. During the second ISCO injection, each well (IW-01, MW-4R, MW-6, and MW-10) was injected with approximately 210 lbs of potassium permanganate. The schedule for the third and final injection, if required, has not yet been determined.

1.5.5 Remaining Contamination

An IRM was conducted at the Site in 2004 to excavate and remove on-site and off-site soils and sediments that contained leachable chromium in concentrations in excess of the TCLP limit of 1.0 mg/L, on-site and off-site ditch sediments containing total chromium in excess of 50 mg/kg, on-site soils containing cadmium at concentrations in excess of 30 mg/kg, or on-site soils containing chromium at concentrations in excess of 450 mg/Kg. Approximately 350 tons of TCLP hazardous soils and 700 tons of non-hazardous soils were removed and disposed off off-site during the IRM. In three locations (IRM S46, C-2, and S82), the remaining cadmium concentrations were above the total cadmium objective, but subsequent TCLP analyses from those areas showed that the remaining soil there was non-hazardous and that, with NYSDEC concurrence, the objective of the IRM was met.

The TCE in the groundwater is primarily a bedrock contaminant. The concentration on-site was several orders of magnitude higher than off-site. The suspected source of TCE was in the vicinity of MW-4R, MW-6, and MW-10 (Figure 4), and the concentrations in this area have typically exceeded 2,000 µg/L.

An additional volume of soil in exceedance of SCOs is assumed present below the building's slab-on-grade foundation, primarily below the grinding room and warehouse sections (former vapor degreaser and sludge pad areas). In the event of future building demolition, excavation and management of those soils will be required under this SMP.

Impacted material remains at three of the four off-Site areas remediated during the 2008-2009 Soil and Sediment Remediation, including the Mohawk River/Quist Road Area, Route 5 Area, and the Chapman Drive Area. The Mohawk River/Quist Road Area and the Chapman Drive Area exhibit mild contamination which is above the LEL but below the SEL. A minimum of 18 inches of clean backfill has been placed above all remaining impacted material in the both areas. The Route 5 area exhibits more severely impacted material, exceeding the SEL at the majority of sample locations. The Route 5 Area has been capped with a geotextile fabric with at least 12 inches of angular armor stone to prevent erosion and offsite migration of impacted soils that remain. Further details about the areas with remaining impacted soils can be found in the FER approved by NYSDEC. No further remediation is required in these areas, but monitoring activities will occur as provided in this SMP.

1.5.6 Engineering and Institutional Controls

Since remaining contamination is present, ECs/ICs are being implemented to protect public health and the environment. The ECs/ICs are designed to be consistent with the ROD so as to:

- Eliminate or reduce the exposures of people at or around the Site to electroplating related metals in soil and sediments;
- Eliminate or reduce exposure of people at or around the Site to chromium, TCE and other VOCs in groundwater;
- Eliminate or reduce environmental exposures of flora or fauna to electroplating-related metals in soil and sediments;
- Eliminate or reduce the release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards;
- Eliminate or reduce the release of contaminants from subsurface soil under buildings into indoor air through soil vapor intrusion; and,
- Attain ambient groundwater quality standards to the extent practicable.

The following ECs are included for the Site:

- Existing cover system to restrict exposure to impacted materials below the soil cover or building (the requirements for the cover system include removal of the contaminated soils from beneath the building should they become accessible);
- Continued operation of the SSDS at the Site whenever the building is occupied, unless future data warrants otherwise (the requirements for the cover system include soil vapor intrusion evaluations at any new construction at the Site above the contaminated groundwater plume);
- Continued operation of the GWETS except as hereafter provided.

The ROD states an IC in the form of an environmental easement will be imposed for the Site. The environmental easement for the Site will ensure that:

- All ECs must be operated and maintained as specified in this SMP;
- On-site and off-site inspections, and corrective actions, must occur and be certified at a frequency and in a manner defined in this SMP;
- Groundwater, soil vapor, and sediment monitoring must be performed as defined in this SMP;
- Data and information pertinent to management for the Site must be reported at the frequency and in a manner defined in this SMP; and,
- On-site environmental treatment and monitoring devices must be protected, repaired, and replaced as necessary to ensure continued functioning in the manner specified in this SMP.

In addition, the Environmental Easement places following restriction on the property:

- Limit the use and development of the property to industrial use;
- Require compliance with the approved SMP;
- Restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by NYSDOH; and,
- Require the property owner to complete and submit to the Department a periodic certification of institutional and engineering controls.

2.0 Engineering and Institutional Control Plan

Since residual contaminated soil, groundwater and soil vapor exists beneath the Site; EC/ICs are required to protect human health and the environment. This EC/IC Control Plan describes the procedures for the implementation and management of all EC/ICs at the Site. The EC/IC Plan is one component of the SMP in addition to the Monitoring Plan (Section 3) and O&M Plan (Section 4).

2.1 Purpose

The purpose of the EC/IC Plan is to provide:

- A description of all EC/ICs on the Site;
- The basic operation and intended role of each implemented EC/IC;
- A description of the key components of the ICs created as stated in the Environmental Easement;
- A description of the features that should be evaluated during each periodic inspection and compliance certification period;
- A description of plans and procedures to be followed for implementation of EC/ICs, such as the implementation of an Excavation Plan for the safe handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the Site;
- Any other provisions necessary to identify or establish methods for implementing the EC/ICs required by the Site remedy, as determined by the NYSDEC; and,
- A description of the reporting requirements for these controls.

2.2 Engineering Controls

2.2.1 Cover Systems

Based on the FS Report, an additional volume of potentially-impacted soil may be present below the building's slab-on-grade foundation, primarily below the grinding room and warehouse sections (former vapor degreaser and sludge pad areas). Some of these soils may contain TCLP exceedances for cadmium but do not pose a risk to groundwater or human health. Although the amount of impacted material is unknown, the approximate extent of soil cover system is shown on Figure 3. The excavation plan (Section 2.4) outlines the procedures required to be implemented in the event(s) during which (i) the inside building foundation floor is breached, penetrated, temporarily removed or demolished, and/or (ii) the outside clean soil cover system is breached, penetrated, and/or removed, and any underlying remaining contamination is disturbed. Procedures for the inspection and maintenance of the building foundation floor and/or the clean soil cover system are provided in the monitoring plan (Section 3).

2.2.2 Remedial Treatment Systems

Two ongoing remedial treatment systems have been installed at the Site: a SSDS and a GWETS. The SSDS is used to prevent exposure of VOCs to workers within the building on-Site. The GWETS is intended to reduce on-site sources of contaminants in groundwater and to control and reduce future migration of contaminated groundwater from the Site.

The SSDS was installed below the slab of the building located at 61 Edson Street to prevent exposure of the occupants to any intruding VOC vapors. The SSDS consists of 14 slab penetrations with riser pipes manifolded to six soil vapor vent fans. All soil vapor vent pipes and fittings, except flow control valves were made of 4-inch Schedule 40 PVC. The flow control valves were 3-inch diameter PVC. The vent pipes were fastened to the structure of the building with hangers. The vent fans were RadonAway Model GP502 and were sized to provide the pressure differential and airflow characteristics necessary to achieve sub-slab depressurization. The vent fans are mounted on the exterior of the building in a watertight protective housing and were secured to the vent pipes with flexible couplings. A manometer and a ¼-inch vapor sampling port were installed on each vertical vent pipe to evaluate system performance. The locations of the slab penetrations and the vent fans are shown on the Figure attached in the Appendix B. The SSDS should be operational whenever the building is occupied, unless future data warrants otherwise.

The GWETS was intended to work as a supplement to the completed injections of potassium permanganate to oxidize contaminants, primarily to limit future migration of contaminated groundwater from the Ward Products Site, and to draw the oxidant into the fractures. The GWETS installed adjacent to the building on-Site consists of a submersible pump, a flow totalizer, air stripper, and a transfer pump. The groundwater extracted by the submersible pump is treated in air stripper for VOC removal and discharged to the City of Amsterdam POTW. The air from the stripper is discharged directly to the atmosphere. The GWETS should be operational as hereafter provided.

Procedures for operating and maintaining the SSDS and GWETS are documented in the O&M Plan (Section 4). Procedures for monitoring both these system are included in the Monitoring Plan (Section 3).

2.3 Institutional Controls

Institutional Controls are required by the ROD to: (1) implement, maintain and monitor ECs; (2) prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination; (3) limit the use and development of the Site to industrial use; and, (4) to limit use of on-site groundwater for potable or process water prior to treatment. Adherence to the ICs is required by an environmental easement and will be implemented upon NYSDEC approval of the SMP.

The environmental easement will include the following restrictions on the Site:

- All ECs must be operated and maintained as specified in this SMP;
- On-site and off-site inspections, and corrective actions, must occur and be certified at a frequency and in a manner defined in this SMP;
- Groundwater, soil vapor, and sediment monitoring must be performed as defined in this SMP;
- Data and information pertinent to management for the Site must be reported at the frequency and in a manner defined in this SMP; and
- On-site environmental treatment and monitoring devices must be protected, repaired, and replaced as necessary to ensure continued functioning in the manner specified in this SMP.

In addition, the Environmental Easement places following restriction on the property:

- Limit the use and development of the property to industrial use;
- Require compliance with the approved SMP;
- Restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by NYSDOH; and,

- Require the property owner to complete and submit to the Department a periodic certification of institutional and engineering controls.

Without limitation the Easement shall require inspections as described in Section 3.5, which shall extend to the sedimentation basins.

2.4 Excavation Plan

Any future intrusive work that will penetrate, encounter or disturb the residual contamination and any modifications or repairs to the existing cover system, both shown as areas restricted under the Easement, will have be performed in compliance with this Section 2.4 of the SMP constituting the Excavation Plan (EP). Intrusive construction work must also be conducted in accordance with the procedures defined in a then prepared Site-specific Health and Safety Plan (HASP) and then prepared Community Air Monitoring Plan (CAMP) that will be developed for the excavation. Any intrusive construction work will require the submission of an Excavation Work Plan to the NYSDEC that will be performed in compliance with the EP, HASP and CAMP, and will be included in the periodic inspection and certification reports submitted under the Site Management Reporting Plan (See Section 2.6).
Those preparing the remedial documents submitted to the State, and parties performing this intrusive work, are completely responsible for the safe performance of all intrusive work, the structural integrity of excavations, and for structures that may be affected by excavations (e.g., building foundations, bridge footings).

2.4.1 Notification

The Site owner or their representative will submit a notification to the NYSDEC at least 10 days prior to the start of any activity that is reasonably anticipated to encounter remaining contamination in areas restricted under the Easement. Currently, this notification will be made to:

Mr. Lawrence J. Alden, P.E.
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, New York 12233-7016

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent, plans for Site re-grading, intrusive elements or utilities to be installed below the soil cover, or any work that may impact an engineering control;
- A summary of environmental conditions anticipated in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work,
- A statement that the work will be performed in compliance with this EP and 29 CFR 1910.120;
- A copy of the contractor's HASP and CAMP;
- Identification of treatment, disposal and/or recycling facilities, as applicable and permitted by law, for potential waste or recycling streams;
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

2.4.2 Soil Screening Methods

Visual, olfactory and instrument-based soil screening will be performed by a qualified environmental professional during all remedial and development excavations into residual contamination in areas restricted under the Easement. Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during such development, such as excavations for foundations and utility work.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site treatment and/or disposal, material that requires testing, material that can be returned to the subsurface, materials that can be recycled and material that can be used as cover soil, all if and as applicable and permitted by law.

2.4.3 Stockpile Methods

Soil stockpiles will be encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points. Stockpiles will be placed on a liner and will be kept covered with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced. Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook maintained at the Site and available for inspection by NYSDEC.

2.4.4 Materials Excavation and Load Out

A qualified environmental professional or person under their supervision will oversee all intrusive work and the excavation and load-out of all excavated material.

The presence of utilities and easements on the Site will be investigated by the project's qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the Site.

A truck decontamination pad will be operated on-site. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be decontaminated at the truck wash before leaving the Site until the activities performed under this section are complete. Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements). Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

2.4.5 Materials Transport Off-Site

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used. All trucks will be washed prior to leaving the Site. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

Truck transport routes will be identified that will: (1) limit transport through residential areas and past sensitive sites; (2) use city-mapped truck routes; (3) minimize off-site queuing of trucks entering the facility; (4) limit total distance to major highways; and (5) promote safety in access to highways. Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site. Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development.

Due to limited available space at the Site, some off-site queuing of trucks may be necessary. The number and duration of trucks lined up outside the Site entrance will be minimized through efficient scheduling and staging at a remote location.

2.4.6 Materials Disposal Off-Site

All soil/fill/solid waste excavated and removed from the Site in areas restricted under the Easement will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations except only as actual sampling data shows otherwise if and as permitted by law and NYSDEC. If disposal of soil/fill from this Site is proposed for unregulated off-site recycling or disposal (i.e. clean soil removed for development purposes), a formal request with work plan will be made to the NYSDEC. Unregulated off-site management, reuse or recycling of materials from this Site will not occur without formal NYSDEC approval.

Off-site disposal, reuse or recycling locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate (e.g. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility). Actual disposal, reuse or recycling quantities and associated documentation will be reported to the NYSDEC in the PRR. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste pursuant to 6NYCRR Part 360-1.2. Material that does not meet the lower of the SCOs for residential use or groundwater protection will not be taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility) without a beneficial use determination issued by NYSDEC.

2.4.7 Materials Reuse On-Site

Any excavated materials that are potentially reusable on-site must be sampled and proven suitable prior to reuse. Excavated materials must be stockpiled and secured on-site in accordance with the materials management practices stated above prior to sampling. Stockpiles shall be limited to a maximum size of 500 cubic yards for sampling. A three point composite sample will be taken from each stockpile and submitted for the VOC, cadmium, chromium, nickel, and zinc analyses, based on the location.

The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Contaminated on-

site material, including historic fill and contaminated soil, that is acceptable for re-use on-site will be placed below a demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

2.4.8 Fluids Management

All liquids to be removed from the Site, including excavation dewatering and purge and development waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the Site, but will be managed either with the on-site GWETS, in accordance with some other permitted treatment and/or disposal system or taken to an off-site disposal facility.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.

2.4.10 Backfill from Off-Site Sources

All materials proposed for import onto the Site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP, applicable regulations (6NYCRR 375-6.7(d)) and guidance (DER-10) prior to receipt at the Site. Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the Site. All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d).

Trucks entering the Site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

2.4.11 Storm Water Pollution Prevention

Soil disturbing activities will be limited and exposed soils will be covered to the extent practicable to minimize erosion. Sediment controls (e.g., silt fence, hay bales, check dams) will be installed downgradient from all disturbed areas to capture any sediment and prevent it from leaving the Site.

Erosion protection, silt barriers and check dams will be installed and inspected once a week and after every storm event during the project. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

2.4.12 Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

In such event, sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides and PCBs), unless the Site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in daily and periodic electronic media reports.

2.5 Inspections and Notifications

2.5.1 Periodic Inspections

Periodic inspections at and about the Site will be conducted at the frequency specified in SMP Monitoring Plan schedule. A comprehensive Site-wide inspection will be conducted annually, regardless of the frequency of the PRR. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If the ECs continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the environmental easement;
- Whether the three sedimentation basins are functioning as intended;
- Performance relative to achievement of remedial action objectives;
- Sampling and analysis of appropriate media during required monitoring events;
- If Site records are complete and up to date; and
- Changes, or needed changes, to the remedial or monitoring system;

Inspections will be conducted in accordance with the procedures set forth in the Monitoring Plan of this SMP (Section 3). The reporting requirements are outlined in the Site Management Reporting Plan (Section 2.6).

If an emergency, such as a natural disaster that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, or an unforeseen failure of any of the ECs, occurs, an inspection of the Site will be conducted within 5 days of the emergency event to verify the effectiveness of the EC/ICs implemented at the Site by a qualified environmental professional as determined by NYSDEC.

2.5.2 Notifications

Notifications will be submitted by the property owner to the NYSDEC as needed for the following reasons:

- 60-day advance notice of any proposed changes in Site use that are required under the terms of the Order on Consent, 6NYCRR Part 375, and/or Environmental Conservation Law.
- 10-day advance notice of any proposed ground-intrusive activities in areas restricted under the Easement.
- Notice within 48-hours of any damage or defect to the foundations of on-site structures in areas restricted under the Easement that reduces or has the potential to reduce the effectiveness of other ECs and likewise any action to be taken to mitigate such damage or defect.
- Notice within 48-hours of any emergency, such as a fire, flood, or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, including a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action shall be submitted to the NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the ECs.

Notifications will be made to:

Mr. Lawrence J. Alden, P.E.
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, New York 12233-7016

In the event that NYSDEC develops a centralized notification system, that system will be used instead.

2.5.3 Evaluation and Reporting

The results of the inspection and Site monitoring data will be evaluated as part of the EC/IC certification in the PRR required under Section 2.6 of this SMP to confirm that the:

- EC/ICs are in place, are performing properly, and remain effective;
- The Monitoring Plan is being implemented;
- O&M activities are being conducted properly; and
- The Site remedy continues to be protective of public health and the environment.

2.5.4 Criteria for Termination of Operation and/or Maintenance and/or Inspections of Remedial Systems

Generally, the remedial processes will be considered to be completed when effectiveness monitoring indicates that the remedy has achieved sufficiently the remedial action objectives identified by the decision document, or until the NYSDEC determines that the continued operation is technically impracticable or not feasible. Any Owner or operator believing a component of the remedy need no longer continue may make application to NYSDEC with such materials and data as are thought by it to support such application. The specific determination of when the following remedial processes are complete will be made in compliance with Section 6.6 of NYSDEC DER-10. Periodic inspection will occur as outlined above.

2.5.4.1 Cover Systems

Inspections of the inside cover system (building slab foundation) and outside cover system (clean soil cover) will occur at the frequency specified in the SMP until all soil below the foundation has been shown to be below Protection of Public Health Industrial SCOs standards established in 6NYCRR 375-6.4(b)(4). As discussed in the FS Report, only limited sampling has been performed under the building slab foundation in the areas of the former sludge drying pad and former vapor degreaser; the soil restricted elsewhere below the foundation is only assumed to be above SCOs. See Section 2.1.1 of the FS Report and Sections 4.1.2 and 4.1.4 of the RRIR. If future sampling, through a NYSDEC-approved plan, shows that no soils are above the industrial use SCOs or that soils above the industrial use SCOs are removed from one or more areas, then the environmental easement may be modified and future inspection of the building slab foundation or clean soil cover over clean areas will not be required.

2.5.4.2 Sedimentation Basins

The sedimentation basins have been constructed to capture impacted sediments and prevent them from migrating further downstream. The ROD requires periodic sampling of the sedimentation basins following construction. If the sampling results show that the accumulated sediment is below the LEL for the four COC metals (cadmium, chromium, nickel and zinc), then future monitoring and sampling of the sedimentation basins will not be required.

2.5.4.3 Sub-Slab Depressurization System

As required by the ROD, the SSDS installed under the building located on the Site is operational only when the building is occupied, unless future data warrants otherwise. Annual inspection of the SSDS will be performed when the building is occupied. If an owner or occupant believes that operation of the SSDS is no longer necessary, a sampling plan may be submitted to NYSDEC to confirm the absence of a need for continued operation of that SSDS, conduct that sampling, and if the results are in acceptable ranges thereafter the continued use and operation of the SSDS will no longer be required. Conditions required for the removal of the SSDS include:

- Subsurface sources have been remediated upon evaluation of appropriate post-remedial sampling results;
- Residual contamination, if any, is not expected to affect indoor air quality significantly when the SSDS is turned off based upon indoor air and/or sub-slab vapor sampling results; and,
- No rebound effect is demonstrated through indoor air and/or sub-slab vapor sampling results after the SSDS has been turned off for a prolonged period of time.

2.5.4.4 Groundwater Extraction and Treatment System

The GWETS will continue operation until residual groundwater concentrations are below groundwater standards or have become asymptotic over an extended period. The GWETS may also be terminated if extraction and treatment of the groundwater becomes economically ineffective with minimal impact to source area reduction or off-site migration. At that point, the groundwater treatment system would be phased out, with NYSDEC concurrence. Groundwater would thereafter be monitored for natural attenuation, and to detect possible rebounds of concentrations. In the event that this target cannot be achieved, the NYSDEC will be consulted about a change in approach.

2.6 Reporting Plan

A PRR will be submitted to NYSDEC annually unless otherwise modified during the periodic review process with the approval of the NYSDEC. The PRR will be prepared in accordance with NYSDEC DER-10 "Technical Guidance for Site Investigation and Remediation".

This report will include the following:

- Identification of all EC/ICs required for the Site;
- An assessment of the effectiveness of all EC/ICs for the Site;
- An evaluation of the EC/IC Plan and the Monitoring Plan for adequacy in meeting remedial goals;
- Results of the required Site inspections and emergency/severe condition inspections, if any;
- A compilation of all deliverables generated during the reporting period, as specified in the SMP; and
- Certification of the EC/ICs required under Section 2.5.3 and 2.6.1 of this SMP.

2.6.1 Certification of Engineering and Institutional Controls

Inspection of the EC/ICs will occur at the frequency described in Section 3 (Monitoring Plan) and Section 4 (O&M Plan). After the last inspection of the reporting period, a qualified environmental professional or professional engineer licensed to practice in New York State will prepare the PRR required by this Section 2.6 which certifies that:

- On-site EC/ICs are unchanged from the previous certification;
- They remain in-place and are effective;
- All remedial systems, including the three offsite sedimentation basins, are performing as designed;
- Nothing has occurred that would impair the ability of the EC/ICs to protect the public health and environment;
- Nothing has occurred that would constitute a violation or failure to comply with any O&M plan for such EC/ICs;
- Access is available to the Site by NYSDEC and NYSDOH to evaluate continued maintenance of such EC/ICs; and
- Site use is compliant with the environmental easement.

2.6.2 Periodic Review Report

The PRR will initially be submitted annually, beginning one year after the COC is issued. The report will be submitted within 45 days of the end of each certification period. The periodic review process may be changed to a lesser frequency upon approval of the NYSDEC.

Media sampling results will also be incorporated into the PRR. The report will include:

- EC/IC certification required under Section 2.5.3 and 2.6.1 of this SMP;
- All applicable inspection forms and other records generated for the Site during the reporting period;
- A summary of any discharge monitoring data and/or information generated during the reporting period with comments and conclusions;
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor), which include a listing of all compounds analyzed, along with the

applicable standards, with all exceedances highlighted. These will include a presentation of past data sufficient for the Department to evaluate contaminant concentration trends;

- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted electronically in a NYSDEC-approved format;
- A performance summary for all treatment systems at the Site during the calendar year, including information such as:
    - The number of days the system was run for the reporting period;
    - The average quarterly flows;
    - The contaminant mass removed;
    - A description of breakdowns and/or repairs along with an explanation for any significant downtime;
    - A description of the resolution of performance problems;
    - A summary of the performance and/or effectiveness monitoring; and
    - Comments, conclusions, and recommendations based on data evaluation.
- A Site evaluation, which includes the following:
    - The compliance of the remedy with the requirements of the ROD and SMP;
    - The operation and the effectiveness of all treatment units, including identification of any needed repairs or modifications;
    - Any new conclusions or observations regarding Site contamination based on inspections or data generated by the Monitoring Plan for the media being monitored;
    - Recommendations regarding any necessary changes to the remedy and/or Monitoring Plan; and
    - The overall performance and effectiveness of the remedy.

The PRR will be submitted in electronic format to NYSDEC Central Office and the NYSDOH Bureau of Environmental Exposure Investigation.

3.0 Monitoring Program

3.1 Introduction

The Monitoring Plan describes the measures for evaluating the performance and effectiveness of the implemented ECs and inspections of three off-site sediment retention basins in accordance with the ROD. This Monitoring Plan may only be revised with the approval of NYSDEC.

3.1.1 General

In Section 8.0 of the ROD, Element 10, "Summary of the Selected Remedy" describes the Groundwater Monitoring requirements for the Site.

Since the remedy will result in impacted media remaining at the Site, a long-term monitoring program will be instituted. The monitoring well network at the Site will be sampled to monitor the extent of the groundwater contamination. This program will allow the effectiveness of the ISCO injections and the GWETS to be monitored and will be a component of the long-term management for the Site. Sediment in the three sediment basins will also be periodically monitored and the results will be sent to the entities responsible for the maintenance of the basins.

Monitoring of the SSDS is not required, except as a prerequisite to permanent removal of the SSDS.

3.1.2 Purpose and Schedule

This Monitoring Plan describes the methods to be used for:

- Sampling and analysis of appropriate media (e.g., groundwater, indoor air, sediment);
- Assessing compliance with NYSDEC groundwater standards, sediment guidance values, and soil vapor intrusion guidelines;
- Assessing compliance with discharge limits;
- Assessing achievement of the remedial performance criteria;
- Evaluating Site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment; and
- Preparing the necessary reports for the various monitoring activities.

To adequately address these issues, this Monitoring Plan provides information on:

- Sampling locations, protocol, and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Reporting requirements;
- Quality Assurance/Quality Control (QA/QC) requirements;
- Inspection and maintenance requirements for monitoring wells, SSDS, and groundwater treatment system;
- ISCO injection schedule and effectiveness; and
- Annual inspection and periodic certification.

Monitoring programs for environmental media are summarized in Table 3.1 and outlined in detail in Sections 3.2 through 3.5 below.

Table 3.1: Media Monitoring Schedule

Monitoring Program	Frequency*	Matrix	Analysis
GWETS Effluent	Quarterly	Water	Chromium, TCE, pH (Per POTW standards)
Groundwater Sampling	Annual	Water	VOCs and Chromium
Sediment Basin	As Required	Sediment	Cadmium, Chromium, Nickel, Zinc

* Frequency will be conducted as specified until otherwise approved by NYSDEC and NYSDOH

3.2 Groundwater Extraction and Treatment System Monitoring

The GWETS installed outside the southeast portion of the Ward Products building is designed to reduce on-site source concentrations of contaminants in groundwater to a limited extent and to limit future off-site migration of contaminated groundwater. System drawings are included in Appendix C. The system effluent discharging to the City of Amsterdam POTW is being monitored in accordance with the POTW permit dated April 1, 2009 (Appendix D). The POTW has additional reporting requirements, which are outlined later in this section.

3.2.1 Inspection Schedule

At present the groundwater extraction and treatment system is inspected on a monthly basis. The inspections include:

- Documentation of volume discharged to the City of Amsterdam POTW;
- Inspection of all treatment components;
- Documentation of all system operating pressures;
- Testing of system interlocks; and
- Maintenance, as required, of the GWETS.

Inspection frequency is subject to change. Unscheduled inspections and/or sampling may take place when a suspected failure of the treatment system has been reported or an emergency occurs that is deemed likely to affect the operation of the system.

3.2.2 General Equipment Inspection

A visual inspection of the complete GWETS will be conducted during each inspection event. GWETS components to be inspected include, but are not limited to, the following:

- Piping systems for leaks or plugs;
- Pressure gauges;
- Warning devices; and
- Air stripper.

If any equipment readings are not within their typical range, any equipment is observed to be malfunctioning, or the system is not performing within specifications, maintenance and repair as per the O&M Plan will be performed immediately, and treatment system will be restarted.

Operational problems will be noted in the PRR.

3.2.3 System Monitoring Devices and Alarms

A high level float switch located inside of the GWETS air stripper will shut down the groundwater pump when the level exceeds the limits of the normal operating mode.

The groundwater extraction pump has an amperage load monitor attached to the controls which shuts the pump down for a predetermined length of time when the amperage drops below a preset limit.

3.2.4 Sampling Event Protocol

The POTW limits are set by the discharge permit to ensure that the integrity of their waste water treatment plant is not compromised by either hydraulic or constituent overload. The protocol and frequency for the POTW sampling is identified in the table below:

Table 3.2: GWETS Effluent Monitoring Schedule

Parameter	Frequency	Sample Type	Limit
Flow, gpd	Continuous	Meter	Average not to exceed 20,000 gpd
pH	Quarterly	Grab	6.0 – 9.0
Trichloroethene	Quarterly	Grab	Monitor Only
Chromium	Quarterly	24 hr. composite	10 mg/L

3.3 Sub-Slab Depressurization Monitoring Program

A SSDS was installed to mitigate possible soil vapor intrusion into the building, whenever the building is occupied. Post-IRM indoor and ambient air sampling was conducted on January 10, 2006, after the system had run continuously for 3 months and compared to the indoor air sampling results of January 2005. It was concluded in the March 2006 RETEC Final Engineering Report that the IRM successfully reduced the indoor air concentrations of TCE to below the NYSDOH's draft guidance value of 5 $\mu g/m^3$; the system is mechanically operational; the area of influence is sufficient; and the average concentration of TCE in the sub-slab soil vapor had reduced over the initial three months of system operation. The SSDS has been determined to effectively maintain a vacuum beneath the slab; therefore no post-installation sampling was required. As long as the SSDS maintains a vacuum, no sampling is required.

3.3.1 Inspection Schedule

The baseline inspection was performed upon installation of the system to measure the area and vacuum of the sub-slab pressure field extension. The integrity of the fan mounting seals and all joints in the interior vent piping was verified. All floor cracks within the mitigation area were smoke tested with the system running to determine where sealing was necessary to prevent leakage. The vacuum

in the system vent pipes, as measures at the manometers was recorded. The results of all performance testing were good.

The system should be inspected once during every continuous twelve month period of operation to ensure continued operation and negative pressurization of sub-slab vapor. The SSDS must be operated whenever the former Ward Products building is occupied unless future data warrants otherwise. In addition, an evaluation of soil vapor intrusion concerns shall be considered at any building located above the contaminated groundwater plume if there is a change in the current use of that building.

Inspection frequency is subject to change with the approval of the NYSDEC. Unscheduled inspections may take place when a suspected failure of the SSDS has been reported or an emergency occurs that is deemed likely to affect the operation of the system. Monitoring deliverables for the system are specified later in this Plan.

3.3.2 General Equipment Inspection

A visual inspection of the complete system will be conducted during the monitoring event. SSDS components to be monitored include, but are not limited to, the following:

- Vacuum blower,
- General system piping, and
- Warning Device/Indicator (liquid gauge manometer).

If any equipment readings are not within their typical range, any equipment is observed to be malfunctioning, or the system is not performing within specifications, then maintenance and repair as per the O&M Plan will be performed immediately and the SSDS will be restarted.

3.4 Groundwater Monitoring Program

The groundwater monitoring program is a long term program and has been implemented to monitor the extent of the groundwater contamination and to determine the effectiveness of the groundwater remedy. Both FGI wells were decommissioned in February of 2010 in accordance with NYSDEC standards outlined in Commissioner Policy CP-43: Groundwater Monitoring Well Decommissioning Policy promulgated on December 18, 2009 and therefore have been removed from the sampling program.

3.4.1 Monitoring System Design

The network of 22 monitoring wells was installed during the RI to evaluate up-gradient and down-gradient groundwater conditions and quality at the Site (Figure 2); well construction logs for the newly installed wells are provided in Appendix E. Groundwater elevations for the bedrock aquifer and analytical results for TCE from the August 2009 sampling event (following the first round ISCO injection) are shown in Figures 4 and 5, respectively. The objective of the long term monitoring will be to observe contaminant trends within the dissolved phase plume and ensure dissolved phase contamination does not extend beyond the downgradient perimeter wells.

A subset 13 monitoring wells have been selected out of the existing complete 22 monitoring well network for long-term monitoring. There are two components to the monitoring plan: evaluation of plume size and downgradient sentinel wells to ensure no further migration. Proposed monitoring wells are positioned along the centerline of the dissolved phase plume include (from upgradient to

downgradient) MW-5, MW-1R, MW-4/MW-4R, MW-10, MW-13 and MW-17. These wells will provide information on the plume trends, both in terms of size and concentrations. Downgradient sentinel monitoring wells include MW-14, MW-15, MW-16, MW-18 and MW-20. Proposed monitoring wells are listed in the table below and shown in Figure 6.

Table 3.3: List of Wells to be Sampled as Part of the Monitoring Plan

Monitoring Well	Well Type	Rationale
MW-1R	Bedrock	Along plume centerline; upgradient of source
MW-4	Overburden	In overburden above source area
MW-4R	Bedrock	Source area well
MW-10	Bedrock	Along plume centerline; downgradient of source
MW-11	Bedrock	Upgradient sentinel well
MW-13	Bedrock	Along plume centerline; downgradient of source
MW-14	Bedrock	Downgradient sentinel well
MW-15	Bedrock	Downgradient sentinel well
MW-16	Bedrock	Downgradient sentinel well
MW-17	Bedrock	Along plume centerline; downgradient of source
MW-18	Bedrock	Downgradient sentinel well
MW-19	Bedrock	Downgradient sentinel well
MW-20	Bedrock	Downgradient sentinel well

The groundwater samples from the above listed wells will be collected semi-annually until efficacy of permanganate injection or groundwater extraction is determined, at which time the sampling frequency may be modified with NYSDEC's approval. The samples from each monitoring well will be analyzed for the field parameters (pH, DO, ORP, conductivity, temperature, and turbidity), VOCs using EPA Method 8260B, total chromium using USEPA Method 010B, and hexavalent chromium using SM 3500 Cr D. All wells (including those not sampled) will be gauged for water levels prior to sampling.

3.4.2 Groundwater Monitoring Schedule

Groundwater monitoring will be conducted semi-annually to account for seasonal variation in the water levels. The sampling frequency and number of wells to be sampled (or retained or abandoned) may be modified with the approval NYSDEC. The SMP may be modified to reflect changes approved by NYSDEC.

3.4.3 Sampling Event Protocol

All monitoring well sampling activities will be recorded in a field book and a groundwater-sampling log presented in Appendix F. Other observations (e.g., well integrity) will be noted on the well sampling log. The well sampling log will serve as the inspection form for the groundwater monitoring well network.

Prior to sampling the wells, depth to groundwater will be measured using a water level indicator. All wells shall be purged and sampled with a submersible pump using methods specified by the USEPA for low flow/low stress sampling [USEPA, 1996].

The monitoring wells will be sampled for VOCs, total chromium, hexavalent chromium, and dissolved chromium. All analyses will be performed by a NYSDOH accredited laboratory.

Per an agreement with NYSDEC, all purge water generated from the groundwater monitoring program will be treated in the on-site GWETS.

Analytical parameters to be monitored are subject to revision with NYSDEC approval. Groundwater monitoring will continue until the remedial objectives have been achieved or until the NYSDEC determines that it is no longer practical.

3.4.4 Monitoring Well Repairs, Replacement, and Decommissioning

If bio-fouling or silt accumulation occurs in the on-site and/or off-site monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and, if necessary absent NYSDEC approval otherwise, replaced (as per the Monitoring Plan), if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of monitoring wells for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent periodic report. Well decommissioning without replacement will be done only with the prior approval of NYSDEC. Well abandonment will be performed in accordance with NYSDEC's CP-43 - Groundwater Monitoring Well Decommissioning Procedures. Monitoring wells rendered unusable will be reinstalled in the nearest available location, unless otherwise approved by the NYSDEC, in which case, these wells will be properly decommissioned.

3.4.5 Groundwater Sampling Procedures

Procedures for obtaining samples of groundwater are described in this section. Groundwater samples will be collected using low-flow, low-stress purge and sampling methods.

The number and frequency of the samples that will be collected for laboratory analysis from monitoring wells are listed in Section 3.4.2. The required equipment and supplies are as follows:

- Field book
- Project plans
- PPE in accordance with the HASP
- Electronic oil/water interface probe
- Disposable polyethylene bailers and low-flow sampling pump
- Polypropylene rope
- Temperature, conductivity, and pH meter
- Turbidity meter
- Flow through cell
- Decontamination supplies

- Peristaltic or submersible pump capable of achieving low-flow rates (i.e., 0.5 liters per minute or less)
- Plastic tubing
- Plastic sheeting
- PID
- Clear tape, duct tape
- Coolers and ice
- Laboratory sample bottles
- Federal Express labels

Purging

- Prior to sampling, the static water level and thickness of any light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL) will be measured (if present) to the nearest 0.01 foot from the surveyed well elevation mark on the top of the PVC casing with a decontaminated oil/water interface probe. NAPL thickness will be confirmed using a clear bailer or a weighted string. The measurement will be recorded in the field book.
- The probe will be decontaminated between uses
- Groundwater from the well will be purged until field parameters stabilize, up to three well volumes are removed, or 1 hour of continuous purging is performed. Field parameters are considered to be stable when three consecutive readings are within the stabilization criteria for that parameter. The stabilization criteria are as follows: below 10 NTUs for turbidity, 3% of conductivity and temperature, 0.1 unit for pH, and 10 mV for ORP. Purging will be conducted using the low-flow sampling technique specified by the U.S. EPA Region 1 in its guidance document entitled "Low-Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells”
- The flow rate measurement will be approximately 0.5 liter per minute or less
- If a well goes dry before the required volumes are removed, it will be allowed to recover, purged a second time until dry or the required parameters are met, and sampled when it recovers sufficiently, in accordance with low-flow sampling protocol
- Purge water will be managed and disposed of properly

Sampling

- Samples will be collected using dedicated 1/4- or 3/8-inch polyethylene tubing and/or bailers
- Prior to filling the sample bottles, the temperature, pH, conductivity, and oxidation reduction potential (ORP) will be measured within a flow-through cell. Turbidity will be measured with a hand-held turbidity meter. All measurements will be recorded in the field book
- Three 40-ml VOA vials with Teflon lined septa and hydrochloric acid as a preservative will be filled for analysis of VOCs. The VOA vials will be filled to ensure that no bubbles are in the sample. A 500 milliliter (mL) plastic bottle preserved with nitric acid will be filled for the total metals analysis
- The sample containers will be labeled, placed in a laboratory-supplied cooler, and packed on ice (to maintain a temperature of 4 degrees C). The cooler will be shipped overnight or delivered to the laboratory for analysis
- COC procedures will be followed
- Well sampling data will be recorded on the Groundwater Sampling Record included in Appendix F, or similar form

All sampling and analyses will be performed in accordance with the requirements mentioned in this section.

- Sample containers will be properly washed, decontaminated, and appropriate preservative will be added (if applicable) prior to their use by the analytical laboratory. Containers with preservative will be tagged as such
- Sample holding times will be in accordance with the NYSDEC ASP requirements
- Field QC samples (e.g., trip blanks, coded field duplicates, and matrix spike/matrix spike duplicates) will be collected as necessary
- Sample Tracking and Custody will be filled out and copied for record
- Calibration Procedures
    - All field analytical equipment will be calibrated immediately prior to each day's use. Calibration procedures will conform to manufacturer's standard instructions
    - The laboratory will follow all calibration procedures and schedules as specified in USEPA SW-846 and subsequent updates that apply to the instruments used for the analytical methods
- Analytical Procedures
- QA Performance and System Audits
- Corrective Action Measures

3.5 Sediment Basin Monitoring Program

Two sedimentation basins were constructed during the post-ROD soil and sediment remedial action to prevent impacted sediments from migrating downgradient: one along the East branch drainage and one along the West branch drainage. The sedimentation basins were constructed with a crushed stone spillway to allow water to pass through but filter out any suspended sediment. During periods of high flow the storm water would be detained within the basin for a period of time, allowing suspended sediments to settle out. A pre-existing storm water detention pond along the East branch drainage, south of Sam Stratton Road, also serves as a sediment basin to prevent the downgradient migration of impacted sediments.

There are three sediment basins associated with the Site that retain sediment and prevent or limit migration into off-site surface waters (see Figure 3). As-built drawings of each basin are included in Appendix A. A description of each of the three sedimentation basins is below:

Route 5 Area Basin – A sediment basin was constructed along the Route 5 Removal Area as part of the post-ROD remedial action (Appendix A; Figure A1). The sediment basin was constructed by creating a “pond” within the stream. A weir constructed of crushed stone was installed on the downgradient end of the basin. The crushed stone was intended to filter out sediments, while allowing water to pass through. During periods of heavy runoff the basin would fill with water and allow the sediments to settle out of suspension. A culvert with a drop inlet is located immediately downstream of the stone spillway to convey the stormwater beneath the CSX railroad. During periods of extremely heavy runoff, stormwater would be allowed to overtop the spillway and enter directly into the culvert.

Chapman Drive Basin - A sediment basin was constructed along the West Branch drainage, just to the North of the railroad spur that runs parallel to Chapman Drive (Appendix A; Figure A2). The basin was constructed following removal of impacted sediments as part of the post-ROD remedial action. The sediment basin was constructed using a perforated 42” diameter corrugated metal riser pipe with crushed stone mounded around the outside of the riser, to the rim elevation. The riser pipe drains into an existing laid up stone culvert, beneath the railroad

spur. A trash rack was constructed atop the riser to prohibit debris from washing into and clogging the pipe. The crushed stone is intended to filter out sediments, while allowing water to pass through. During periods of heavy runoff the basin would fill with water and allow the sediments to settle out of suspension. During extreme precipitation or flood events the stormwater will be allowed to overtop the riser pipe and drain into the culvert to maintain flood capacity.

Sam Stratton Road Basin – An existing stormwater detention pond/basin is located along the East Branch Drainage, just South of Sam Stratton Road (Appendix A; Figure A3). This detention pond/basin also serves as a sediment basin, allowing sediments to settle out of the stormwater. This basin will be used as a monitoring point for sediment accumulation along the Northern reaches of the East branch drainage.

3.5.1 Monitoring System Design

Each of the three sediment basins downgradient from the Site will be monitored and inspected annually, in accordance with the ROD. Inspection frequency is subject to change with the approval of the NYSDEC. The inspection will consist of an assessment of the annual (since the last inspection) and total accumulation of sediment within the basins and the overall functionality of the basins. If the annual accumulation in a basin exceeds 4 inches or if there is a total accumulation in the basin exceeding 18 inches (all measured from the basin bottom at the end of the 2009 Sediment projects), then sediment samples will be collected from the top 4 inches of sediment. The sediment samples will be analyzed for cadmium, chromium, nickel and zinc. In case of the smaller basins (Route 5 Basin and Chapman Drive Basin), all sediments will be removed and in case of the bigger basins, sediments from the zone sampled will be removed and disposed offsite if:

1) There is 18 inches of accumulated sediment and the sample results are above LEL, or;
2) Sample results are above SEL.

Any necessary sediment removal will follow the procedures set forth in the Excavation Plan (Section 2.4). If the top four inches of accumulated sediment ever show the metal concentrations in the zone sampled, to be below the LEL, then the owner may petition to the NYSDEC to cease sampling and monitoring of the sediment basin(s).

Removal of accumulated sediment from the basins for other reasons (for example: stormwater management), may be managed by the person responsible for maintenance and operation of the basin(s) without NYSDEC involvement under this SMP.

Unscheduled inspections and/or sampling may take place when a suspected failure of the sedimentation basins has been reported or an emergency occurs that is deemed likely to affect the operation of the basins.

3.5.2 Sampling Event Protocol

The protocol for the sediment sampling is based on the collection of one five-point composite sample per basin. Samples will be collected from the top four inches of sediment. Samples will be analyzed for cadmium, chromium, nickel, and zinc.

3.5.3 Sediment Sampling Procedures

The scoop/trowel method will be used for collection of easily accessible dry sediment samples and sediment samples located underwater where the water depth is less than six inches. This collection method will be accomplished using a stainless steel trowel or spoon used to manually dig into the subsurface material to the required depth designated for the sampling location. Sampled material then will be transferred to a stainless steel bowl for homogenization. The trowel and bowl will be decontaminated between sample locations.

3.5.4 Sediment Basin Monitoring

Exposure to residual impacted materials at the three excavation areas addressed during the post-ROD remedial action is prevented by a soil cover and/or armor stone cap system, which has been placed over the remaining impacted materials. This cover system is comprised of a minimum of 18 inches of run of bank gravel or 12 inches of armor stone. During the inspection of the sediment basins, the integrity of the cover system will be observed. If the integrity of the cover system has been compromised (e.g., erosion), then the result will be documented in the PRR.

3.6 Monitoring Reporting Requirements

All monitoring results will be reported to NYSDEC following the sampling event. Compliance monitoring reports including laboratory analysis reports are due within 30 days following receipt of the final analytical laboratory package.

Compliance monitoring reports will include at a minimum:

- Date of event;
- Personnel conducting sampling;
- Description of the activities performed;
- Type of samples collected (e.g., groundwater, sediment, sub-slab vapor, indoor air);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, inspection checklists, etc.);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format); and
- Any observations, conclusions, or recommendations.

All reports to the NYSDEC shall be sent electronically to:

Mr. Lawrence J. Alden, P.E.
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, New York 12233-7016
ljalden@gw.dec.state.ny.us

Additionally, there are separate reporting requirements for the City of Amsterdam POTW. The POTW Discharge Permit requires a quarterly report to the City of Amsterdam that includes the analytical results of the Permit identified constituents and the total volume of water discharged to the City POTW. All reports mailed to the City of Amsterdam shall be mailed to:

Chief Operator, Amsterdam Wastewater Treatment Plant
-and-
City Engineer
City of Amsterdam
61 Church St
Amsterdam, NY 12010

The POTW Discharge Monitoring Report shall include the following in table format:

- Dates of flow measurements
- Number of days in event
- Total flow in quarter
- Daily average flow
- Sample date
- pH
- Trichloroethene concentration
- Chromium concentration

3.6.1 Periodic Review Report

As described in Section 2.6.2, a PRR will be submitted annually, beginning one year after the COC is issued. The report will be submitted within 45 days of the end of each certification period. Other reports, such as validated groundwater and sediment monitoring data, may be submitted separately or may be included as part of the PRR, as appropriate and approved by the NYSDEC.

4.0 Operation and Maintenance Plan

This O&M Plan describes the measures necessary to operate and maintain the mechanical components of the remedy selected for the Site. This O&M Plan:

- Includes the steps necessary to allow individuals unfamiliar with the Site to operate and maintain the groundwater extraction and treatment and sub-slab depressurization systems;
- Includes an O&M contingency plan; and,
- Will be updated periodically to reflect changes in Site conditions or the manner in which the groundwater extraction and treatment and SSDS systems are operated and maintained.

Information on non-mechanical ECs (i.e. soil cover system) are provided in Section 3. A copy of this O&M Plan, along with the complete SMP, will be kept at the Site. This O&M Plan is not to be used as a stand-alone document, but as a component document of the SMP.

4.1 Remedial Treatment Systems Description

The GWETS controls groundwater flow in the most impacted area of the Site, resulting in a capture zone that reduces off-site migration of contaminated groundwater.

As a selected remedy, a central groundwater recovery well, with an electric submersible pump and an on-site treatment system was installed. Originally the planned rate of pumping was 5 to 10 gpm; however the actual current rate is about 2 gpm. Treated effluent is discharged to the City of Amsterdam's POTW, via the sanitary sewer, under a discharge permit (Appendix D). The operation of the recovery well and treatment system are expected to continue until the remedial objectives have been achieved, or until NYSDEC determines that continued operation is technically impracticable or not feasible.

The groundwater treatment system was constructed by Hour Electric as shown in the Figure included in Appendix C. The groundwater treatment system consists of a submersible pump for groundwater extraction, followed by a flow totalizer and an air stripper in a heated shed. This treatment train assumes that chromium treatment chemical addition will not be required.

The originally proposed ¾ HP submersible pump was replaced with a ½ HP SP4 Grundfos® submersible pump as the recharge rate in the recovery well was lower than anticipated. The pump was adjusted to pump approximately 2 gpm to avoid pumping the well dry. The static water level is approximately 11 feet below ground surface and lowers to approximately 19 to 21 feet below ground surface while the pump is operational. A pump protector installed on the pump shuts the pump down for 200 minutes when the water level falls below the pump intake. Groundwater conditions may change which could either increase or decrease the withdraw rate.

The groundwater flows through a flow totalizer before entering the air stripper. The air stripper consists of two trays and a water collection sump. The air is provided by a blower and is discharged through a stack after passing through the incoming groundwater. The treated water is discharged to a POTW outfall from the air stripper sump using a discharge pump. Sampling ports are located before the totalizer and after the discharge pump to facilitate inlet and outlet sample collection. An air discharge permit is not required for this system.

Specifications of the pump and the pump protector are includes in Appendix G.

One SSDS is previously installed under the building slab and is operated whenever the building is occupied. The system should be inspected once at least once a year and necessary maintenance should be performed. The annual inspection should include a visual inspection of the complete system, both indoors and outdoors. Any actionable items found during the inspection should be addressed immediately.

The inspection items for the SSDS should include, but not limited to:

- Recording manometer vacuums;
- Inspecting the fans for mechanical operation, noise, and vibration;
- Inspecting all piping and piping connections (indoors and outdoors);
- Checking for new cracks in walls and floors; and
- Ensuring all piping supports are properly anchored.

4.1.1 System Performance Monitoring and Recordkeeping

At present, monitoring of the GWETS operation is performed during monthly inspections. The operator is to maintain a logbook and note the flow meter readings, pressure gauges readings, and any other conditions noted at the Site. The logbook should be kept up to date with the observations and actions taken during each Site visit. The operator is responsible for reviewing these records for any short or long term changes in the system performance (e.g., flow rate, alarms, recovered and treated groundwater volume, pressure gauge readings), since these may be indicators of a need for repair or maintenance. This logbook will remain in the treatment shed along with the visitors' sign in sheet and this Manual.

4.1.2 System Inspection and Maintenance

The operator maintains the equipment according to the schedule and requirements of the component manufacturer or more frequently when inspection indicates the need exists. The routine maintenance of the system includes data collection, and visual inspection of the outside components of the system and integrity of the connections. Thorough inspection of internal parts of the system should be performed semi-annually. This will include disassembling air stripper and removing accumulated scale. The manufacturers' installation, operation, and maintenance manuals are provided as Appendix G.

4.1.3 Maintenance Reporting Requirements

Maintenance reports and any other information generated during regular operations at the Site will be kept on-file on-site. All reports, forms, and other relevant information generated will be available upon request to the NYSDEC and will be submitted as part of the PRR.

Checklists or forms/ field book will be completed during each maintenance event. Checklists/forms will include, but not be limited to the following information:

- Date;
- Name, company, and position of person(s) conducting maintenance activities;
- Maintenance activities conducted;

- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment (attached to the checklist/form).

4.2 Contingency Plan

Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions. In the event of an emergency condition impacting the treatment system or building (such as a fire, flood, failure of the heating system during freezing temperatures) or caused by the treatment system (such as a break in the piping or pump, or some other problem, causing a fire or spill/overflow), shut off power to the system, if safe to do, by the main disconnect switch located on the electric services panel on the wall behind the air stripper. Then proceed as otherwise provided below.

4.2.1 Emergency Spill Response

In the event of an alarm condition or overflow/spill condition, the following procedures should be followed if safe to do:

- Alarm light: Make sure the recovery well pump and the air stripper blower are OFF. Assess the situation and correct the problem before pressing the reset button located on the control panel and restarting the system.
- Overflow/spill condition: Switch the RW-1 (sump) pump to “off”.

The person reporting the emergency should then immediately call the following emergency coordinators in the order shown until one is reached.

Name	Title	Phone
Paul Kilchenstein	AECOM Project Manager	603-224-3971
Steve Gray	AECOM Field Technician	518-424-3856
Brendan Maye	AECOM Supervisor	617-784-3665

The emergency coordinator shall obtain the following information from the person reporting the emergency.

- The estimated time of the event, (Time/Date)
- The exact location and nature of the emergency
- The extent of the spill/overflow or release, if any
- The nature and extent of damage caused
- Corrective actions taken
- Persons and agencies contacted

Once the emergency is discovered and reported to the emergency coordinator, the coordinator shall assess the urgency of the situation and determine if the system should be shut down or other measures taken and if the NYSDEC or others need to be contacted.

4.2.2 Personal Injury

If a personal injury occurs or is reported at or from the groundwater treatment system or building, the event should be reported to the emergency coordinator as soon as possible, not longer than 24 hours.

4.2.3 Toxic Exposure

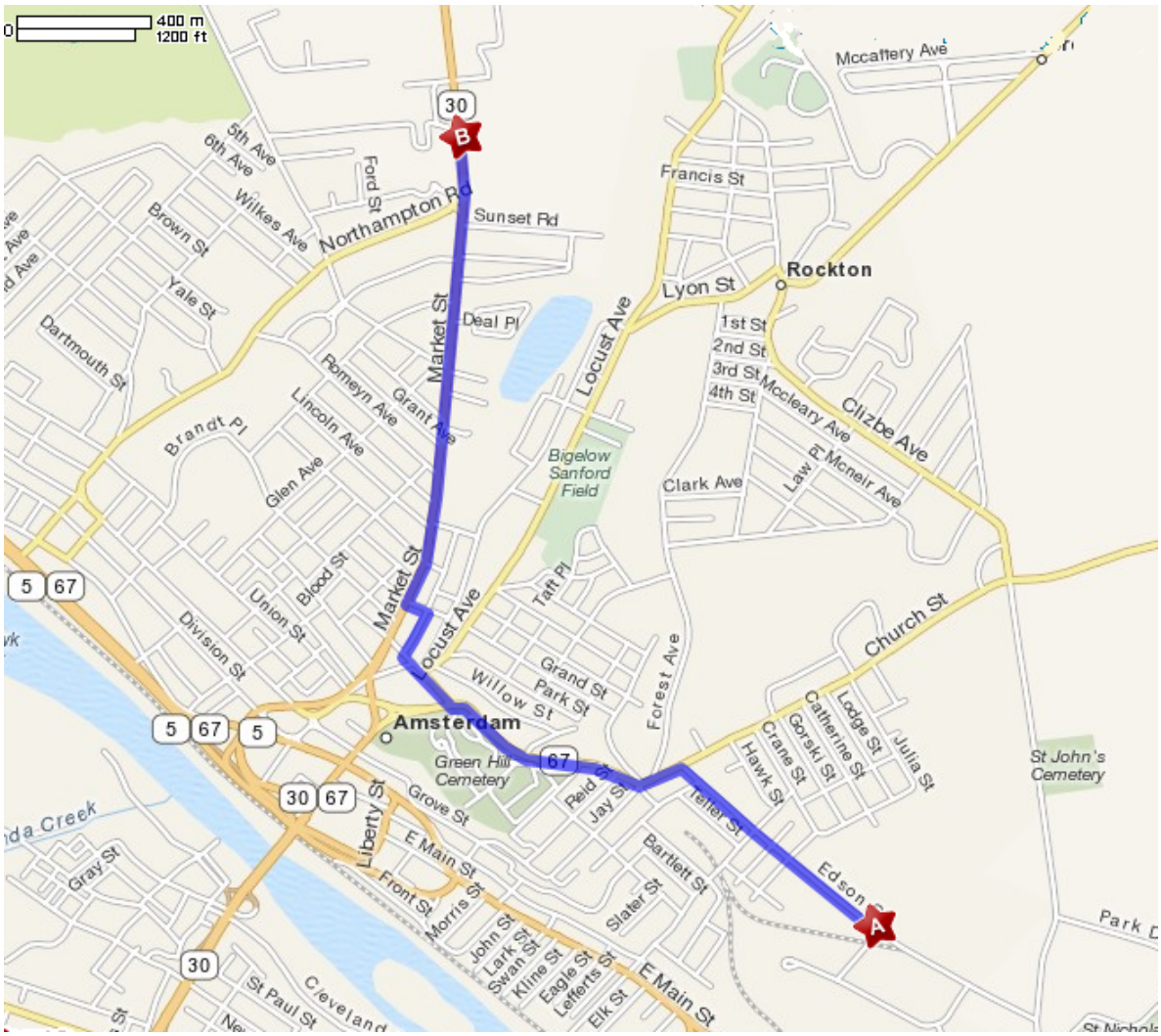
If a toxic exposure occurs or is reported at or from the groundwater treatment system or building, the event should be reported to the emergency coordinator as well as outside agencies which may include the fire department, hospital, or ambulance, as necessary and as soon as possible, not longer than 24 hours.

4.2.4 Public Notification

Public notification will be provided to or by the appropriate agencies (e.g., NYSDEC, fire department, POTW, police department) when necessary to make the general public aware of the conditions at the Site. The phone numbers of the key agencies are as below:

Agency	Contact Person	Title	Contact Number
Fire Department			911
Police Department			911
NYSDEC	Larry Alden	Project Manager	518-402-9767
City of Amsterdam		City Engineer	518-841-4331
Amsterdam Wastewater Treatment Plant		Chief Operator	518-843-3897

4.3 Map and Directions to Emergency Health Facility



- Site Location: 61 Edson Street, Amsterdam, New York
- Nearest Hospital Name: Amsterdam Memorial Hospital
- Hospital Location: 5010 State Highway 30, Amsterdam, New York
- Hospital Telephone: (518) 841-3414
- Directions to the Hospital:

  Start: 61 Edson Street, Amsterdam, NY 12010

  1. Head **northwest** on **Edson St** toward **Sam Stratton Rd (West)** 0.6 mi
  2. Turn **left** at **Church Street** 0.1 mi

3. Turn **right** to stay on **Church Street** 0.4 mi

4. Take 2nd **right** onto **Prospect Street** 0.2 mi

5. Take 3rd **right** onto **Elizabeth Street** 0.1 mi

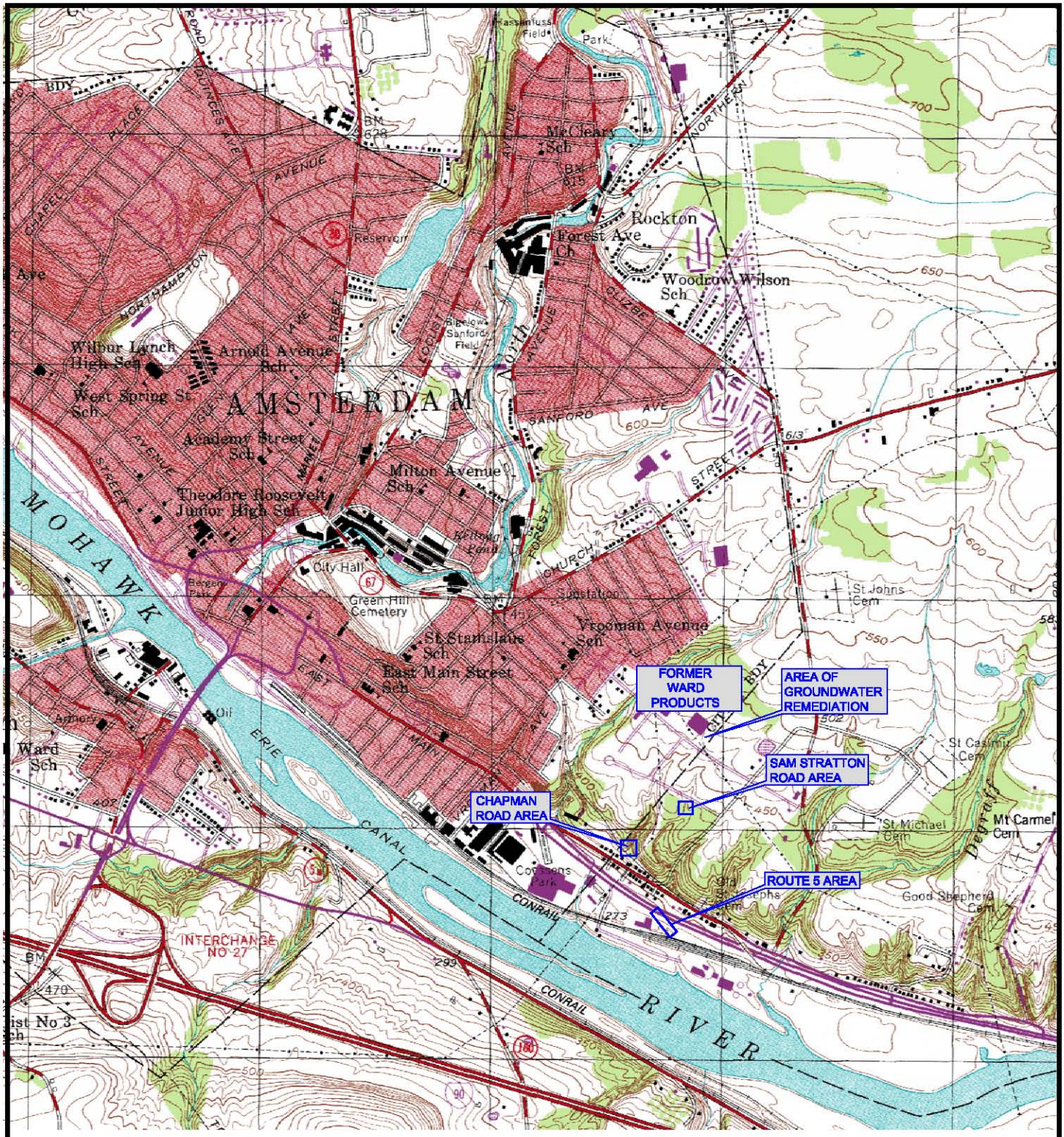
6. Take the 1st **left** onto **Storrie Street** 240 ft

7. Turn **right** at **NY-30 N/Market Street** 1.1 mi
   Continue to follow **NY-30 N**, Destination on the **left**

End: Amsterdam Memorial Healthcare: Foundation
5010 State Highway 30, Amsterdam, NY 12010-7532

- Total Distance: 2.5 Miles
- Total Estimated Time: 7 Minutes

Figures



UNITED STATES GEOLOGIC SURVEY
AMSTERDAM QUADRANGLE
NEW YORK
7.5 MINUTE SERIES (TOPOGRAPHY)

0' 1000' 2000' 4000'

AECOM

FIGURE 1
SITE LOCATION MAP
FORMER WARD PRODUCTS
SITE MANAGEMENT PLAN

AMSTERDAM, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
	KAM	60134119	11 - 2010	1

Plotted By: MeisterK
Layout-Sheet Name: 1
Plot File Date Created: Nov/11/2010 8:23 AM

Filename: L:\WORK\107297\CADD\AECOM-CADD\SITE_MANAGEMENT\WARDS-SITE-MAP_NAD83_EAST-ZONE_FT.DWG

SARATOGA HORSEWORKS
57 EDSON ST.

WARD PRODUCTS 61 EDSON ST.

BUSH MILLWORKS
54 EDSON ST.

GRAVEL PARKING LOT

EDSON STREET

SAM STRATTON ROAD

UCMI
1 SAM STRATTON RD.

DRIVEWAY AND PARKING LOT

STORAGE BUILDING

SAFARI ENTERPRISES INC.
64 EDSON ST.

FIBER GLASS INDUSTRIES, INC.
69 EDSON ST.

FGI-1 (ABANDONED)

FGI-2 (ABANDONED)

MW-1
MW-1R
MW-2
MW-3
MW-4
MW-4R
MW-5
MW-6
MW-7
MW-8
MW-9
MW-10
MW-11
MW-12
MW-13
MW-14
MW-15
MW-16
MW-17
MW-18
MW-19
MW-20
RW-01
IW-01
IW-02
IW-03
IW-04

N

0 50 100 200
SCALE IN FEET

LEGEND

- MONITORING WELL LOCATION
- RECOVERY WELL
- ISCO INJECTION WELL

NOTES

1. MW-1, MW-2, MW-3 AND MW-4 ARE OVERBURDEN WELLS AND OTHERS ARE BEDROCK WELLS.
2. FGI-1 AND FGI-2 WERE ABANDONED IN MAY 2010.

AECOM
40 British American Boulevard
Latham, New York 12110
T: (518) 951-2200
F: (518) 951-2300

FIGURE 2
SITE PLAN

WARD PRODUCTS SITE
AMSTERDAM, NEW YORK

JULY 2010 60155290

Plotted By: meisterk
Plot File Date Created: Feb/10/2011 1:10 PM
Layout-Sheet Name: AREAS
Filename: L:\WORK\107297\CADD\AECOM-CADD\SITE_MANAGEMENT\WARDS_PRODUCTS_SITE_MANAGEMENT-2011.DWG

LEGEND

- EXCAVATION & SEDIMENT REMOVAL AREAS (2009)
- EXCAVATION & SEDIMENT REMOVAL AREAS (PRIOR TO 2009)

PLAN

NOT TO SCALE

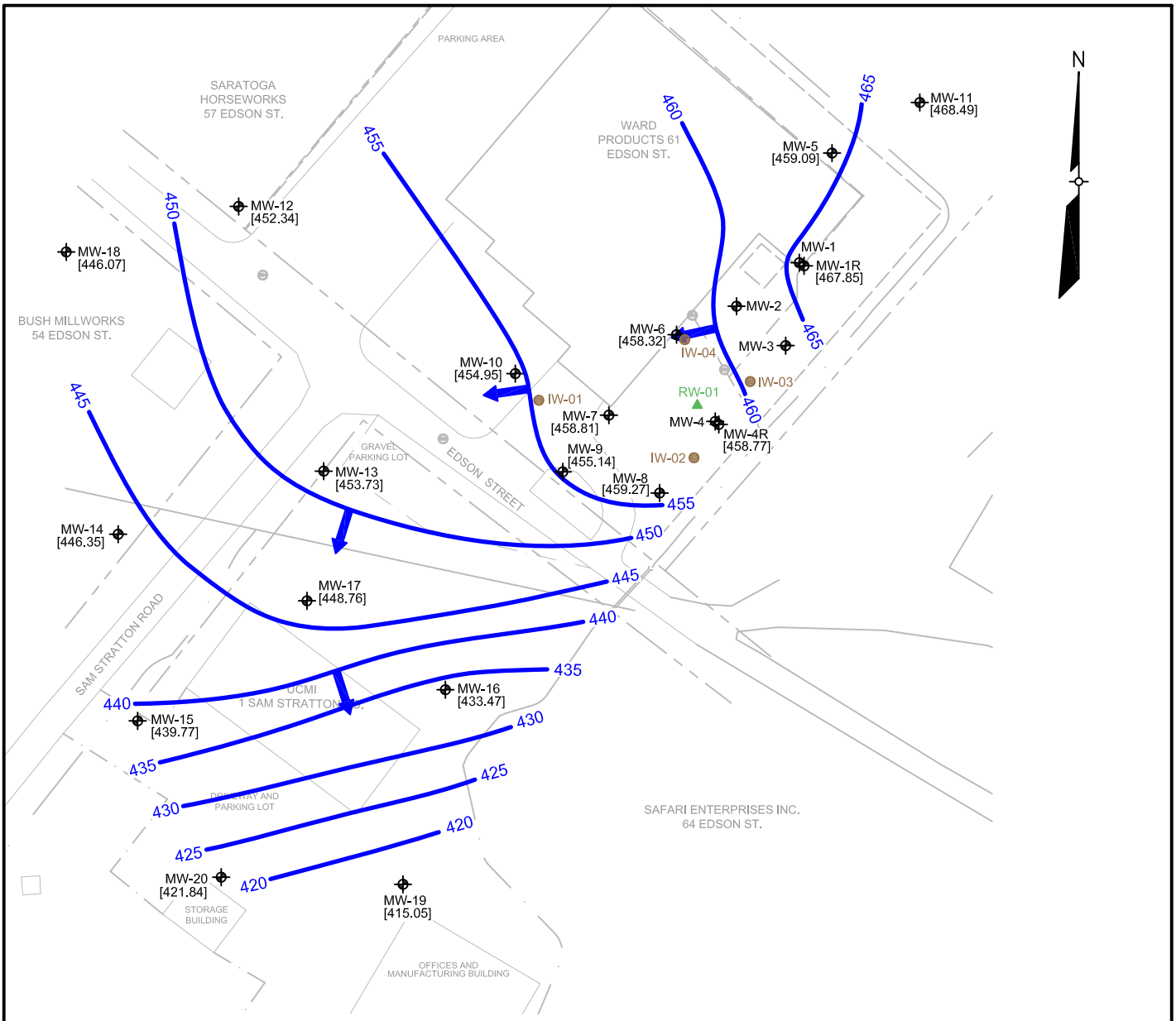
FORMER WARD PRODUCTS SITE MANAGEMENT PLAN AMSTERDAM, NEW YORK

AREAS OF SOIL & SEDIMENT REMOVAL

AECOM
40 British American Blvd.
Latham, New York 12110
T 518.951.2200 F 518.951.2300
WWW.AECOM.COM

DRN BY:	1-INCH — VERIFY SCALE IF PLAN SHEET IS REDUCED				
DES BY:					
CHK BY:					
APP BY:	1	ADDED SOIL CONCENTRATIONS	KAM	DJW	10/09/2009
	REV	DESCRIPTION	DRN	CHK	DATE (M/D/Y)

PROJECT START DATE (M/Y): JULY 2010
PROJECT NO.: 60134119
FILENAME: WARD PRODUCTS.DWG
SHEET NO.:
FIGURE NO.: 3



LEGEND

- MONITORING WELL LOCATION
- RECOVERY WELL
- ISCO INJECTION WELL
- [468.49] GROUNDWATER ELEVATION (ft. MSL)
- GROUNDWATER CONTOUR (ft. MSL)
- GROUNDWATER FLOW DIRECTION

NOTE

1. MW-1, MW-2, MW-3 AND MW-4 ARE OVERBURDEN WELLS AND ARE NOT USED TO CONTOUR.

0 75 150 300

SCALE IN FEET

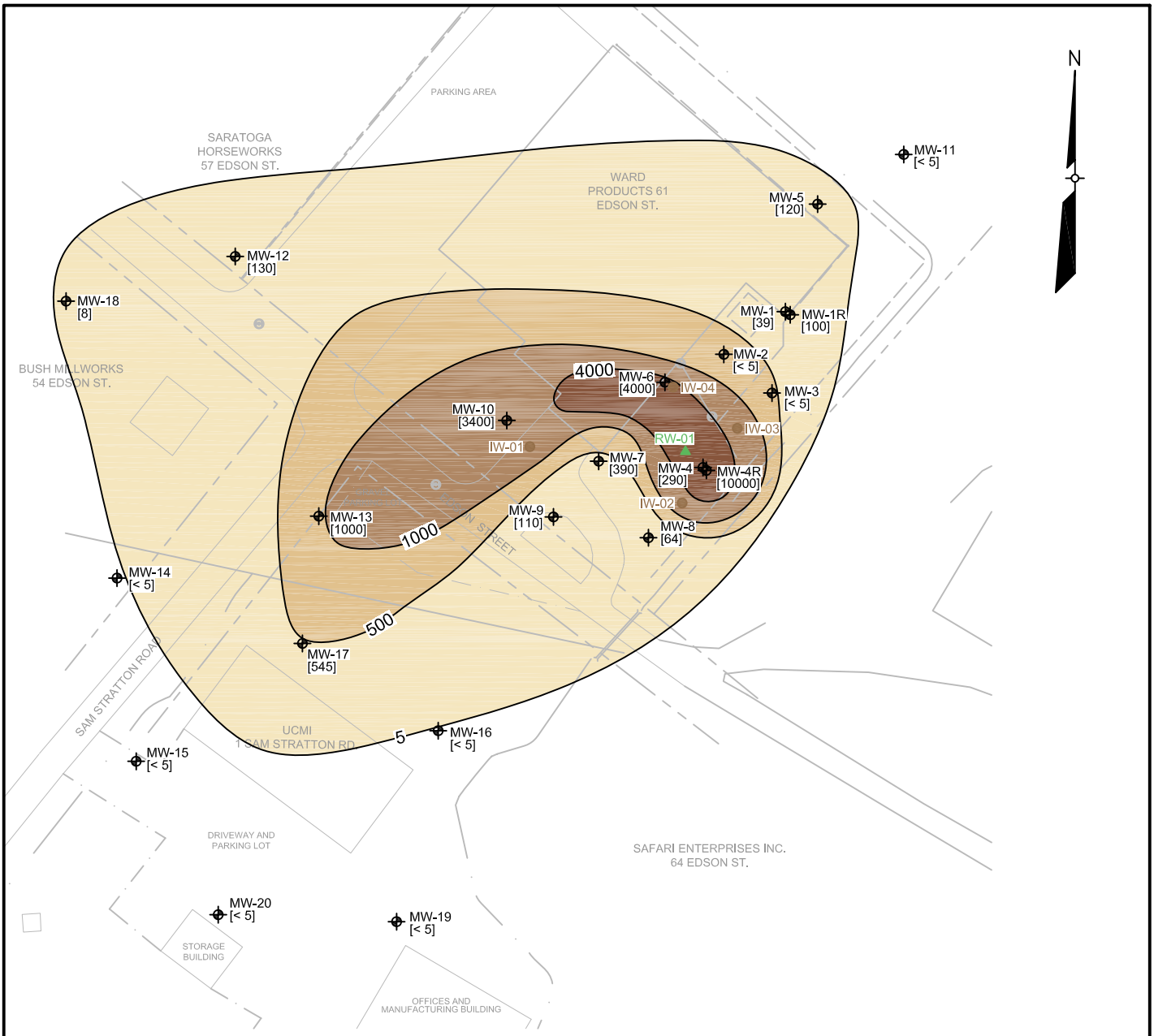
AECOM

40 British American Boulevard
Latham, New York 12110
T: (518) 951-2200
F: (518) 951-2300

FIGURE 4
BEDROCK GROUNDWATER ELEVATION CONTOURS AUGUST 2009

WARD PRODUCTS SITE
AMSTERDAM, NEW YORK

JULY 2010 60155290



LEGEND

- MONITORING WELL LOCATION
- RECOVERY WELL
- ISCO INJECTION WELL
- [545] TCE CONCENTRATION (µg/L)
- —— 5 —— TCE CONCENTRATIONS IN GROUNDWATER, µg/L, AUGUST 2009

NOTES

1. MW-1, MW-2, MW-3 AND MW-4 ARE OVERBURDEN WELLS AND OTHERS ARE BEDROCK WELLS.

0 75 150 300

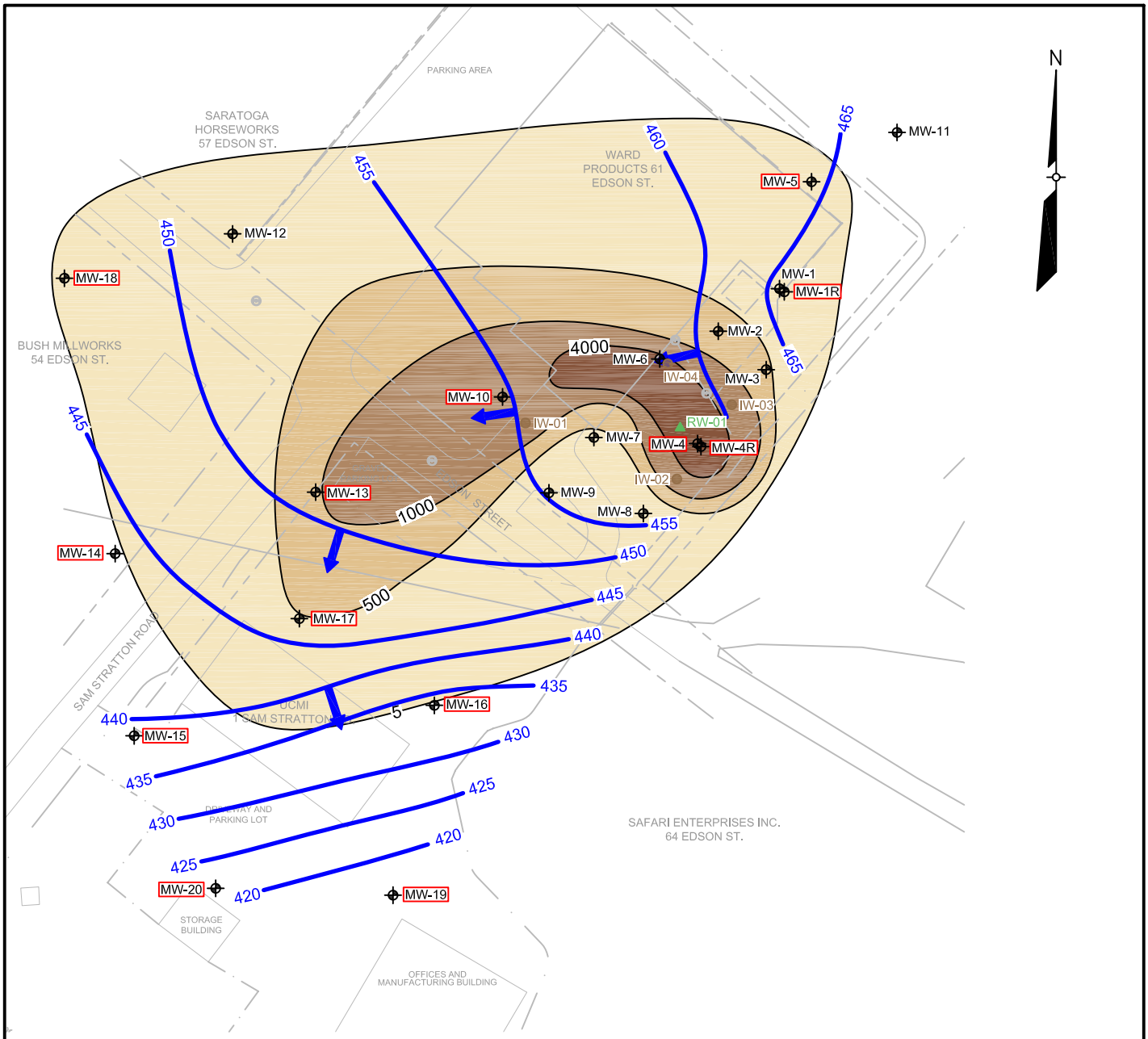
SCALE IN FEET

AECOM
40 British American Boulevard
Latham, New York 12110
T: (518) 951-2200
F: (518) 951-2300

FIGURE 5
BEDROCK GROUNDWATER TCE CONCENTRATIONS AUGUST 2009

WARD PRODUCTS SITE
AMSTERDAM, NEW YORK

JULY 2010 60155290



LEGEND

- MONITORING WELL LOCATION
- RECOVERY WELL
- ISCO INJECTION WELL
- PROPOSED MONITORING WELL TO BE SAMPLED SEMI-ANNUALLY
- —— 5 —— TCE CONCENTRATIONS IN GROUNDWATER, µg/L, AUGUST 2009
- GROUNDWATER CONTOUR (ft. MSL)
- GROUNDWATER FLOW DIRECTION

0 50 100 200

SCALE IN FEET

NOTE

1. MW-1, MW-2, MW-3 AND MW-4 ARE OVERBURDEN WELLS AND OTHERS ARE BEDROCK WELLS.

AECOM
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Latham, New York 12110
T: (518) 951-2200
F: (518) 951-2300

FIGURE 6
MONITORING WELL LOCATIONS

WARD PRODUCTS SITE
AMSTERDAM, NEW YORK

JULY 2010 60155290

Appendix A

As-Built Drawings of Sediment Basins

WOODED AREA

LIMIT OF BACKFILL MATERIALS

LIMIT OF EXCAVATION BOUNDARY

WOODED AREA

GRATED DROP INLET
GRATE EL. 263.36

LEGEND:

- 245 — EXCAVATION GRADE MAJOR CONTOUR (DASHED WHERE INFERRED)
- 244 — EXCAVATION GRADE MINOR CONTOUR (DASHED WHERE INFERRED)
- VEGETATION BOUNDARY
- LIMIT OF EXCAVATION BOUNDARY (AS SURVEYED BY H2H ON 12/13/08 & 1/14/09)
- WATERWAY BOUNDARY AT 1/14/09
- SOIL BACKFILL
- STONE BACKFILL

0’ 10’ 20’ 40’

REFERENCE:

ALL DATA COLLECTED AND DISPLAYED IN NAD83 NEW YORK STATE PLANE, EAST ZONE, US FOOT.

MAPPING PROVIDED BY H2H ASSOCIATES, TROY N.Y.

TOPOGRAPHIC SURVEY CONDUCTED BY MATSON LAND SURVEYING.

VERIFY SCALE IF PLAN SHEET IS REDUCED 1 INCH

REV	DESCRIPTION	DRN	CHK	DATE (M/D/Y)
1	ADDED SOIL CONCENTRATIONS	KAM	DJW	10/09/2009

DRN BY: DES BY: CHK BY: APP BY:

AECOM
40 British American Blvd.
Latham, New York 12110
T 518.951.2200 F 518.951.2300
WWW.AECOM.COM

FORMER WARD PRODUCTS
SITE MANAGEMENT PLAN
AMSTERDAM, NEW YORK

ROUTE 5 AREA SEDIMENT BASIN

PROJECT START DATE (M / Y): JULY 2010
PROJECT NO.: 60134119
FILENAME: WARD PRODUCTS.DWG
SHEET NO.:
FIGURE NO.: A1

Plotted By: MeisterK
Plot File Date Created: Jul/27/2010 7:25 AM
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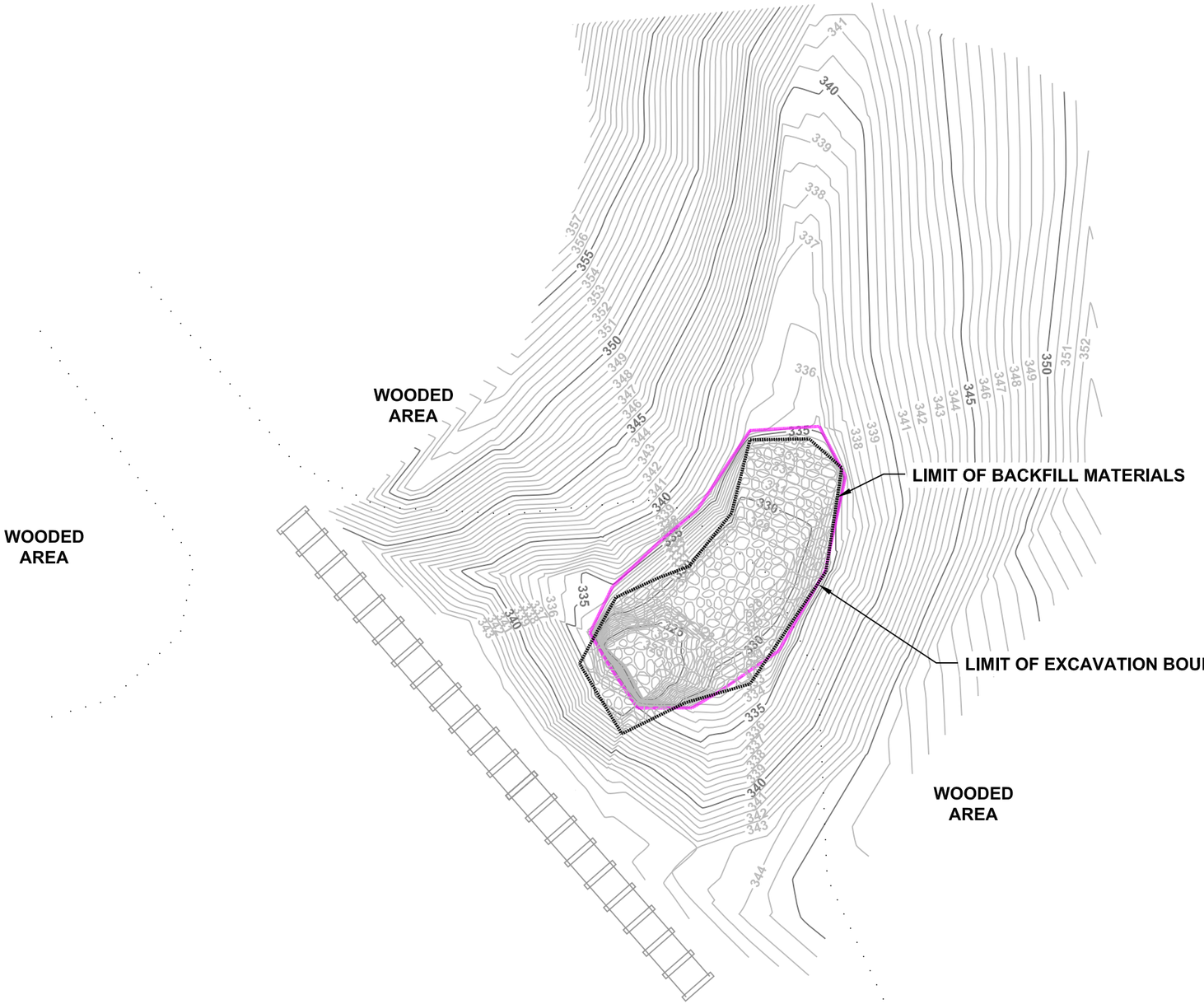


LEGEND:

- 245 — EXCAVATION GRADE MAJOR CONTOUR (DASHED WHERE INFERRED)
- 244 — EXCAVATION GRADE MINOR CONTOUR (DASHED WHERE INFERRED)
- VEGETATION BOUNDARY
- LIMIT OF EXCAVATION BOUNDARY (AS SURVEYED BY H2H ON 12/13/08 & 1/14/09)
- WATERWAY BOUNDARY AT 1/14/09
- STONE BACKFILL

REFERENCE:

ALL DATA COLLECTED AND DISPLAYED IN NAD83 NEW YORK STATE PLANE, EAST ZONE, US FOOT.

MAPPING PROVIDED BY H2H ASSOCIATES, TROY N.Y.

TOPOGRAPHIC SURVEY CONDUCTED BY MATSON LAND SURVEYING.

0' 10' 20' 40'

VERIFY SCALE IF PLAN SHEET IS REDUCED 1 INCH 1

REV	DESCRIPTION	DRN	CHK	DATE (M/D/Y)
1	ADDED SOIL CONCENTRATIONS	KAM	DJW	10/09/2009

DRN BY: DES BY: CHK BY: APP BY:

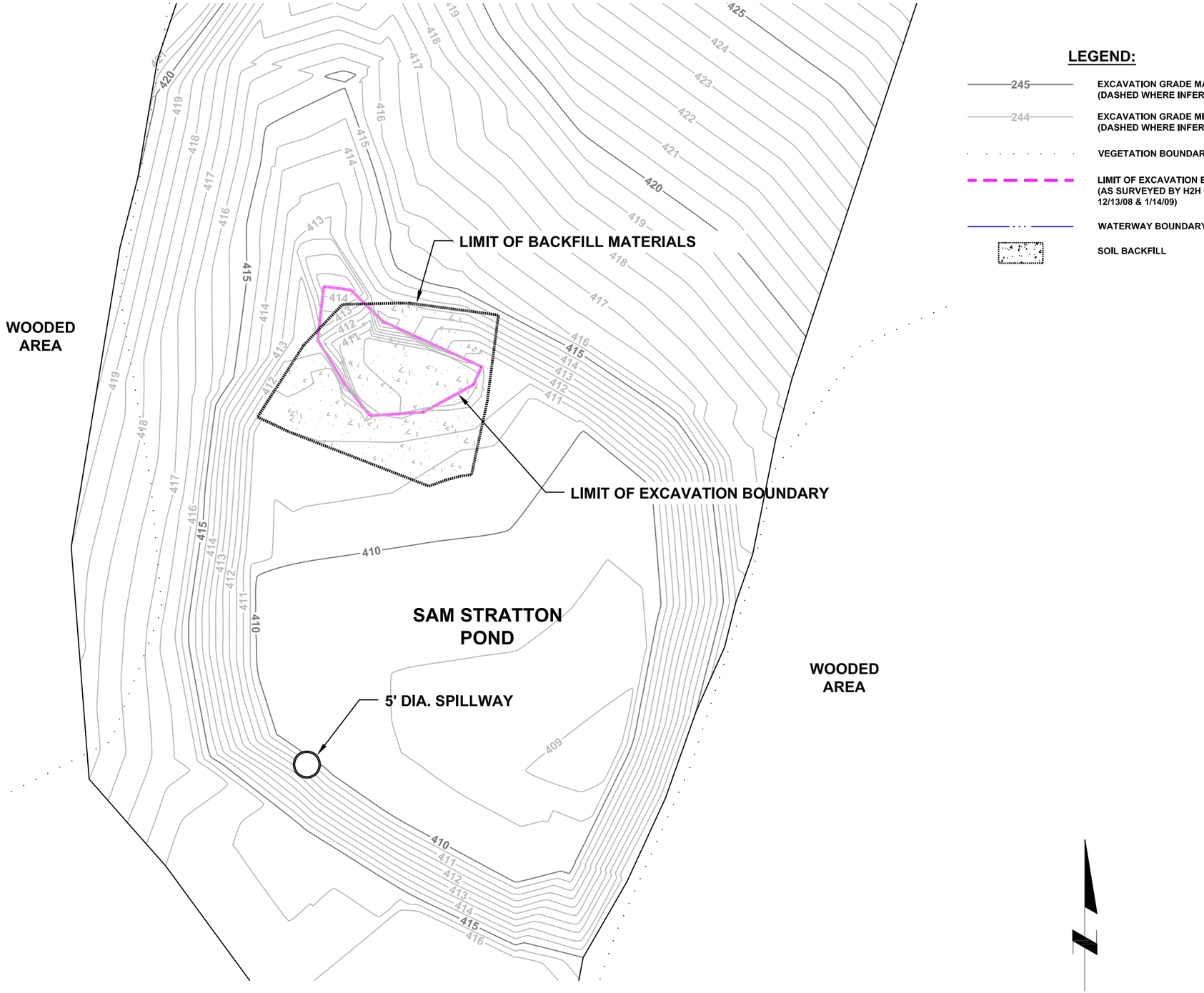
AECOM
40 British American Blvd.
Latham, New York 12110
T 518.951.2200 F 518.951.2300
WWW.AECOM.COM

CHAPMAN DRIVE SEDIMENT BASIN

FORMER WARD PRODUCTS
SITE MANAGEMENT PLAN
AMSTERDAM, NEW YORK

PROJECT START DATE (M / Y)	JULY 2010
PROJECT NO.	60134119
FILENAME	WARD PRODUCTS.DWG
SHEET NO.	
FIGURE NO.	A2

Plotted By: MeisterK
Plot File Date Created: Jul/27/2010 7:29 AM
Layout-Sheet Name: A2
Filename: L:\WORK\107297\CADD\AECOM-CADD\SITE_MANAGEMENT\WARDS_PRODUCTS_SITE_MANAGEMENT.DWG



REFERENCE:

ALL DATA COLLECTED AND DISPLAYED IN NAD83 NEW YORK STATE PLANE, EAST ZONE, US FOOT.

MAPPING PROVIDED BY H2H ASSOCIATES, TROY N.Y.

TOPOGRAPHIC SURVEY CONDUCTED BY MATSON LAND SURVEYING.

REV	DESCRIPTION	DRN	CHK	DATE (M/D/Y)
1	ADDED SOIL CONCENTRATIONS	KAM	DJW	10/09/2009

1 INCH — VERIFY SCALE IF PLAN SHEET IS REDUCED

DRN BY: | DES BY: | CHK BY: | APP BY:

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Latham, New York 12110
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WWW.AECOM.COM

FORMER WARD PRODUCTS
SITE MANAGEMENT PLAN
AMSTERDAM, NEW YORK

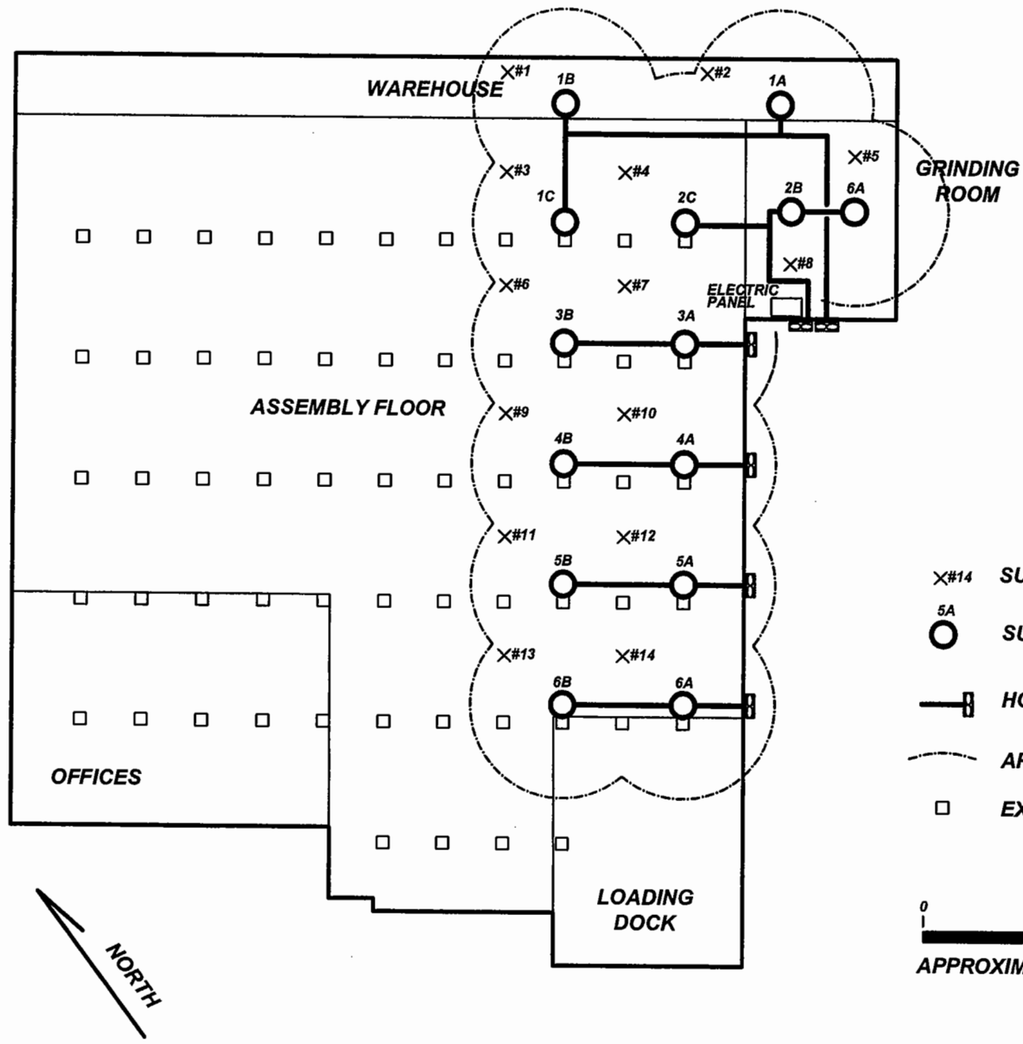
SAM STRATTON ROAD SEDIMENT BASIN

PROJECT START DATE (M / Y): JULY 2010
PROJECT NO.: 60134119
FILENAME: WARD PRODUCTS.DWG
SHEET NO.:
FIGURE NO.: A3

Plotted By: MeisterK
Plot File Date Created: Jul/27/2010 7:30 AM
Layout-Sheet Name: A3
Filename: L:\WORK\107297\CADD\AECOM-CADD\SITE_MANAGEMENT\WARDS_PRODUCTS_SITE_MANAGEMENT.DWG

Appendix B

As-Built Drawings of the Sub-Slab Depressurization System



#14 SUB-SLAB COMMUNICATION TEST POINT

5A SUB-SLAB SUCTION POINT AND VERTICAL VENT PIPE

HORIZONTAL VENT PIPE AND FAN

APPROXIMATE ZONE OF INFLUENCE

EXISTING STRUCTURAL SUPPORT COLUMNS

0 50 100

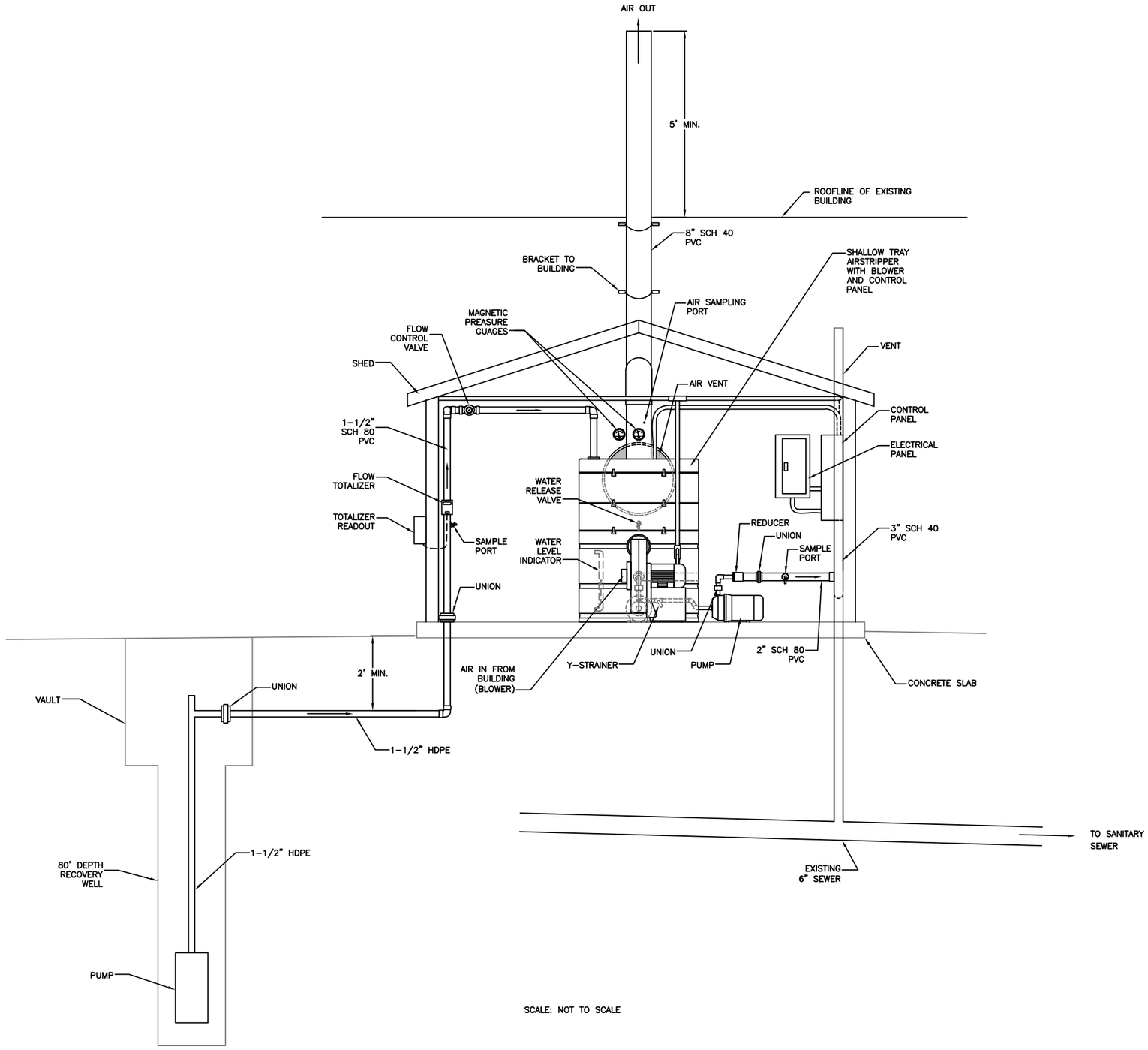
APPROXIMATE SCALE IN FEET

RETEC

Ward Products Site Amsterdam, NY NWR0-15852-700			AS-BUILT INDOOR AIR AND SOIL VAPOR MITIGATION SYSTEM	
DATE: 02/28/06	DRWN: MRH	FILE:	LAYOUT:	FIGURE 3

Appendix C

As-Built Drawing of Groundwater Treatment System



SCALE: NOT TO SCALE

NOTES:

1. PUMP IS A GRUNDFOS 4-INCH STAINLESS STEEL SUBMERSIBLE; 2-WIRE; 230V; 1/2/HP PUMP WITH A PUMP SAVER PLUS PUMP PROTECTOR 233P-1.5
2. FLOW TOTALIZER IS A MCMATER CARR 4041K23
3. FLOW CONTROLER VALVE IS MCMASTER CARR 4695K47
4. AIR STRIPPER IS NEEP STAINLESS STEEL SHALLOW TRAY MODEL 2321P
5. AIR BLOWER IS AMERICAN FAN MODEL AF-15-B15247-8
6. AIR STRIPPER DISCHARGE PUMP IS A GOULDS MODEL 1ST1C5E4
7. PRESSURE GUAGES FOR SUMP AND FOR STACK ARE MAGNEHELIC DWYER MODEL 2040 AND 2000-0C, RESPECTIVELY
8. LOW AIR PRESSURE SWITCH IS DWYER MODEL 1950-20-2F, PITOT TUBE IS DWYER MODEL 160-8, AND AIR STRIPPER SUMP LEVEL SWITCH IS A SUPER SINGLE PUMP SWITCH
9. SHED IS A LOWES'S COMMERCIAL SERVICES DESIGN NUMBER PB8-002D-4508 WITH 2" OF BLUE BOARD INSULATION ON INTERIOR WALLS AND CEILING. HEATING IS CHROMALOX MODEL CPHH-50031, 2 UNITS TOTALING 1000 WATTS
10. RECOVERY WELL VAULT IS EMCO WHEATON RETAIL PART NUMBER A0717-724ABW

AECOM

FORMER WARD PRODUCTS REMEDIATION AMSTERDAM, NEW YORK 12518-005-500			**AS-BUILT DRAWING OF GROUNDWATER TREATMENT SYSTEM**
DATE: 09/29/09	DRWN: C.C./DM		**APPENDIX D**

Appendix D

POTW Discharge Permits

CITY OF AMSTERDAM

INDUSTRIAL WASTEWATER DISCHARGE PERMIT

Effective Date: **April 1, 2009** Expiration Date: **March 31, 2012**

In accordance with all terms and conditions of the City of Amsterdam's (City's) Sewer Use Ordinance and with applicable provisions of Federal or State law or regulations, permission is hereby granted to:

New Water Reality
61 Edson Street
Amsterdam, New York 12010

for the discharge of industrial process wastewater into the City's Wastewater Treatment Works.

1. This permit is granted in accordance with the application filed on **March 17, 2008** and in conformity with plans, specifications, discharge monitoring reports and other data which are filed and considered part of this permit, together with the following conditions and requirements.

2. Industrial Wastewater Discharge (IWD) permits are issued to a specific user for a specific operation. IWD permits may not be reassigned or transferred to a new user, sold to a new owner, or used at different premises or for a new or changed operation without prior written approval of the City.

3. PERMIT APPEALS: The permittee may petition to appeal the terms of this permit within thirty (30) days of the receipt of this permit. This petition must be in writing. Failure to submit a petition for review shall be deemed to be a waiver of the appeal. In its' petition the permittee must indicate the permit provisions objected to, the reasons for this objection, and an alternate condition, if any, it seeks to be placed in the permit. The effectiveness of this permit shall not be stayed pending reconsideration by the City. If, after considering the petition, the City determines that reconsideration is proper, the City shall remand the permit for reissuance, and those permit provisions being reconsidered shall be stayed pending reissuance.

4. The permittee shall apply for permit reissuance a minimum of one hundred eighty (180) days prior to the expiration of this permit.

5. Permit issued pursuant to Section 195-7 of the City Sewer Use Ordinance by:

Recommended by:

Richard W. Phillips, P.E.
City Engineer

Approved by:

Ann M. Thane
Mayor of Amsterdam

Permittee:

New Water Reality
61 Edson Street
Amsterdam, New York 12010

Conditions:

1. Duty to Comply: The permittee must comply with all conditions of this permit, with all wastewater discharge prohibitions and limitations set forth in Section 195-5 of the City's Sewer Use Orindnace, and with all applicable prohibitions and limitations set forth in federal pretreatment regulations. Failure to comply with these requirements may be grounds for administrative action or enforcement proceedings.

2. Periodic Monitoring Reports: Quarterly Compliance Monitoring Reports, including laboratory analyses reports, are due on the 15 th day of each month following the quarter of sampling. Reports shall be signed by an authorized representative of the Industrial user and shall be submitted to the Superintendent of the Amsterdam Wastewater Treatment Plant and the City Engineer.

3. Noncompliance Report: If self-monitoring reveals violation of any discharge limitations specified herein, the permittee shall notify the Superintendent of the Amsterdam Wastewater Treatment Plant within 24 hours of becoming aware of the violations. The permittee shall also repeat the sampling and analysis and submit the results of the repeat analysis to the Superintendent of the Amsterdam Wastewater Treatment Plant within thirty days after becoming aware of the violations.

4. Additional Monitoring by the Permittee: If the permittee monitors any pollutant more frequently than required by this permit, using test procedures identified in "Specification for Self Monitoring Program", the results of this monitoring shall be included in the permittee's self monitoring reports.

5. Retention of Records: Copies of all records and reports must be kept by Industrial users for a minimum of three (3) years. Industrial users shall make such records available for inspection and copying by the USEPA, NYSDEC and the City of Amsterdam. These records will be maintained by ENSR at their Ithaca, NY office

6. New or Changed Wastewater Discharge: All industrial users shall apply for and receive written approval from the City of Amsterdam prior to discharging any new waste streams or pollutants, or any substantial increase or decrease in the volume or characteristics of existing waste streams discharged to the City's Wastewater Treatment Plant.

7. Inspection and Entry: The permittee shall allow duly authorized employees or representatives of the City to enter the permittee's premises for purposes of inspection, observation, measurement, sampling, and testing in accordance with Section 195-7 of the City Sewer Use Ordinance.

8. Accidental Discharge Reporting: Any discharge, slug, spill, breakdown, or unanticipated byass of wastewater pretreatment equipment, or any other cause, the permittee shall notify the Superintendent of the Amsterdam Wastewater Plant immediately by telephone. In addition, the permittee shall submit a written statement within seven (7) days of said occurrence describing the discharge, steps taken to reduce or eliminate and steps taken to prevent a reoccurrence of the discharge.

9. Penalties for Violation: The Amsterdam Sewer Use Ordinance provides that any person who shall continue to violate any provision of the SUO and who knowingly makes any false statement or other representation, or who tampers with or knowingly makes any false statement, or who tampers with or knowingly renders inaccurate any City monitoring device shall be guilty of a misdemeanor and shall be punished by a fine of not less than $300 dollars and not more than $1,000 dollars or by imprisonment for not more than six months, or both. In addition, this City may recover expenses arising from loss, damage and litigation from such violations.

10. Permit Modifications: Terms and conditions of this permit may be modified by the City if revision is necessary to meet the City's SPDES discharge permit requirements. If substantial changes of the permittee operations or wastewater occur, or if applicable Federal Pretreatment Standards are amended, or if the City determines that there is good cause to do so.

11. Serviceability: The provisions of this permit are serviceable, and if any provision of this permit or application of any provision of this permit is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

12. Certification Statement: All permit holders must sign a Certification Statement when submitting your monthly/quarterly report; it is a part of your permit conditions obligation.

NOTICE OF VIOLATIONS:

Any industry or transporter that violates The City of Amsterdam's Sewer Use Ordinance shall receive from the City a written Non-Compliance of said violation to be published in the local newspaper. The participant shall be granted reasonable time to correct such violation (Normally 30 days). The City may also suspend service upon formal notice when such suspension is necessary in order to stop an actual discharge that the City may deem inappropriate.

PENALTIES:

Any user who has violated or continues to violate The City's Sewer Use Ordinance or the conditions of their discharge permit shall be liable for a maximum civil penalty of $5,000.00, or not less than $1,000.00 per violation per day. Any person who continues to violate the City's Sewer Use Ordinance or the conditions of this permit, and who records, plans, tampers, renders inaccurate monitoring devices and who makes false statements shall be guilty of a misdemeanor and shall be punished by a fine of not less than $1,000.00 or not more than $5,000.00 per violation and/or imprisonment for not more than 1 year or both.

HAZARDOUS WASTE:

The City of Amsterdam will not accept any hazardous waste that will inhibit or disrupt The Wastewater Plant, its treatment process or operations, which may cause harm to humans or the environment. Under no circumstances will the owner of this permit introduce any waste from a different source that was not originally agreed upon by the City of Amsterdam and without first submitting a complete analysis of said source to The Chief Plant Operator for his approval before any discharge is warranted.

WASTEWATER DISCHARGE LIMITS

Permittee:

New Water Reality
61 Edson Street
Amsterdam, New York 12010

In addition to the limitations set forth in Section 195-5 of the City's Sewer Use Ordinance, the permittee shall not discharge any pollutant in excess of the concentrations specified below.

	Average Day Discharge (GPD)
Flow:	20,000 GPD
	Allowable Range (SU)
pH:	6.0 – 9.0

POLLUTANT	Maximum Daily Concentration (mg/l)
Arsenic	0.5 mg/l
Cadmium	5.0 mg/l
Chromium	10 mg/l
Chromium Hex	5.0 mg/l
Cyanide	1.0 mg/l
Lead	1.0 mg/l
Mercury	0.10 mg/l
Nickel	5.0 mg/l
Silver	0.5 mg/l
Zinc	1.0 mg/l
Bis (2-ethylhexyl) phthalate	0.5 mg/l
Total Phenloics	3.0 mg/l
Suspended Solids	200 mg/l
Copper	1.2 mg/l

MONITORING REQUIREMENTS

From the period beginning on the effective date of the permit until **March 31, 2012;** the permittee shall monitor the project remediation site outfall for the following parameters, and at the indicated frequency:

Parameter	Frequency	Sample Type
Flow (gpd)	Continuous	Meter
pH	1/Quarter	Grab
Trichlorethene	1/Quarter	Grab
Chromium	1/Quarter	24 – hr Composite

Note: The sampling and monitoring frequency requirements at the startup of the remediation project shall be bi-weekly for the first month, monthly for the second and third months, and quarterly thereafter.

USER FEE SCHEDULE

In accordance with Section 195-14 of the City Sewer Use Ordinance the following fee schedule shall apply for this discharge:

Minimum Quarterly	$ 65.25
Fixed Quarterly for Testing (per NYSDEC requirement)	$ 320.00
Discharge Fee (Metered Flow)	$ 0.50/100 cf

Appendix E

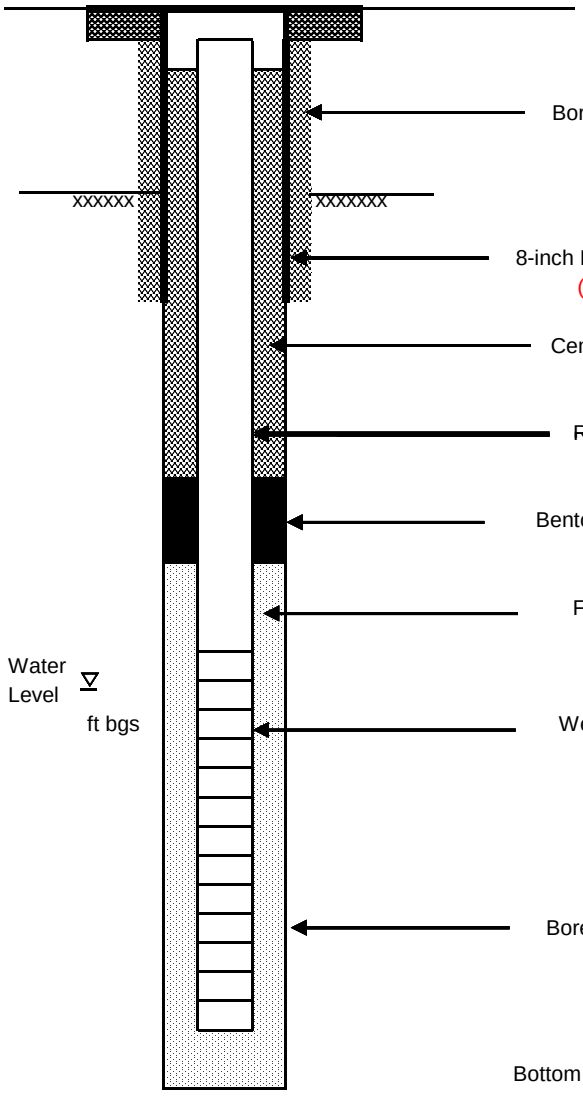
Well Construction Logs

AECOM

RECOVERY WELL DIAGRAM
SINGLE-CASED
FLUSH-MOUNT COMPLETION

Well No. RW-01

Project: FORMER WARD PRODUCTS	Location: Amsterdam, New York	Page 1 of 1		
AECOM Project No.: 113042.100	Subcontractor: Nothnagle Drilling	Water Levels		
Surface Elevation: Ft	Driller: Kevin	Date	Time	Depth
Top of PVC	Well Permit No.:	6/2/09	8:15	11.10'
Casing Elevation: Ft	AECOM Rep.: Mark Howard	6/4/09	12:07	11.01'
Datum: NGVD 1988	Date of Completion: 6/1/2009			



Locking protective flushmount with concrete pad

Ground Surface 472.08* ft

Well casing 2.0 ft bgs

Borehole diameter 8.25 inches

Top of Rock -14 ft bgs

8-inch ID steel casing (TEMPORARY) 0.0 ft to -16.0 ft

Cement-bentonite grout from -5.0 ft to -15.5 ft

Riser Pipe from 0.0 ft to -20.0 ft

Bentonite seal from N/A ft to N/A ft

Filter pack from -17.5 ft to -80.0 ft

Water Level ▽ ft bgs

Sand Size #0

Well screen from -20.0 ft to -80.0 ft

Diameter 6 inches
Slot size 0.010 inches (10 Slot)
Type PVC

Borehole diameter 8.25 inches

Bottom Cap at -80.0 ft

Bottom of Borehole at -80.8 ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.
* Elevation of the rim of the cover

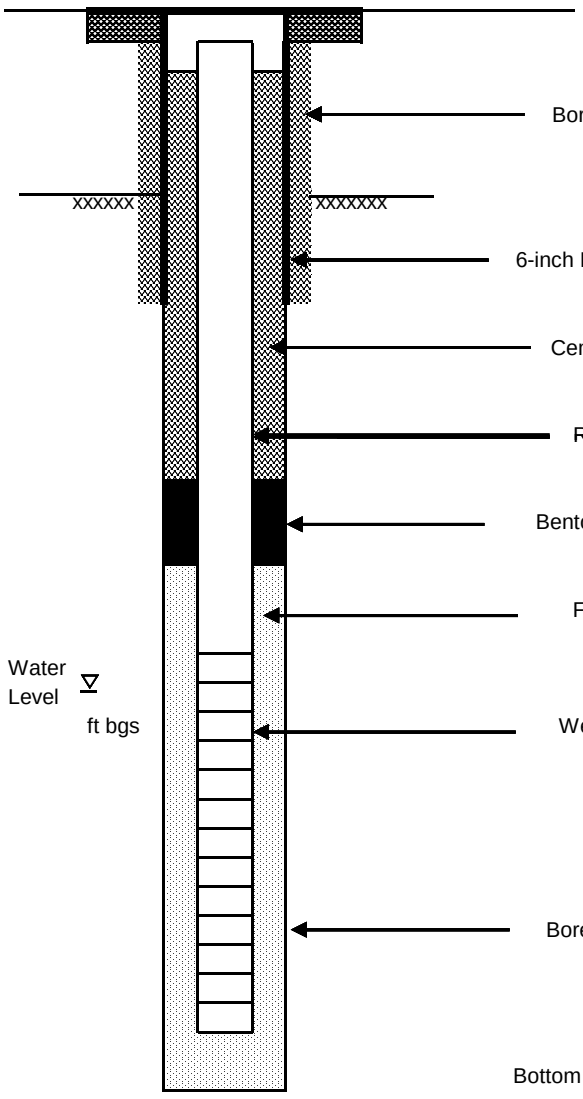
(NOT TO SCALE)

AECOM

INJECTION WELL DIAGRAM
SINGLE-CASED
FLUSH-MOUNT COMPLETION

Well No. IW-01

Project: FORMER WARD PRODUCTS	Location: Amsterdam, New York	Page 1 of 1		
AECOM Project No.: 113042.100	Subcontractor: Nothnagle Drilling	Water Levels		
Surface Elevation: Ft	Driller: Kevin	Date	Time	Depth
Top of PVC	Well Permit No.:	6/4/09	11:59	12.28'
Casing Elevation: Ft	AECOM Rep.: Mark Howard			
Datum: NGVD 1988	Date of Completion: 6/4/2009			



Locking protective flushmount with concrete pad

Ground Surface 466.19 ft

Well casing 0.5 ft bgs

Borehole diameter 8.00 inches

Top of Rock ~-30 ft bgs

6-inch ID steel casing 0.0 ft to -28.0 ft

Cement-bentonite grout from -1.0 ft to -29.0 ft

Riser Pipe from 0.0 ft to -30.5 ft

Bentonite seal from N/A ft to N/A ft

Filter pack from N/A ft to N/A ft

Sand Size N/A

Well screen from -30.5 ft to -45.5 ft

Diameter 2 inches
Slot size 0.010 inches (10 Slot)
Type PVC

Borehole diameter 4.00 inches

Bottom Cap at -45.3 ft

Bottom of Borehole at -45.5 ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

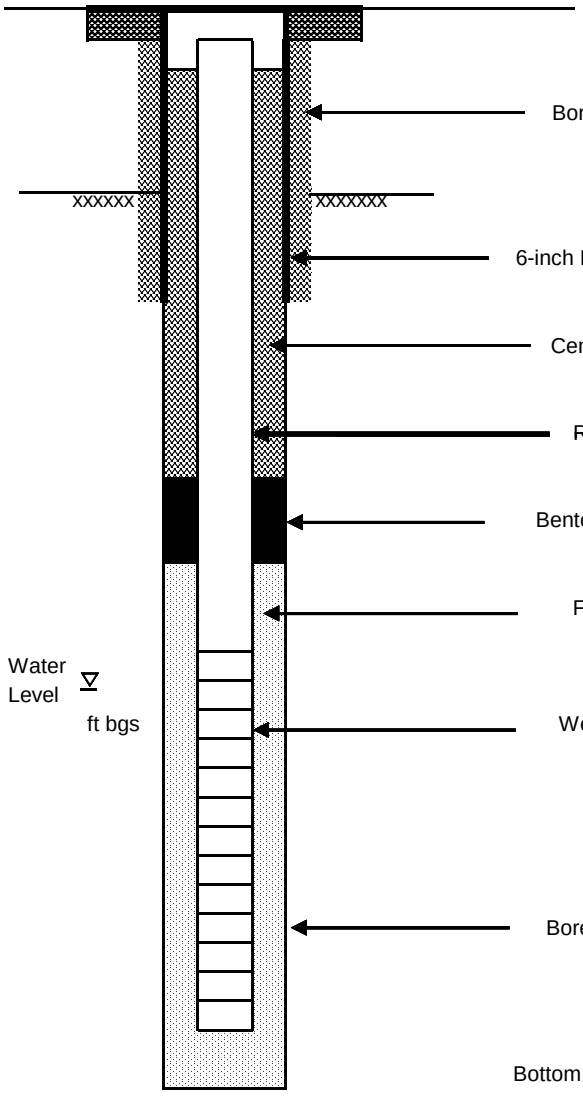
(NOT TO SCALE)

AECOM

INJECTION WELL DIAGRAM
SINGLE-CASED
FLUSH-MOUNT COMPLETION

Well No. IW-02

Project: FORMER WARD PRODUCTS	Location: Amsterdam, New York	Page 1 of 1		
AECOM Project No.: 113042.100	Subcontractor: Nothnagle Drilling	Water Levels		
Surface Elevation: Ft	Driller: Kevin	Date	Time	Depth
Top of PVC	Well Permit No.:	6/4/09	12:01	9.56'
Casing Elevation: Ft	AECOM Rep.: Mark Howard			
Datum: NGVD 1988	Date of Completion: 6/4/2009			



Locking protective flushmount with concrete pad

Ground Surface 468.79 ft

Well casing 0.5 ft bgs

Borehole diameter 8.00 inches

Top of Rock -13.5 ft bgs

6-inch ID steel casing 0.0 ft to -15.5 ft

Cement-bentonite grout from -1.0 ft to -15.5 ft

Riser Pipe from 0.0 ft to -20.0 ft

Bentonite seal from N/A ft to N/A ft

Filter pack from N/A ft to N/A ft

Water Level ▽ ft bgs

Sand Size N/A

Well screen from -20.0 ft to -80.0 ft

Diameter 2 inches
Slot size 0.010 inches (10 Slot)
Type PVC

Borehole diameter 4.00 inches

Bottom Cap at -80.0 ft

Bottom of Borehole at -80.8 ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

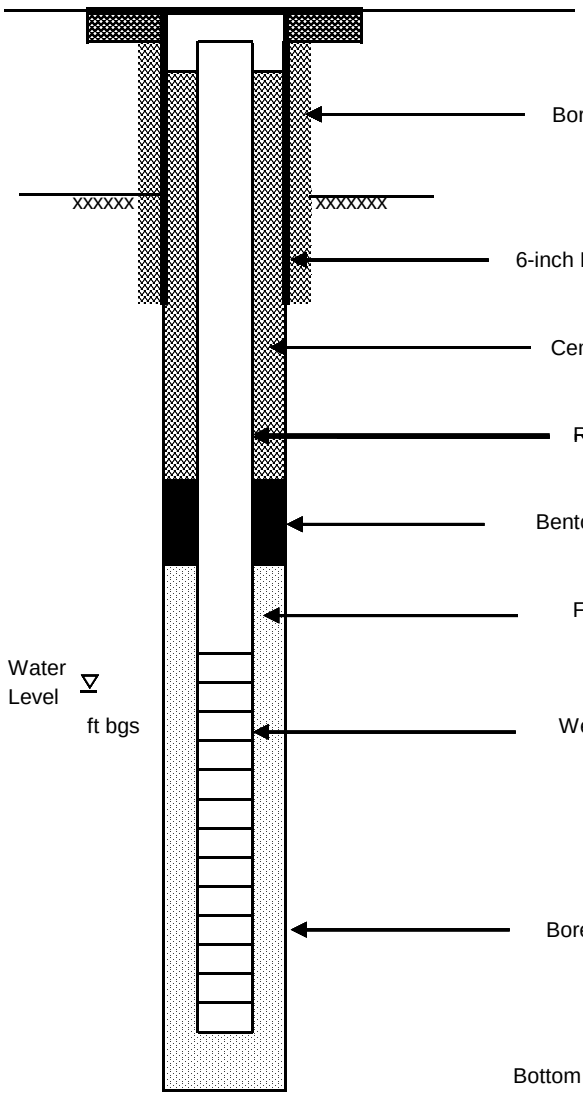
(NOT TO SCALE)

AECOM

INJECTION WELL DIAGRAM
SINGLE-CASED
FLUSH-MOUNT COMPLETION

Well No. IW-03

Project: FORMER WARD PRODUCTS	Location: Amsterdam, New York	Page 1 of 1		
AECOM Project No.: 113042.100	Subcontractor: Nothnagle Drilling	Water Levels		
Surface Elevation: Ft	Driller: Kevin	Date	Time	Depth
Top of PVC	Well Permit No.:	6/4/09	12:03	13.78'
Casing Elevation: Ft	AECOM Rep.: Mark Howard			
Datum: NGVD 1988	Date of Completion: 6/4/2009			



Locking protective flushmount with concrete pad

Ground Surface 472.51 ft

Well casing 0.5 ft bgs

Borehole diameter 8.00 inches

Top of Rock -11 ft bgs

6-inch ID steel casing 0.0 ft to -13.0 ft

Cement-bentonite grout from -1.0 ft to -13.0 ft

Riser Pipe from 0.0 ft to -20.0 ft

Bentonite seal from N/A ft to N/A ft

Filter pack from N/A ft to N/A ft

Sand Size N/A

Well screen from -20.0 ft to -80.0 ft

Diameter 2 inches
Slot size 0.010 inches (10 Slot)
Type PVC

Borehole diameter 4.00 inches

Bottom Cap at -80.0 ft

Bottom of Borehole at -80.8 ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

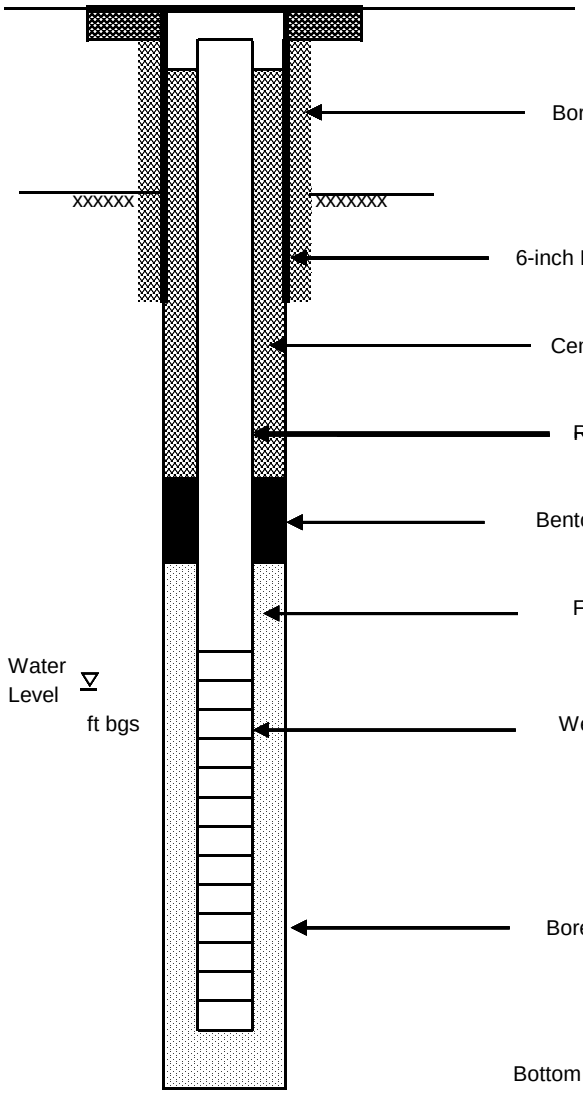
(NOT TO SCALE)

AECOM

INJECTION WELL DIAGRAM
SINGLE-CASED
FLUSH-MOUNT COMPLETION

Well No. IW-04

Project: FORMER WARD PRODUCTS	Location: Amsterdam, New York	Page 1 of 1		
AECOM Project No.: 113042.100	Subcontractor: Nothnagle Drilling	Water Levels		
Surface Elevation: Ft	Driller: Kevin	Date	Time	Depth
Top of PVC	Well Permit No.:	6/4/09	12:05	12.66
Casing Elevation: Ft	AECOM Rep.: Mark Howard			
Datum: NGVD 1988	Date of Completion: 6/4/2009			



Locking protective flushmount with concrete pad

Ground Surface 471.24 ft

Well casing 0.5 ft bgs

Borehole diameter 8.00 inches

Top of Rock -13 ft bgs

6-inch ID steel casing 0.0 ft to -15.0 ft

Cement-bentonite grout from -1.0 ft to -15.0 ft

Riser Pipe from 0.0 ft to -20.0 ft

Bentonite seal from N/A ft to N/A ft

Filter pack from N/A ft to N/A ft

Sand Size N/A

Well screen from -20.0 ft to -80.0 ft

Diameter 2 inches
Slot size 0.010 inches (10 Slot)
Type PVC

Borehole diameter 4.00 inches

Bottom Cap at -80.0 ft

Bottom of Borehole at -80.8 ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

(NOT TO SCALE)

Appendix F

Groundwater Sampling Form

Injection Well Purging/Sampling Form

Project Name and Number: _____

Monitoring Well Number: _____ Date: _____

Samplers: _____

Sample Number: _____ QA/QC Collected? _____

Purging / Sampling Method: _____

1. L = Total Well Depth: _____ feet
2. D = Riser Diameter (I.D.): _____ feet
3. W = Static Depth to Water (TOC): _____ feet
4. C = Column of Water in Casing: _____ feet
5. V = Volume of Water in Well = $C(3.14159)(0.5D)^2(7.48)$ _____ gal
6. D2 = Pump Setting Depth (ft): _____ feet
7. C2 = Column of water in Pump/Tubing (ft): _____ feet
8. Tubing Volume = C2(0.005737088) _____ gal

D (inches)	D (feet)
1-inch	0.08
2-inch	0.17
3-inch	0.25
4-inch	0.33
6-inch	0.50

Conversion factors to determine V given C

D (inches)	1-inch	2-inch	3-inch	4-inch	6-inch
V (gal / ft)	0.041	0.163	0.37	0.65	1.5

Water Quality Readings Collected Using _____

Parameter	**Units**	**Readings**						
Time	24 hr							
Water Level (0.33)	feet							
Volume Purged	gal							
Flow Rate	mL / min							
Turbidity (+/- 10%)	NTU							
Dissolved Oxygen (+/- 10%)	%							
Dissolved Oxygen (+/- 10%)	mg/L							
Eh / ORP (+/- 10)	MeV							
Specific Conductivity	mS/cm^c							
Conductivity (+/- 3%)	µmho / cm							
pH (+/- 0.1)	pH unit							
Temp (+/- 0.5)	C							
Color	Visual							
Odor	Olfactory							

Comments:

* Three consecutive readings within range indicates stabilization of that parameter.

Appendix G

Manufacturer Provided Operation and Maintenance Manuals

SP4”

4-Inch Stainless Steel Submersible Pumps

(US) Installation and operating instructions

DRINKING WATER
SYSTEM COMPONENTS
ANSI/NSF 61
65 GM

Please leave these instructions with the pump for future reference.

SAFETY WARNING

WARNING: Reduced risk of electric shock during operation of this pump requires the provision of acceptable grounding. If the means of connection to the supply connected box is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor (at least the size of the circuit supplying the pump) to the grounding screw provided within the wiring compartment.

NOTICE: This product is designes for pumping water only. Third party agency evalustions are based on pumping water only.

Pre-Installation Checklist

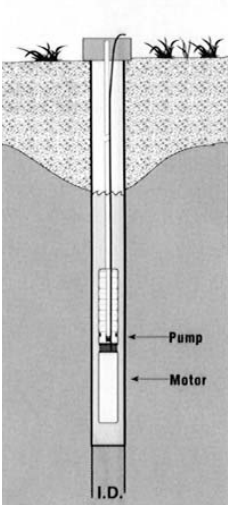
1. Well Preparation

If the pump is to be installed in a new well then the well should be fully developed and bailed or blown free of cuttings and sand. The stainless steel construction of the GRUNDFOS submersibles make it resistant to abrasion; however, no pump made of any material can forever withstand the destructive wear that occurs when constantly pumping sandy water.

If this pump is used to replace an oil-filled submersible or oil-lubricated line-shaft turbine in an existing well, the well must be blown or bailed clear of oil.

2. Make Sure You Have The Right Pump

Determine the maximum depth of the well, and the draw-down level at the pump's maximum capacity. Pump selection and setting depth should be based on this data.



3. Pumped Fluid Requirements

CAUTION: Submersible well pumps are designed for pumping clear, cold water; free of air or gases. Decreased pump performance and life expectancy can occur if the water is not cold, clear or contains air or gasses. Water temperature should not exceed 102°F.

A check should be made to ensure that the installation depth of the pump will always be at least three feet below the maximum drawdown level of the well. The bottom of the motor should never be installed lower than the top of the screen or within five feet of the well bottom.

Ensure that the requirement for minimum flow past the motor is met, as shown in the table below:

Minimum Water Flow Requirements for Submersible Pump Motors

MINIMUM DIAMETER	CASING OR SLEEVE I.D. IN INCHES	MIN. GPM FLOW PASSING THE MOTOR
4-Inch	4	1.2
	5	7
	6	13
	7	21
	8	30

NOTES: For proper motor cooling, a flow inducer or sleeve must be used if the water enters the well above the motor or if there is insufficient water flow past the motor. The minimum water velocity past 4" motors is 0.25 feet per second.

PRE-INSTALLATION CHECKLIST

4. Splicing the Motor Cable

If the splice is carefully made, it will be as efficient as any other portion of the cable, and will be completely watertight. There are a number of cable splicing kits available today – epoxy filled, rubber-sealed and so on. Many perform well if the manufacturer's directions are followed carefully. If one of these kits is not used, we recommend the following method for splicing the motor cable.

Examine the motor cable and drop cable carefully for damage. Cut the motor leads off in a staggered manner. Cut the ends of the drop cable so that the ends match up with the motor leads. Be sure to match the colors. Strip back and trim off one-half inch of insulation from each lead, making sure to scrape the wire bare to obtain a good connection. Be careful not to damage the copper conductor when stripping off the insulation. Insert a properly sized Sta-kon-type connector on each pair of leads, again making sure that colors are matched. Using Sta-kon crimping pliers, indent the lugs. Be sure to squeeze down hard on the pliers, particularly when using large cable. Form a piece of electrical insulation putty tightly around each Sta-Kon. The putty should overlap on the insulation of the wire. Use a good quality tape such as ***#33 Scotch Waterproof*** or ***Plymouth Rubber Company Slipknot Grey***. Wrap each wire and joint tightly for a distance of about 2-1/2 inches on each side of the joint. Make a minimum of four passes over each joint and overlap each pass approximately one inch to assure a completely watertight seal.

INSTALLATION PROCEDURES

1. Attach the Pump to the Motor

When attaching the pump to the motor we recommend the pump be bolted down in a cross pattern around the four bolts. Starting from the back (opposite the cable opening) and using a cross pattern, tighten the motor bolts to 13.5 ft-lbs, using progressive tightening until torque is met. (See figure 1 for example).

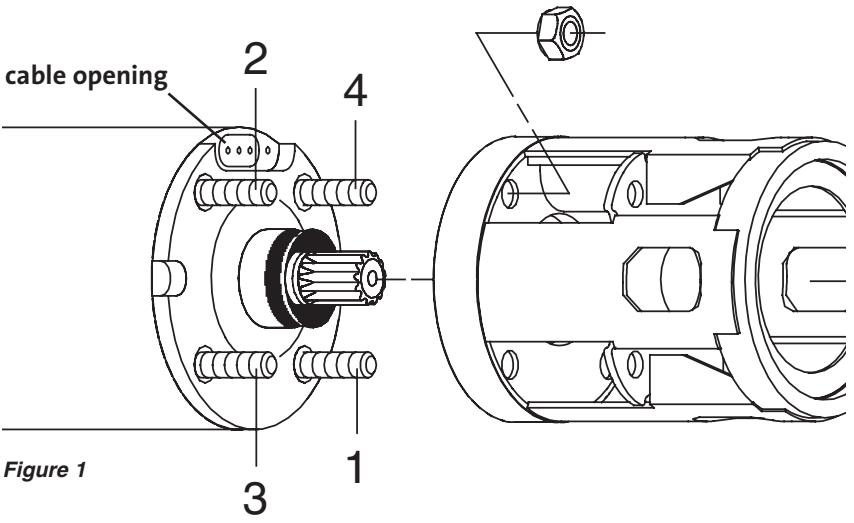


Figure 1

INSTALLATION PROCEDURES

2. Attach the Pump to the Pipe

A back-up wrench should be used when riser pipe is attached to the pump. The pump should only be gripped by the flats on the top of the discharge chamber. Under no circumstances grip the body of the pump, cable guard or motor. When tightened down, the threaded end of the first section of the riser pipe or the nipple must not come in contact with the check valve retainer in the discharge chamber of the pump. After the first section of the riser pipe has been attached to the pump, the lifting cable or elevator should be clamped to the pipe. Do not clamp the pump. When raising the pump and riser section, be careful not to place bending stress on the pump by picking it up by the pump-end only. It is recommended that plastic-type riser pipe be used only with the smaller domestic submersibles. The manufacturer or representative should be contacted to ensure the pipe type and physical characteristics are suitable for this use. Use the correct joint compound recommended by the specific pipe manufacturer. Besides making sure that points are fastened, we recommend the use of a torque arrestor when using plastic pipe.

3. Lower the Pump Into the Well

Make sure the electrical cables are not cut or damaged in any way when the pump is being lowered in the well. Do not use the power cables to support the weight of the pump.

To protect against surface water entering the well and contaminating the water source, the well should be finished off above grade utilizing a locally approved well seal or pitless adaptor unit. We recommend that steel riser pipes always be used with the larger submersibles. A pipe thread compound should be used on all joints. Make sure that the joints are adequately tightened in order to resist the tendency of the motor to loosen the joints when stopping and starting.

The drop cable should be secured to the riser pipe at approximately every 10 ft/3 m to prevent sagging, looping and possible cable damage. Nylon cable clips or waterproof tape may be used. The cable splice should be protected by securing it with clips or tape just above each joint.

Figure 2

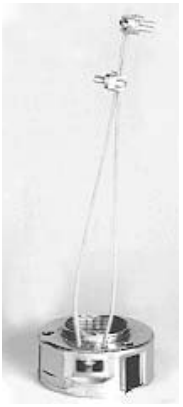


Figure 3

IMPORTANT: *Plastic pipe tends to stretch under load. This stretching must be taken into account when securing the cable to the riser pipe. Leave three to four inches of slack between clips or taped points. This tendency for plastic pipe to stretch will also affect the calculation of the pump setting depth. As a general rule, you can estimate that plastic pipe will stretch to approximately 2% of its length. When plastic riser pipe is used, it is recommended that a safety cable be attached to the pump to lower and raise it. The discharge chamber of GRUNDFOS 4-inch submersibles is designed to accommodate this cable. (See Figures 2 & 3.)*

Check Valves: A check valve should always be installed at the surface of the well and one at a maximum of 25 feet above static water level. In addition, for installations deeper than 200 feet, check valves should be installed at no more than 200 foot intervals.

4. Electrical Connections

WARNING: Reduced risk of electric shock during operation of this pump requires the provision of acceptable grounding. If the means of connection to the supply connected box is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor (at least the size of the circuit supplying the pump) to the grounding screw provided within the wiring compartment.

Verification of the electrical supply should be made to ensure the voltage, phase and frequency match that of the motor. Motor electrical data can be found on page 6. If voltage variations are larger than ± 10%, do not operate the pump. Single-phase motor control boxes should be connected as shown on the wiring diagram mounted on the inside cover of the control box supplied with the motor. The type of wire used between the pump control boxes should be approved for submersible pump application. The conductor insulation should be type RW, RUW, TW or equivalent.

A high-voltage surge arrestor should be used to protect the motor against lightning and switching surges. Lightning voltage surges in power lines are caused when lightning strikes somewhere in the area. Switching surges are caused by the opening and closing of switches on the main high-voltage distribution power lines.

The correct voltage-rated surge arrestor should be installed on the supply (line) side of the control box or starter (See Figure 4a & 4b). The arrestor must be grounded in accordance with the National Electric Code and local governing regulations.

PUMPS SHOULD NEVER BE STARTED UNLESS THE PUMP IS TOTALLY SUBMERGED. SEVERE DAMAGE MAY BE CAUSED TO THE PUMP AND MOTOR IF THEY ARE RUN DRY.

The control box shall be permanently grounded in accordance with the National Electric Code and local governing codes or regulations. The ground wire should be a bare stranded copper conductor at least the same size as the drop cable wire size. Ground wire should be as short a distance as possible and securely fastened to a true grounding point. True grounding points are considered to be: a grounding rod driven into the water strata; steel well casing submerged into the water lower than the pump setting level; and steel discharge pipes without insulating couplings. If plastic discharge pipe and well casing are used, a properly sized bare copper wire should be connected to a stud on the motor and run to the control panel. Do not ground to a gas supply line. Connect the grounding wire to the ground point first, then to the terminal in the control box.

Single Phase Hookup

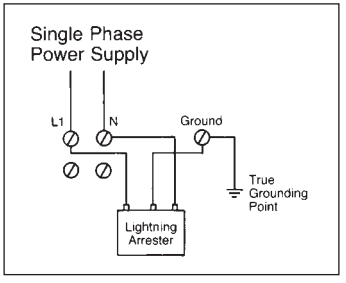


Figure 4a

Three Phase Hookup

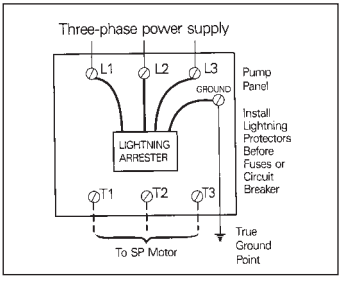
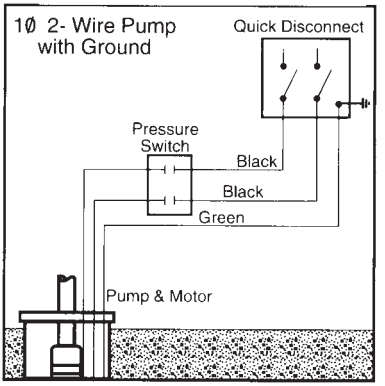


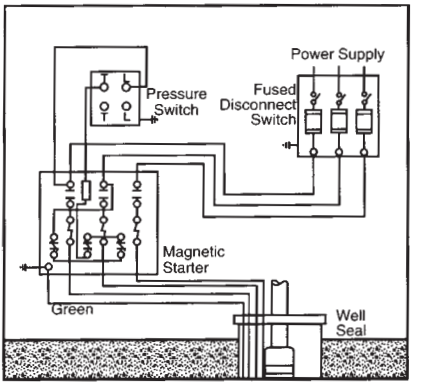
Figure 4b

INSTALLATION PROCEDURES

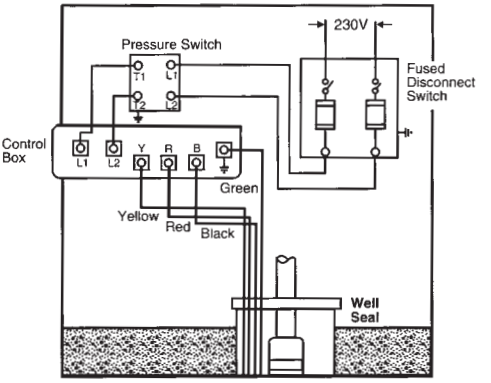
Single-Phase 2-Wire Wiring Diagram for Submersible Motors



Three-Phase Wiring Diagram for Submersible Motors



Single-Phase 3-Wire Control Box for Submersible Motors



4. Starting the Pump for the First Time

A. Attach a temporary horizontal length of pipe to the riser pipe.
B. Install a gate valve and another short length of pipe to the temporary pipe.
C. Adjust the gate valve one-third of the way open.
D. Verify that the electrical connections are in accordance with the wiring diagram.
E. After proper rotation has been checked, start the pump and let it operate until the water runs clear of sand, silt and other impurities.
F. Slowly open the valve in small increments as the water clears until the valve is all the way open. The pump should not be stopped until the water runs clear.
G. If the water is clean and clear when the pump is first started, the valve should still be opened until it is all the way open.

GRUNDFOS MOTORS Submersible Pump Motors -Electrical Data 60Hz

HP	Ph	Volt	S.F.	Circ. Brkr or Fuses Std.	Circ. Brkr or Fuses Delay	Amperage Start	Amperage Max.	Full Load Eff. (%)	Full Load Pwr Fact.	Max. Thrust (lbs)	Line-to-Line Resistance (Ohms) Blk-Yel	Line-to-Line Resistance (Ohms) Red-Yel	KVA Code **	3-Ph. Overload Protection Starter Size	3-Ph. Overload Protection Furnas Amb. Comp
4-Inch, Single Phase, 2-Wire Motors (control box not required)															
MS402B															
1/3	1	230	1.75	15	5	25.7	4.6	59	77	900	6.8-8.2		S	-	-
1/2	1	115	1.60	30	15	55.0	12.0	62	76	900	1.1-1.3		R	-	-
1/2	1	230	1.60	15	7	34.5	6.0	62	76	900	5.2-6.3		R	-	-
3/4	1	230	1.50	20	9	40.5	8.4	62	75	900	3.2-3.8		N	-	-
1	1	230	1.40	25	12	48.4	9.8	63	82	900	2.5-3.1		M	-	-
1-1/2	1	230	1.30	35	15	62.0	13.1	64	85	900	1.9-2.3		L	-	-
4-Inch, Single Phase, 3-Wire Motors															
MS402B															
1/3	1	115	1.75	25	10	29.0	9.0	59	77	900	1.55-1.9	2.4-3	M	-	-
1/3	1	230	1.75	15	5	14.0	4.6	59	77	900	6.8-8.3	17.3-21.1	L	-	-
1/2	1	115	1.60	30	15	42.5	12.0	61	76	900	0.9-1.1	1.9-2.35	L	-	-
1/2	1	230	1.60	15	7	21.5	6.0	62	76	900	4.7-5.7	15.8-19.6	L	-	-
3/4	1	230	1.50	20	9	31.4	8.4	62	75	900	3.2-3.9	14-17.2	L	-	-
1	1	230	1.40	25	12	37.0	9.8	63	82	900	2.6-3.1	10.3-12.5	K	-	-
1-1/2	1	230	1.30	35	15	45.9	11.6	69	89	900	1.9-2.3	7.8-9.6	H	-	-
MS4000															
2	1	230	1.25	30	15	57.0	13.2	72	86	1500	1.5-1.8	3.4-4.1	G	-	-
3	1	230	1.15	45	20	77.0	17.0	74	93	1500	1.2-1.4	2.45-3	F	-	-
5	1	230	1.15	70	30	110	27.5	77	92	1500	0.65-0.85	2.1-2.6	F	-	-
4-Inch, Three Phase, 3-Wire Motors															
MS4000															
1-1/2	3	230	1.30	15	8	40.3	7.3	75	72	750	3.9		K	0	K41
		460	1.30	10	4	20.1	3.7	75	72	750	15.9		K	0	K32
		575	1.30	10	4	16.1	2.9	75	72	750	25.2		K	0	K28
2	3	230	1.25	20	10	48	8.7	76	75	750	3.0		J	0	K50
		460	1.25	10	5	24	4.4	76	75	750	12.1		J	0	K34
		575	1.25	10	4	19.2	3.5	76	75	750	18.8		J	0	K31
3	3	230	1.15	30	15	56	12.2	77	75	1000	2.2		H	0	K54
		460	1.15	15	7	28	6.1	77	75	1000	9.0		H	0	K37
		575	1.15	15	6	22	4.8	77	75	1000	13.0		H	0	K36
5	3	230	1.15	40	25	108	19.8	80	82	1000	1.2		H	1	K61
		460	1.15	20	12	54	9.9	80	82	1000	5.0		H	0	K50
		575	1.15	15	9	54	7.9	80	82	1000	7.3		H	0	K43
7-1/2	3	230	1.15	60	30	130	25.0	81	82	1000	0.84		H	1	K67
		460	1.15	35	15	67	13.2	81	82	1000	3.24		J	1	K56
		575	1.15	30	15	67	10.6	81	82	1000	5.2		J	1	K53
10	3	460	1.15	50	25	90	18.0	81	80	1500	1.16		H	1	K61
		575	1.15	40	20	72	14.4	81	80	1500	1.84		H	1	K58

*All Grundfos 4" motors have a ground (green wire)

GRUNDFOS & Franklin Control Box

RATING HP	RATING VOLT	GRUNDFOS MOTOR MODEL	GRUNDFOS CONTROL BOX	FRANKLIN MOTOR MODEL	FRANKLIN CONTROL BOX
				These models may have additional digits	
1/3	115	MS402B	SA-SPM5	214502	28010249
1/3	230	MS402B	SA-SPM5	214503	28010349
1/2	115	MS402B	SA-SPM5	214504	28010449
1/2	230	MS402B	SA-SPM5	214505	28010549
3/4	230	MS402B	SA-SPM5	214507	28010749
1	230	MS402B	SA-SPM5	214508	28010849
1.5	230	MS402B		224300	2823008
2	230	MS4000		224301	2823018
3	230	MS4000		224302	2823028
5	230	MS4000		224303	2821138
					2821139

*For questions regarding Franklin control boxes - refer to the Franklin Submersible Motors Application Maintenance Manual

MOTOR INFORMATION

The key to long submersible motor life is good cooling. Most submersible pumps rely on moving heat away from the motor by forced convection. The ambient/produced fluid is typically drawn by the motor in the course of pumping to accomplish this task. Submersible motors used in the water supply industry are typically designed to operate at full load in water up to 30°C (86°F), provided the flow velocity can be maintained at a minimum of 0.5 feet per second (fps).

Required Cooling Flow and Velocity

AWWA specifications state the maximum motor diameter and the minimum inside diameter of the well shall be in such relationship that under any operating condition the water velocity past the motor shall not exceed 12 fps (3.7 m/s) nor be less than 0.5 fps (0.15 m/s). The AWWA specification are principally applicable to motors 6-inch and larger, as most 4-inch motor designs are based on a minimum cooling flow velocity of 0.25 fps (0.08 m/s) at rated ambient temperature. Table 8 relates flow, casing and motor size requirements to accomplish minimum cooling velocity.

Table 8: Minimum Submersible Cooling Flow Requirements

Casing/Sleeve I.D. (inches)	4" Motor (0.25 fps)	6" Motor (0.5 fps)
	(gpm)	
4	1.2	–
5	7.0	–
6	13	9
7	20	25
8	30	45
10	50	90
12	80	140
14	110	200
16	150	280
18	–	380

Notes:
1. Minor irregularities associated with motor shape and diameter variations between manufactures are not accounted for in the table.
2. At the velocity specified in the table the temperature differential between the motor surface and ambient water will range from 5° - 15°C (10-30°F).

Some submersible motor manufactures require no cooling fluid flow past the motor, when the produced fluid temperature is 20°C (68°F) or less. Cooling by free convection in such cases, is only permitted in the vertical position and is contingent on no adverse operating conditions present such as; poor power, high stop/start frequency, presence of incrustating deposits on the motor surface, etc. Detramental operating conditions are difficult to identify or predict, and for this reason, the minimum cooling flow should be provided whenever possible - regardless of the ambient fluid temperature.

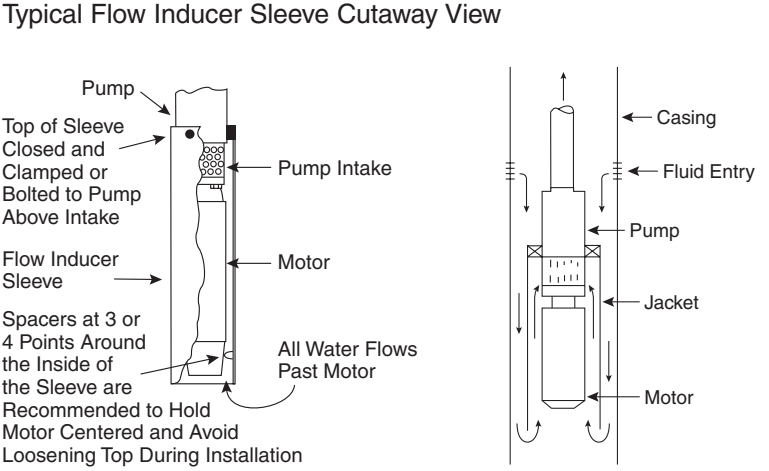
Typical Motor Jacket/Shroud Configurations.

The motor shroud is generally of the next nominal diameter of standard pipe larger than the motor or the pump, depending on the shroud configuration used. The tubular/pipe material can be plastic or thin walled steel (corrosion resistant materials preferred). The cap/top must accommodate power cable without damage and provide a snug fit, so that only a very small amount of fluid can be pulled through the top of the shroud. The fit should not be completely water tight as ventilation is often required to allow escape of the air or gas that might accumulate. The shroud body should be stabilized to prevent rotation and maintain the motor centered within the shroud. The shroud length should extend to a length of 1-2 times the shroud diameter beyond the bottom of the motor when possible. Shrouds are typically attached immediately above the pump intake or at the pump/column correction.

A typical motor sleeve/shroud selection example is sited below and illustrated in Figure 8:

> If a well feeds water from above the pump, has a casing/chamber too small to allow a motor jacket/sleeve on the pump, and does not have adequate level and flow to allow raising the pump above the inflow, it is difficult to properly cool the motor. When possible, the casing depth should be increased to allow flow to come from below the motor. If this is not practical, adequate flow past the motor can usually be attained by employing a motor jacket with a stringer pipe or by using a jet tube.

Figure 8: Typical Motor Jacket Installation Scenarios



MOTOR INFORMATION

Single-Phase 60 Hz

MOTOR RATING		COPPER WIRE SIZE (AWG)								
VOLTS	HP	14	12	10	8	6	4	2	0	00
115	1/3	130	210	340	540	840	1300	1960	2910	
	1/2	100	160	250	390	620	960	1460	2160	
230	1/3	550	880	1390	2190	3400	5250	7960		
	1/2	400	650	1020	1610	2510	3880	5880		
	3/4	300	480	760	1200	1870	2890	4370	6470	
	1	250	400	630	990	1540	2380	3610	5360	6520
	1-1/2	190	310	480	770	1200	1870	2850	4280	5240
	2	150	250	390	620	970	1530	2360	3620	4480
	3	120	190	300	470	750	1190	1850	2890	3610
	5			180	280	450	710	1110	1740	2170

Three-Phase 60 Hz

MOTOR RATIN		COPPER WIRE SIZE (AWG)						
VOLTS	HP	14	12	10	8	6	4	2
208	1-1/2	310	500	790	1260			
	2	240	390	610	970	1520		
	3	180	290	470	740	1160	1810	
		5170	280	4690	1080			1660
230	1-1/2	360	580	920	1450			
	2	280	450	700	1110	1740		
	3	210	340	540	860	1340	2080	
	5		200	320	510	800	1240	1900
460	1-1/2	1700						
	2	1300	2070					
	3	1000	1600	2520				
	5	590	950	1500	2360			
575	1-1/2	2620						
	2	2030						
	3	1580	2530					
	5	920	1480	2330				

FOOTNOTES:

1. If aluminum conductor is used, multiply lengths by 0.5. Maximum allowable length of aluminum is considerably shorter than copper wire of same size.
2. The portion of the total cable which is between the service entrance and a 3Ø motor starter should not exceed 25% of the total maximum length to ensure reliable starter operation. Single-phase control boxes may be connected at any point of the total cable length.
3. Cables #14 to #0000 are AWG sizes, and 250 to 300 are MCM sizes.

U.S.A.
Grundfos Pumps Corporation
17100 W. 118th Terrace
Olathe, KS 66061
Telephone (913) 227-3400
Fax: (913) 227-3500

Canada
Grundfos Canada, Inc.
2941 Brighton Road
Oakville, Ontario L6H 6C9, Canada
Telephone: (905) 829-9533
Fax: (905) 829-9512

Mexico
Bombas Grundfos de Mexico, S.A. de C.V.
Boulevard TLC No. 15
Parque Industrial Stiva Aeropuerto
Apodaca, N.L. Mexico
C.P. 66600 Apodaca, N.L. Mexico
Telephone: 011-52-81-8144-4000
Fax: 011-52-81-8144-4010

L-SP-TL-048 Rev. 6/04 (US)

ShallowTray® Low Profile Air Stripper Specification Sheet - Polyethylene Systems

hallowTray Serial #: 12717-2321P Customer: AECOM Environment Intended Ship Date: May 28, 2009

gineered By: Dave Cushman Order Date: May 6, 2009 Submittal Approval Required: ____ Yes No ✓

Design Review: Engineering _____ Sales _____

Additional Treatment Equipment:

System Serial #: 12717 **EconoPump Serial #:** N/A

I. Special Components / Requirements / Information / Comments

II. Design Criteria

Design Water Flow Rate: 8 gpm

Maximum Water Flow Rate: 50 gpm, which is considered a ✓ Low Water Flow Design, or ____ a High Water Flow Design, and is based on the blower model selection.

Weir Height: 2 " Inlet, 2 " Outlet

Equipment Power Requirements: 3 Ø, 208 volts, 60 Hz

INSTALL ALL EQUIPMENT PER APPLICABLE NATIONAL AND LOCAL CODES.
CUSTOMER TO PROTECT EXPLOSION-PROOF MOTORS FROM RAIN.

III. Basic System Components

CAUTION: MAXIMUM PRESSURE OR VACUUM ACROSS PLASTIC SYSTEM = 22" WC

✓ Sump Tank, Cover, Rings — Linear low density polyethylene

2 Stripper Trays (quantity) — High density polyethylene

√ Latches — Zinc-plated steel

✓ Main Blower (with inlet screen and damper) — American Fan Model # AF-15-B15247-8

Minimum Required Blower Performance: 300 cfm @ 14 " wc

3 hp, 3 Ø, 208 volts, _____ rpm

60 Hz, ✓ TEFC or ____ EXP

8 "Blower Inlet Size, 8 "Blower Outlet Size

Blower P/N AF-15-B15247-8

Coupling P/N 8" x 8"

Riser P/N Build Riser if needed

✓ Blower on Inlet (Pressure system)

___ Blower on Outlet (Vacuum system)

___ Blowers on In & Out (Combo system)

Main Blower Sized For:
14 "wc required for ShallowTray Air Stripper
0 "wc additional available for airstream equipment

✓ Mist Eliminator Pad — Koch style 4310, 4" thick, 304 ss

✓ Spray Nozzle — Hollow cone, 90° pattern, sized for 15 psi, brass

✓ Sight Tube — Brass fittings, Nalgene tubing

✓ Stripper Tray Gaskets — Medium density neoprene sponge rubber

✓ Inlet Piping Connection — Schedule 80 PVC, Brass

✓ Blower and Vent Line Connections — Flexible PVC couplings

IV. Optional Equipment

___Frame — Solid steel deck, angle runners, painted.

✓ Air Pressure Gauge (0 - 40 "wc) — Dwyer Magnehelic 2000 series SHIP LOOSE

Gravity Discharge Riser — PVC 80 Piping, with vacuum relief valve

Additional Blower (with inlet screen and damper) — _____ Fan Model #_____

Required Performance — _____cfm @ _____" wc Blower P/N_____
_____hp, ____Ø, _ _volts, _____rpm, Hz, ____TEFC or ____EXP
____"Blower Inlet Size, ____"Blower Outlet Size

Feed Pump — _____ Pump Model #_____

Required Performance — _____ gpm @ _____' TDH Feed Pump P/N_____
_____hp, _ Ø, _____volts, _____rpm, Hz, ____TEFC or ____EXP
Port Sizes: _____ inch inlet, _____ inch outlet. Impeller Size _____ inches

✓ Discharge Pump SHIP LOOSE — Goulds Pump Model # 1ST1C5E4

Required Performance — 8 gpm @ 50 ' TDH Discharge Pump P/N 1ST1C5E4
.5 hp, 3 Ø, 200 volts, 3450 rpm, 60 Hz, ✓ TEFC or ____EXP
Port Sizes: 1.25 inch inlet, 1.00 inch outlet. Impeller Size _____ inches

Main Disconnect Switch — Integral with electrical enclosure, rotary style, door/cabinet interlocked

✓ Control Panel SHIP LOOSE — Motor starters, system alarm interlock circuit, operator switches. alarm light.
NEMA 4 Enclosure, _____ Amps, 3 Ø, 200 Volts, 60 Hz, _____ wire plus ground

___Control Panel w/ Pump Controls — Motor starters, system alarm interlock circuit, pump level control circuit, operator switches, alarm light,
NEMA _____ Enclosure, _____ Amps, _____Ø, _____Volts, _____Hz, _____ wire plus ground

PurgePanel ™ — NEMA 7 Main Disconnect switch, NEMA 4 enclosure, air pressure gauge,
Low air pressure switch, Blower (100 cfm @ 2" w.c.)

Autodialer — Manufacturer_____

___Control Circuit Transformer — _____:120vac

Intrinsically-Safe Relay — _____ Pepperl+Fuchs, WE77/Ex2-UL repeater relay Dual Channel, SPDT relay output
_____Warrick 27A1E0 latching relay Single Channel, SPDT relay output

Intermittent Operation — Blower time-delay circuit added to panel design. Blower shuts off 5 minutes after inlet water flow stops.

Auto Operation — # of wells

Well Probes — Warrick, series 3W, Cord Length=_____

___Blower Start/Stop Switch — Local blower switch mounted near blower, NEMA _____

___Power Lapse Indicator — Black-out / Brown-out indicating light, switch, and circuit added to panel design

✓ Individual Alarm Light — Light and relay circuit added to panel design

Strobe Alarm Light — ___Red, ___ Blue, Federal Signal, NEMA 4, UL listed

___Alarm Horn — Federal Signal

✓ Low Air ✓ Press. ___Vacuum Switch — Dwyer 1950-1, preset at 1.6" wc (range=0.3"wc to1.6" wc), Explosion-proof SHIP LOOSE

___High Air ___Press. ___Vacuum Switch — Dwyer 1950, _____"wc to _____"wc, Explosion-proof

___Low Water Level Alarm Float Switch — Mechanical, SJ Electro, (qty)____N.O., (qty)____N.C.

✓ High Water Level Alarm Float Switch — Mechanical, SJ Electro, (qty) 1 N.O., (qty) N.C. INSTALL IN SUMP

✓ Discharge Pump Float Switch — Mechanical, SJ Electro, (qty) 1 N.O., (qty)____N.C. INSTALL IN SUMP

___Water Flow Meter — Manufacturer_____

✓ Air Flow Meter SHIP LOOSE — Dwyer 2000-0 meter, single-point insertion pitot tube, mounting kit, & slide rule

___Water Press. Gauge,___inlet, ___outlet — Dial gauge, liquid-filled

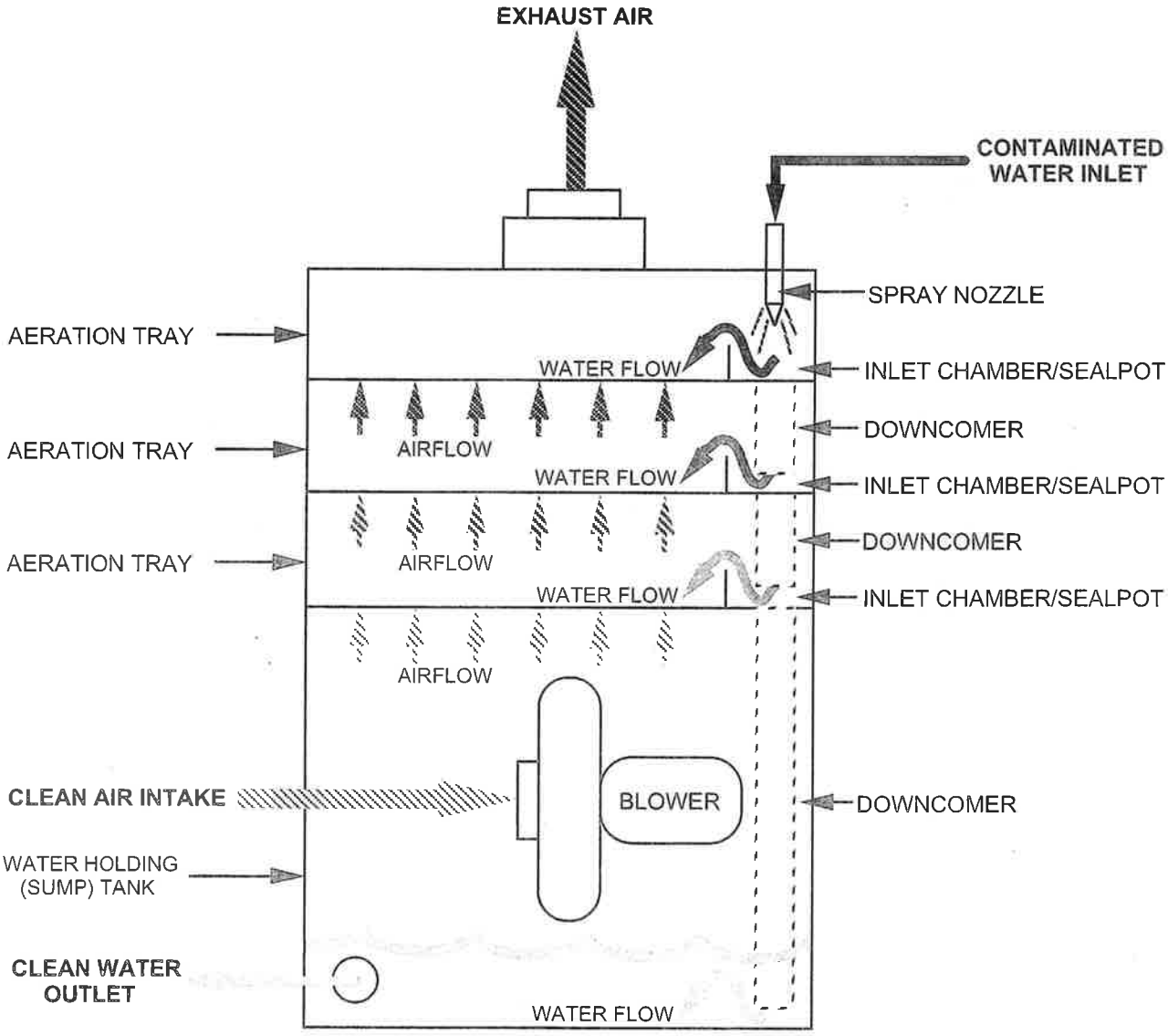
___Water Temp. Gauge,___inlet, ___outlet — Dial gauge

✓ Line Sampling Port, ___inlet, ___outlet — Schedule 80 PVC SHIP LOOSE

___Air Blower Silencer — Manufacturer_____

___Washer Wand — Nozzle, Elbow, 1/4" steel pipe

AERATION PROCESS, COUNTER-CURRENT AIR AND WATER FLOW



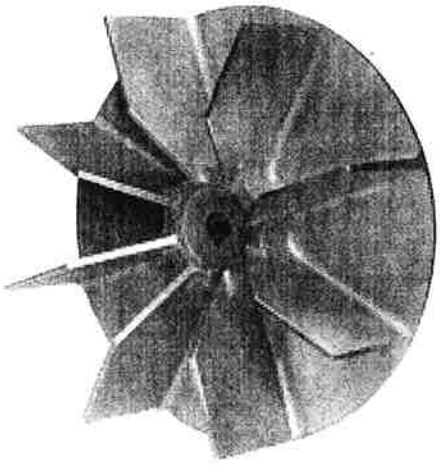
FOR REFERENCE ONLY !

DO NOT ASSEMBLE PER THIS DRAWING. SEE DRAWINGS THAT ARE SPECIFIC TO THIS UNIT.

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NH 03784
(603) 298-7061

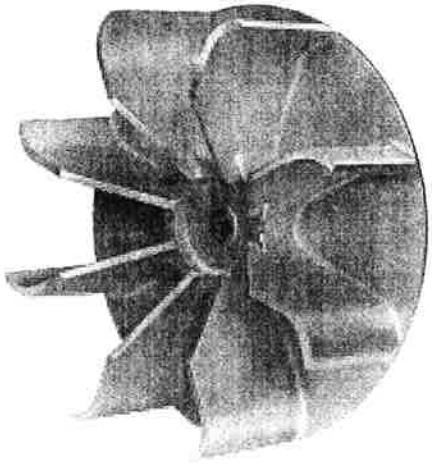
TOLERANCES UNLESS OTHERWISE SPECIFIED ±1 in.	DRAWING NAME: AERATION PROCESS		
	DRAWING #: 900-200-00003		
DRAWN: MS DATE: 1/11/93	CUSTOMER:		
REV: A 3/9/94	SCALE:	SIZE: A	SHEET : OF:

Model: AF-15-B15247-8



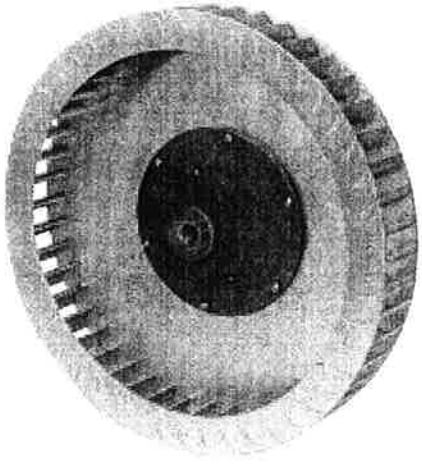
Radial Wheel (Code R)

Cast aluminum radial open design for air and light material applications. Also available in welded steel construction.



Backward Curve Wheel (Code B)

Cast aluminum backward curve blade tip design for clean air applications where lower noise level is a consideration.



Forward Curve Wheel (Code F)

Fabricated aluminum forward curve with cast iron hub design for clean air applications. Has highest performance at a given speed making it ideal for 50 Hz applications where space is a problem.

AF-12-R13446-7

- Fan Size
- Wheel Type
  - ***R*** = Radial
  - ***B*** = Backward Curve
  - ***F*** = Forward Curve
- Wheel Size Code
- Inlet Diameter

All fan/wheel/inlet combinations shown in this catalog have each been thoroughly air and sound performance tested at the American Fan Company Test Laboratory.

Air testing was performed per AMCA 210-85 figure 7, installation type B (free inlet, ducted outlet). Sound testing was performed per AMCA 300-85, installation type B. Fans in this catalog **are not** licensed to bear the AMCA certified ratings seal.

BHP Range	60 Hz RPM	50 Hz RPM
up to 2.00	3450	2875
2.01-5.00	3500	2875
5.01 & higher	3515	2900

Model AF features a rugged, lightweight and rustproof cast aluminum housing making it ideal for demanding industrial applications. Model AF is available in direct or belt drive with a variety of accessories to meet your requirements.

Capacity selections are available up to 4000 CFM and pressure selections up to 20" SP w.g.

- Split housing for maintenance ease
- Even O.D. pipe sizes on inlet and outlet
- Non-sparking cast aluminum housing
- Assortment of wheel sizes to pin-point your performance requirement
- Reliability
- Wheel both statically and dynamically balanced
- Rustproof
- Low initial cost
- Available in arrangements 1,2,4,8 and 9

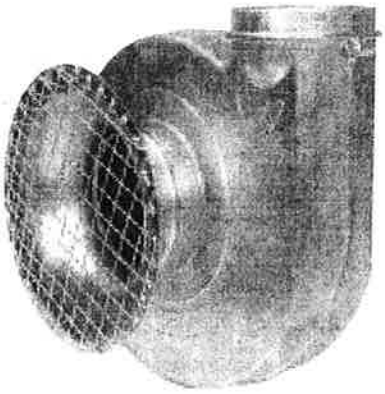
Rubber processing
Food processing
Chemical processing
Fume control
Dust control
Combustion air for incinerators, ovens, furnaces, kilns and dryers
Paper and printing machinery

Cooling electronic equipment, motors, generators and transformers
Textile machinery
Light materials conveying
Woodworking machinery
Forced drying

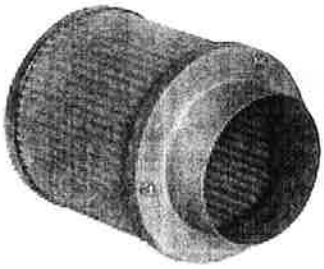
Inlet flange
Outlet flange
Housing drain
Cast Iron housing
Fabricated steel wheel
Shaft seal
Sound attenuator
Inlet filter

Corrosive resistant coatings
Inlet and/or outlet guard
Fabricated stainless wheel and housing
Full or half cut-off
Heat slinger
Drive guard system

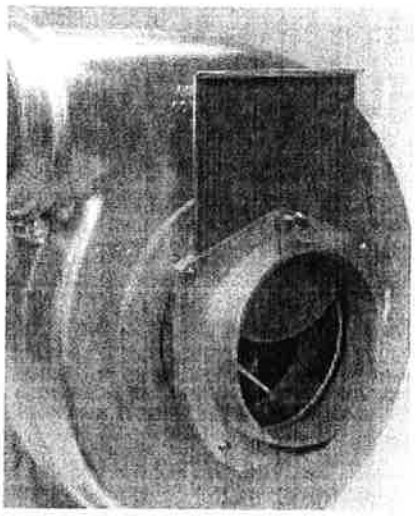
Spun steel venturi provides efficient smooth airflow into fan inlet on non inlet-ducted applications.



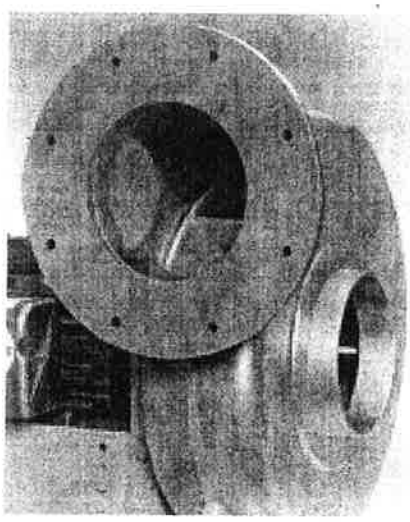
1" square wire cloth is welded to large end of inlet venturi providing OSHA type guarding with minimal airflow restriction.



Oil wetted, crimped steel wire mesh media provides 94% filtration efficiency of particulate of 10 micron or larger. Filters are cleanable and reusable.

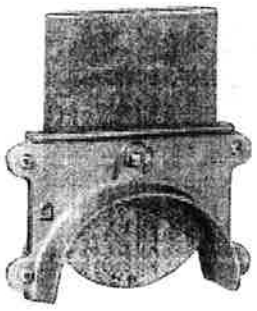


Cast aluminum flange matches ANSI flange bolt patterns. Available with either ANSI mounting hole diameters or 7/16" diameter (standard).



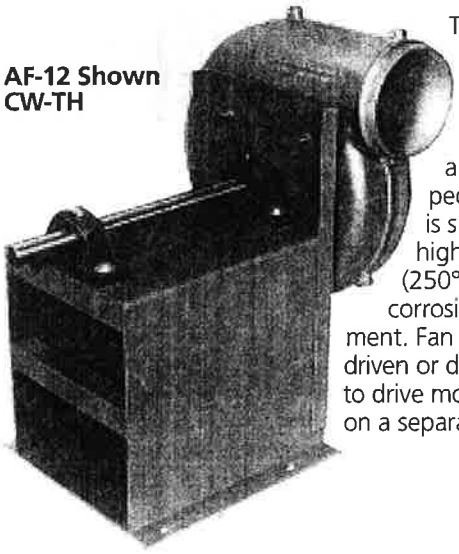
Cast aluminum housing with steel gate allows manual adjustment of CFM. Thumbscrew locks gate in place. Can be mounted on inlet or outlet.

Neoprene isolators with molded-in steel mounting plate and threaded top mounting hole. Provides ¼" static deflection.



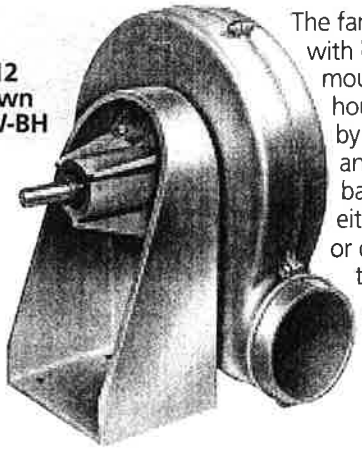
Similar to full cut-offs except half cut-offs are saddle mounted to ductwork on inlet or outlet.

AF-12 Shown CW-TH



The fan wheel is overhung with both bearings mounted on a common pedestal. ARRT. 1 is suitable for high temperature (250°F max.) and/or corrosive environment. Fan can be belt driven or directly coupled to drive motor mounted on a separate base.

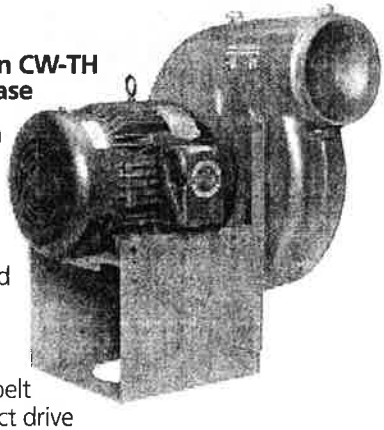
AF-12 Shown CCW-BH



The fan wheel is overhung with both bearings mounted in a cast iron housing supported by the fan housing and a cast aluminum base. Unit can be either belt driven or direct coupled to an independently supported motor.

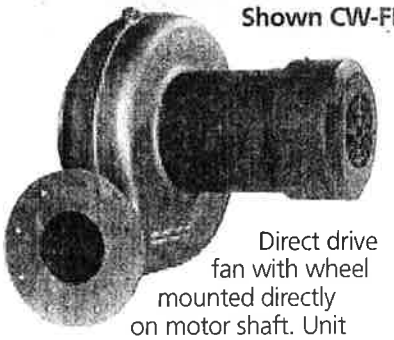
AF-9 Shown CW-TH with cast alum. base

AF-15 Shown CW-TH with steel base



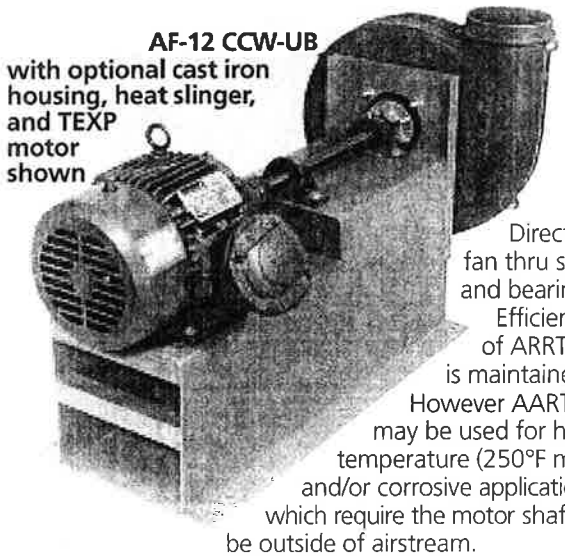
Direct drive fan with wheel mounted directly on motor shaft. Unit is designed for standard temperature applications only. With no belt losses, the direct drive fan operates at a higher efficiency.

FLANGE MOUNT AF-9 Shown CW-FM



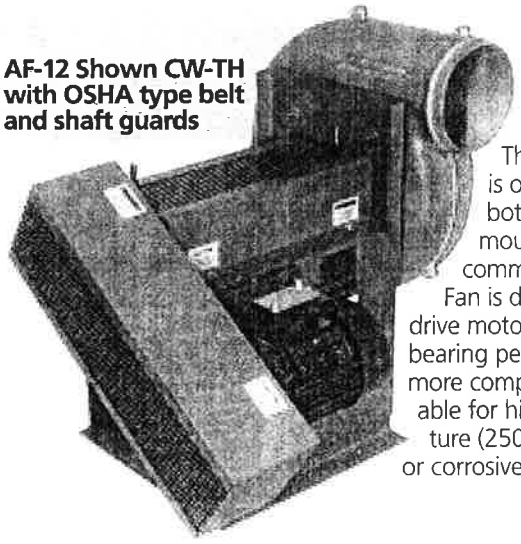
Direct drive fan with wheel mounted directly on motor shaft. Unit is designed to be supported by the outlet flange.

AF-12 CCW-UB with optional cast iron housing, heat slinger, and TEXP motor shown



Direct drive fan thru shaft and bearings. Efficiency of ARRT. 4 is maintained. However AART. 8 may be used for high temperature (250°F max.) and/or corrosive applications which require the motor shaft to be outside of airstream.

AF-12 Shown CW-TH with OSHA type belt and shaft guards



The fan wheel is overhung with both bearings mounted on a common pedestal. Fan is driven with drive motor mounted on bearing pedestal for a more compact unit suitable for high temperature (250°F max.) and/or corrosive environment.

1426	5.464	15-R16422-7	92	38	76	7	8
1487	5.698	15-R16422-10	93	40	78	10	8
1545	5.917	15-R16422-8	96	39	77	8	8
1771	6.603	15-R15550-7	92	35	72	7	8
1779	6.524	15-R15550-8	95	36	75	8	8
1873	6.883	15-R15550-10	96	37	75	10	8
2035	8.445	15-R16550-7	94	41	65	7	8
2173	8.927	15-R16550-8	94	42	66	8	8
2360	9.419	15-R16550-10	96	43	66	10	8
541	1.905	12-R14032-7	92	25	99	7	6
984	3.556	15-R15234-7	93	32	82	7	8
1040	3.777	15-R15234-8	92	33	84	8	8
1089	4.003	15-R15234-10	93	34	89	10	8
1178	4.602	15-R16422-7	92	38	81	7	8
1225	4.842	15-R16422-10	94	40	84	10	8
1233	4.909	15-R16422-8	95	39	83	8	8
1473	5.608	15-R15550-7	91	35	77	7	8
1586	5.859	15-R15550-8	95	36	81	8	8
1678	6.255	15-R15550-10	96	37	81	10	8
1934	8.093	15-R16550-7	93	41	70	7	8
2060	8.503	15-R16550-8	93	42	71	8	8
2229	9.009	15-R16550-10	94	43	71	10	8
676	2.814	15-R15234-8	90	33	90	8	8
687	2.750	15-R15234-7	91	32	87	7	8
731	3.169	15-R15234-10	90	34	96	10	8
817	3.581	15-R16422-7	91	38	87	7	8
836	3.773	15-R16422-8	94	39	89	8	8
885	3.770	15-R16422-10	91	40	90	10	8
1257	5.608	15-R15550-7	91	35	83	7	8
1364	5.136	15-R15550-8	96	36	87	8	8
1457	5.547	15-R15550-10	97	37	86	10	8
1808	7.605	15-R16550-7	93	41	75	7	8
1936	8.050	15-R16550-8	92	42	76	8	8
2074	8.547	15-R16550-10	93	43	76	10	8
319	2.035	15-R15234-8	88	33	96	8	8
421	2.106	15-R15234-7	88	32	93	7	8
462	2.500	15-R16422-7	89	38	93	7	8
523	2.791	15-R16422-8	90	39	95	8	8
526	3.114	15-R16422-10	89	40	96	10	8
1029	4.273	15-R15550-7	90	35	88	7	8
1122	4.352	15-R15550-8	94	36	92	8	8
1187	4.667	15-R15550-10	97	37	92	10	8
1666	7.077	15-R165550-7	93	41	80	7	8
1796	7.549	15-R165550-8	92	42	81	8	8
1909	8.005	15-R165550-10	93	43	81	10	8
148	1.658	15-R15234-7	87	32	99	7	8
154	1.737	15-R16422-7	88	38	99	7	8
807	3.613	15-R15550-10	95	37	98	10	8
1504	6.526	15-R16550-7	91	41	85	7	8
1612	6.957	15-R16550-8	92	42	86	8	8
1719	7.338	15-R16550-10	92	43	86	10	8
1307	5.868	15-R16550-7	96	41	90	7	8
1396	6.232	15-R16550-8	96	42	91	8	8
1497	6.566	15-R16550-10	92	43	91	10	8
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1132	5.266	15-R16550-8	100	42	96	8	8
1219	5.601	15-R16550-10	92	43	96	10	8

184	.174	8-B07025-3	85	72	30	3	4
219	.226	8-B08125-3	86	74	22	3	4
225	.170	8-B07025-4	84	73	33	4	4
289	.285	8-B08125-4	84	75	24	4	4
161	.167	8-B07025-3	85	72	45	3	4
198	.163	8-B07025-4	84	73	49	4	4
202	.221	8-B08125-3	86	74	33	3	4
264	.273	8-B08125-4	84	75	36	4	4
368	.311	9-B08725-4	85	76	28	4	4
383	.319	9-B08725-5	85	77	29	5	4
449	.487	9-B10127-4	86	78	22	4	4
494	.517	9-B10127-5	86	79	23	5	4
571	.836	10-B10127-6	87	80	24	6	5
687	1.151	10-B10727-6	89	81	20	6	5
130	.158	8-B07025-3	84	72	60	3	4
161	.150	8-B07025-4	84	73	65	4	4
187	.216	8-B08125-3	86	74	44	3	4
238	.258	8-B08125-4	84	75	48	4	4
344	.299	9-B08725-4	85	76	37	4	4
358	.305	9-B08725-5	85	77	39	5	4
425	.468	9-B10127-4	86	78	29	4	4
469	.500	9-B10127-5	86	79	31	5	4
542	.809	10-B10127-6	86	80	32	6	5
659	1.116	10-B10727-6	88	81	27	6	5
97	.145	8-B07025-3	85	72	75	3	4
112	.134	8-B07025-4	84	73	81	4	4
163	.207	8-B08125-3	86	74	55	3	4
209	.242	8-B08125-4	84	75	61	4	4
319	.285	9-B08725-4	85	76	46	4	4
333	.290	9-B08725-5	85	77	49	5	4
400	.447	9-B10127-4	86	78	36	4	4
444	.484	9-B10127-5	86	79	39	5	4
514	.799	10-B10127-6	86	80	41	6	5
632	1.092	10-B10727-6	88	81	34	6	5
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36	.114	8-B07025-4	84	73	98	4	4
46	.120	8-B07025-3	85	72	90	3	4
133	.194	8-B08125-3	85	74	66	3	4
171	.220	8-B08125-4	84	75	73	4	4
293	.269	9-B08725-4	85	76	56	4	4
306	.273	9-B08725-5	85	77	59	5	4
373	.425	9-B10127-4	86	78	44	4	4
417	.466	9-B10127-5	86	79	46	5	4
484	.782	10-B10127-6	86	80	49	6	5
605	1.067	10-B10727-6	88	81	41	6	5
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1262	2.962	12-B14132-7	94	83	23	7	6
99	.180	8-B08125-3	85	74	77	3	4
120	.193	8-B08125-4	84	75	85	4	4
266	.251	9-B08725-4	85	76	65	4	4
277	.256	9-B08725-5	85	77	68	5	4
345	.401	9-B10127-4	86	78	51	4	4
382	.440	9-B10127-5	86	79	54	5	4
449	.754	10-B10127-6	86	80	57	6	5
576	1.038	10-B10727-6	87	81	47	6	5
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1231	2.901	12-B14132-7	94	83	27	7	6
42	.160	8-B08125-4	83	75	97	4	4
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232	.229	9-B08725-4	85	76	74	4	4
238	.233	9-B08725-5	85	77	78	5	4
318	.379	9-B10127-4	86	78	58	4	4
351	.411	9-B10127-5	86	79	62	5	4
402	.698	10-B10127-6	86	80	65	6	5
545	1.004	10-B10727-6	87	81	54	6	5
979	2.027	12-B13031-7	90	82	38	7	6
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164	.189	9-B08725-4	85	76	84	4	4
174	.193	9-B08725-5	85	77	88	5	4
292	.356	9-B10127-4	86	78	65	4	4
326	.380	9-B10127-5	86	79	70	5	4
362	.643	10-B10127-6	83	80	73	6	5
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89	.150	9-B08725-4	85	76	93	4	4
254	.322	9-B10127-4	86	78	73	4	4
294	.348	9-B10127-5	86	79	77	5	4
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271	.530	10-B10127-6	83	80	89	6	5
437	.872	10-B10727-6	84	81	74	6	5

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168	.274	9-B10127-4	86	79	93	4	4
172	.435	10-B10127-6	83	80	97	6	5
403	.836	10-B10727-6	84	81	81	6	5
847	1.817	12-B13031-7	88	82	57	7	6
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63	.204	9-B10127-4	86	78	95	4	4
352	.747	10-B10727-6	84	81	88	6	5
817	1.769	12-B13031-7	88	82	61	7	6
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1394	3.023	15-B14132-10	86	86	53	10	8
270	.633	10-B10727-6	84	81	95	6	5
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1015	2.539	12-B14132-7	90	83	54	7	6
1308	2.850	15-B14132-7	87	84	51	7	8
1320	2.915	15-B14132-10	86	86	57	10	8
1338	2.900	15-B14132-8	86	85	53	8	8
757	1.670	12-B13031-7	88	82	71	7	6
983	2.479	12-B14132-7	90	83	58	7	6
1247	2.812	15-B14132-10	85	86	61	10	8
1253	2.763	15-B14132-7	87	84	54	7	8
1272	2.790	15-B14132-8	85	85	57	8	8
1831	4.992	15-B15247-10	91	89	52	10	8
720	1.612	12-B13031-7	88	82	76	7	6
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1204	2.683	15-B14132-8	85	85	61	8	8
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2244	7.781	15-B16550-10	94	95	51	10	8
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810	2.109	12-B14132-7	89	83	78	7	6
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1493	4.224	15-B15247-10	89	89	69	10	8
1896	6.861	15-B16550-7	95	93	51	7	8
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1341	5.189	15-B16550-10	90	95	86	10	8
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801	3.631	15-B16550-10	89	95	97	10	8
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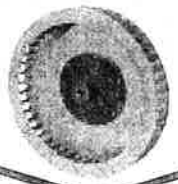

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894	2.203	9-F10020-5	86	50	23	5	4
315	.382	8-F07620-3	82	47	50	3	4
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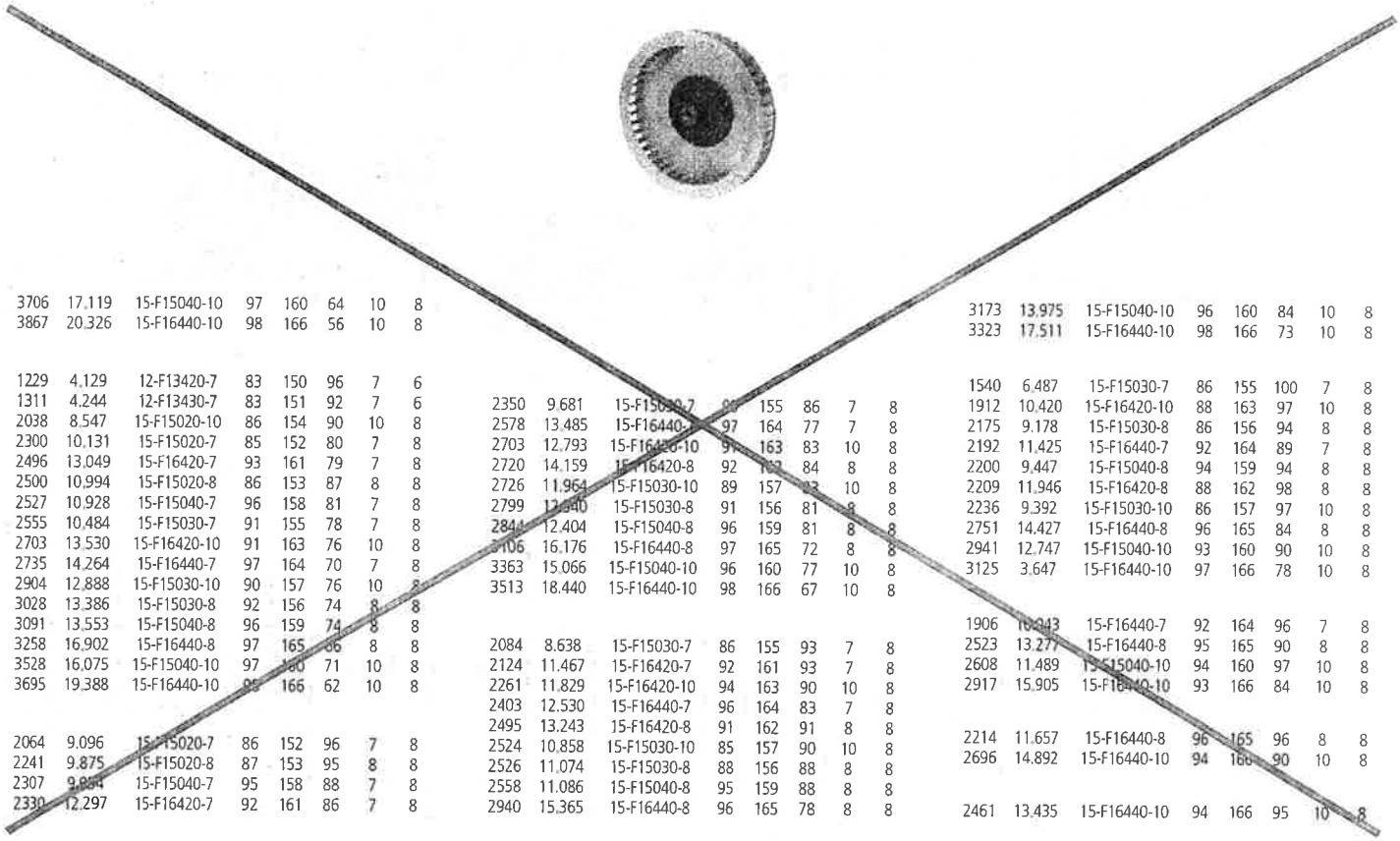

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3867	20.326	15-F16440-10	98	166	56	10	8
1229	4.129	12-F13420-7	83	150	96	7	6
1311	4.244	12-F13430-7	83	151	92	7	6
2038	8.547	15-F15020-10	86	154	90	10	8
2300	10.131	15-F15020-7	85	152	80	7	8
2496	13.049	15-F16420-7	93	161	79	7	8
2500	10.994	15-F15020-8	86	153	87	8	8
2527	10.928	15-F15040-7	96	158	81	7	8
2555	10.484	15-F15030-7	91	155	78	7	8
2703	13.530	15-F16420-10	91	163	76	10	8
2735	14.264	15-F16440-7	97	164	70	7	8
2904	12.888	15-F15030-10	90	157	76	10	8
3028	13.386	15-F15030-8	92	156	74	8	8
3091	13.553	15-F15040-8	96	159	74	8	8
3258	16.902	15-F16440-8	97	165	86	8	8
3528	16.075	15-F15040-10	97	160	71	10	8
3695	19.388	15-F16440-10	98	166	62	10	8
2064	9.096	15-F15020-7	86	152	96	7	8
2241	9.875	15-F15020-8	87	153	95	8	8
2307	9.884	15-F15040-7	95	158	88	7	8
2330	12.297	15-F16420-7	92	161	86	7	8
2350	9.681	15-F15030-7	89	155	86	7	8
2578	13.485	15-F16440-7	97	164	77	7	8
2703	12.793	15-F16420-10	91	163	83	10	8
2720	14.159	15-F16420-8	92	162	84	8	8
2726	11.964	15-F15030-10	89	157	83	10	8
2799	13.940	15-F15030-8	91	156	81	8	8
2844	12.404	15-F15040-8	96	159	81	8	8
3106	16.176	15-F16440-8	97	165	72	8	8
3363	15.066	15-F15040-10	96	160	77	10	8
3513	18.440	15-F16440-10	98	166	67	10	8
2084	8.638	15-F15030-7	86	155	93	7	8
2124	11.467	15-F16420-7	92	161	93	7	8
2261	11.829	15-F16420-10	94	163	90	10	8
2403	12.530	15-F16440-7	96	164	83	7	8
2495	13.243	15-F16420-8	91	162	91	8	8
2524	10.858	15-F15030-10	85	157	90	10	8
2526	11.074	15-F15030-8	88	156	88	8	8
2558	11.086	15-F15040-8	95	159	88	8	8
2940	15.365	15-F16440-8	96	165	78	8	8
3173	13.975	15-F15040-10	96	160	84	10	8
3323	17.511	15-F16440-10	98	166	73	10	8
1540	6.487	15-F15030-7	86	155	100	7	8
1912	10.420	15-F16420-10	88	163	97	10	8
2175	9.178	15-F15030-8	86	156	94	8	8
2192	11.425	15-F16440-7	92	164	89	7	8
2200	9.447	15-F15040-8	94	159	94	8	8
2209	11.946	15-F16420-8	88	162	98	8	8
2236	9.392	15-F15030-10	86	157	97	10	8
2751	14.427	15-F16440-8	96	165	84	8	8
2941	12.747	15-F15040-10	93	160	90	10	8
3125	3.647	15-F16440-10	97	166	78	10	8
1906	10.043	15-F16440-7	92	164	96	7	8
2523	13.277	15-F16440-8	95	165	90	8	8
2608	11.489	15-F15040-10	94	160	97	10	8
2917	15.905	15-F16440-10	93	166	84	10	8
2214	11.657	15-F16440-8	96	165	96	8	8
2696	14.892	15-F16440-10	94	166	90	10	8
2461	13.435	15-F16440-10	94	166	95	10	8

TYPE A

All parts of the fan in contact with the air or gas being handled shall be made of non-ferrous material.

TYPE B

Fan shall have entirely non-ferrous wheel and a non-ferrous ring about the opening through which the shaft passes.

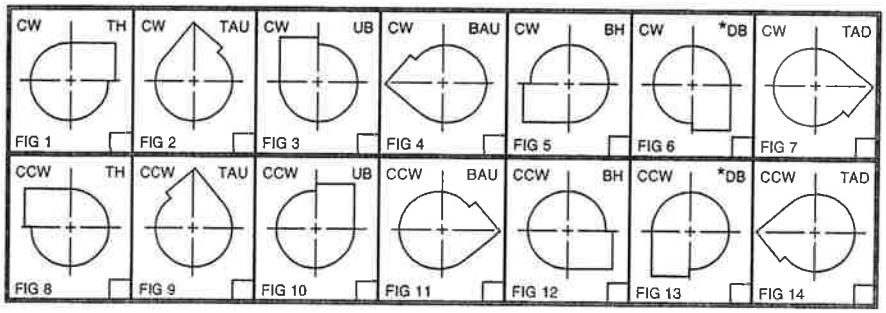
TYPE C

Fan shall be so constructed that a shift of the wheel or shaft will not permit two ferrous parts of the fan to rub or strike.

Model AF meets the requirements of Type A Spark Resistant Construction
(with the exception of the shaft) since they have aluminum wheels and housings.

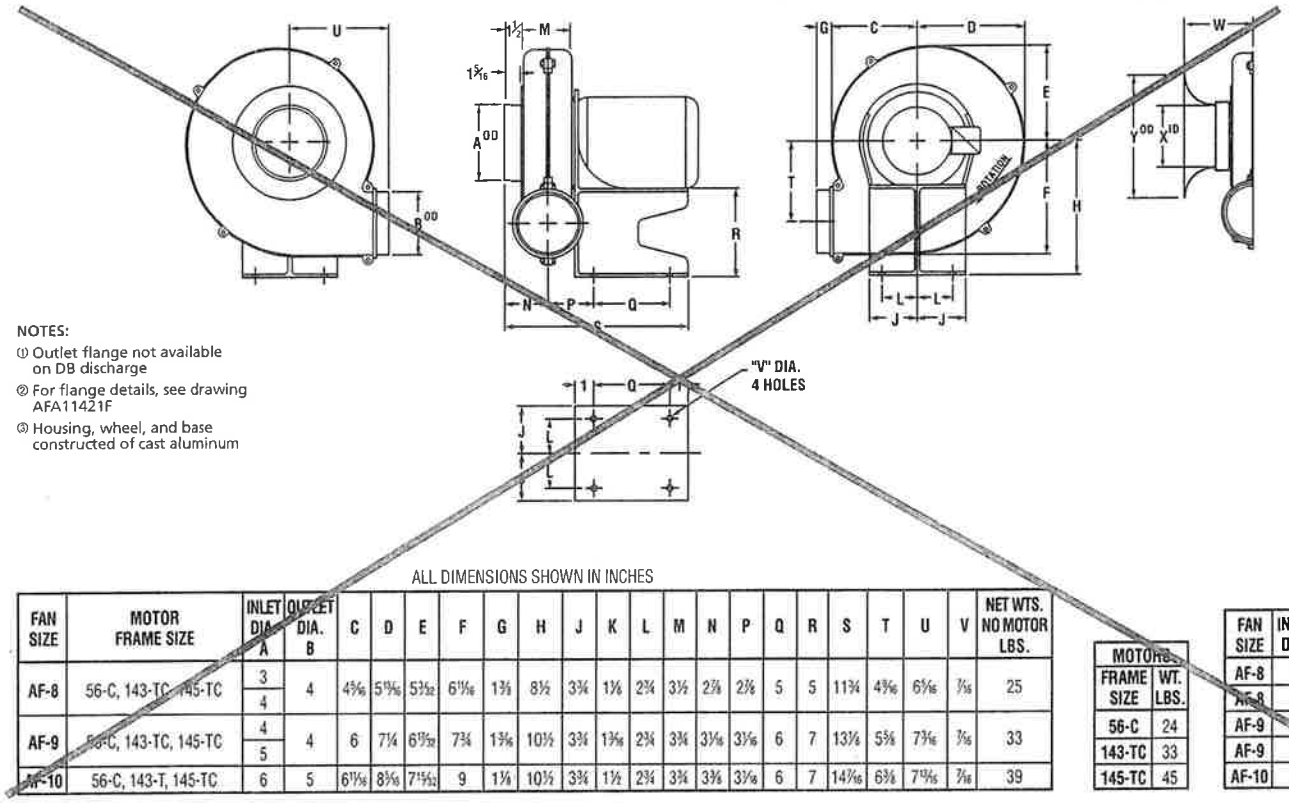
All AF arrangements with cast aluminum radial or backward curve wheels can be operated with airstream temperatures up to 200°F. Blowers with aluminum forward curve wheels can be operated with airstream temperatures up to 150°F. Higher temperature construction up to 700°F is available with welded steel construction (radial wheels only) and welded steel housings in arrangements 1, 8, and 9.

Volume — cubic meters/sec. x 2119 = cubic feet/min. (CFM)
Pressure — Pascals (N/m²) x 0.004 = inches water
Power — kilowatts (Kw) x 1.341 = horsepower
Length — centimeters (cm) x 0.3937 = inches
Temperature — (°C x 1.8) + 32 = °F



NOTE:
Rotation is viewed from driven side.

NOTE:
Downblast discharge not available with outlet flange.



NOTES:

① Outlet flange not available on DB discharge

② For flange details, see drawing AFA11421F

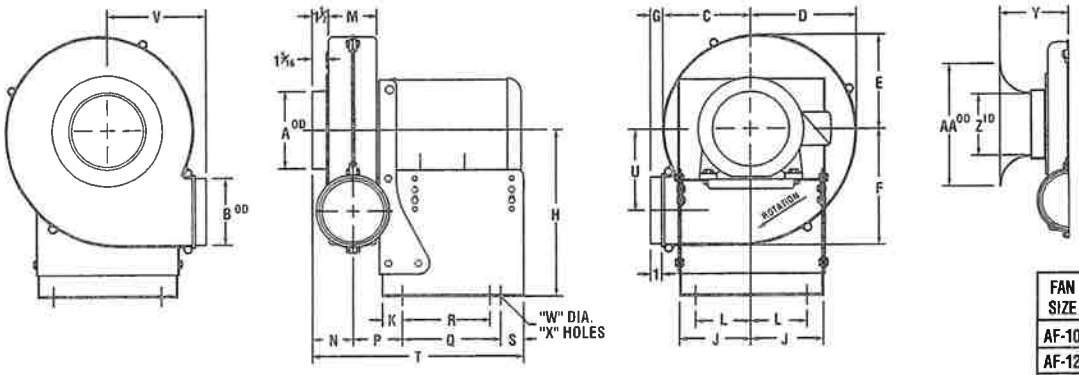
③ Housing, wheel, and base constructed of cast aluminum

ALL DIMENSIONS SHOWN IN INCHES

FAN SIZE	MOTOR FRAME SIZE	INLET DIA. A	OUTLET DIA. B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	NET WTS. NO MOTOR LBS.
AF-8	56-C, 143-TC, 145-TC	3	4	4 5/16	5 13/16	5 21/32	6 11/16	1 3/8	8 1/2	3 3/4	1 1/8	2 3/4	3 1/2	2 3/8	2 3/8	5	5	11 3/4	4 3/16	6 5/16	7/16	25
		4																				
AF-9	56-C, 143-TC, 145-TC	4	4	6	7 1/4	6 13/32	7 3/4	1 3/8	10 1/2	3 3/4	1 3/16	2 3/4	3 3/4	3 1/16	3 1/16	6	7	13 1/4	5 5/8	7 3/16	7/16	33
		5																				
AF-10	56-C, 143-T, 145-TC	6	5	6 11/16	8 3/16	7 15/32	9	1 3/8	10 1/2	3 3/4	1 1/2	2 3/4	3 3/4	3 3/8	3 7/8	6	7	14 7/16	6 3/8	7 13/16	7/8	39

MOTORS	
FRAME SIZE	WT. LBS.
56-C	24
143-TC	33
145-TC	45

FAN SIZE	INLET DIA.	INLET BELL		
		W	X	Y
AF-8	3	4 1/4	2 5/8	5 1/8
AF-8	4	4 3/4	3 1/8	7 1/4
AF-9	4	4 15/16		
AF-9	5	5 3/16	4 5/8	9 1/4
AF-10	6	6 5/16	5 1/2	11



NOTES:

① AF-15 with 182T/184-T frame motor is not available in DB discharge

② AF-15, Add 7/8" to dimensions "P" & "T" for DB discharge (213T, 215T, 254T, 284TS, 286TS only)

③ AF-15 not available with 56 or 56C frame motors

④ For flange details, see drawing AFA11421F

⑤ Motor base is field adjustable to accept motor frames as shown

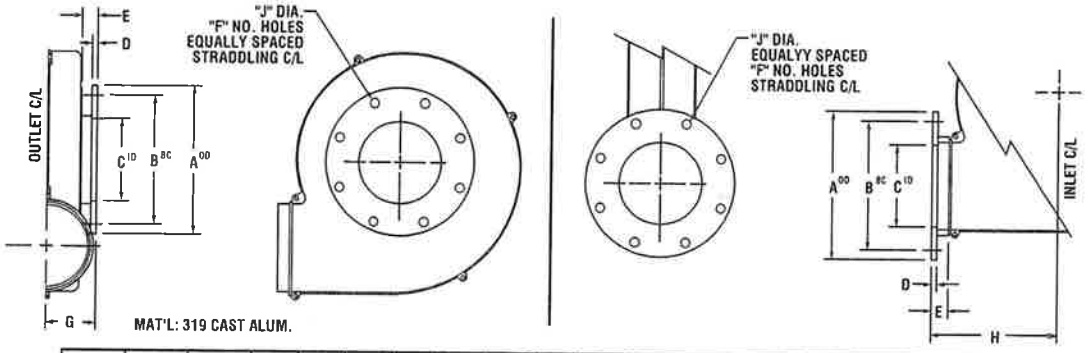
⑥ All sizes "DB" discharge only available less outlet flange

FAN SIZE	INLET DIA.	INLET BELL		
		Y	Z	AA
AF-10	6	6 3/16	5 1/2	11
AF-12	7	6 15/16	6 1/2	13
AF-15	7	7 3/4		
AF-15	8	8 1/4	7 1/2	15
AF-15	10	9 1/4	9 1/2	19

ALL DIMENSIONS SHOWN IN INCHES

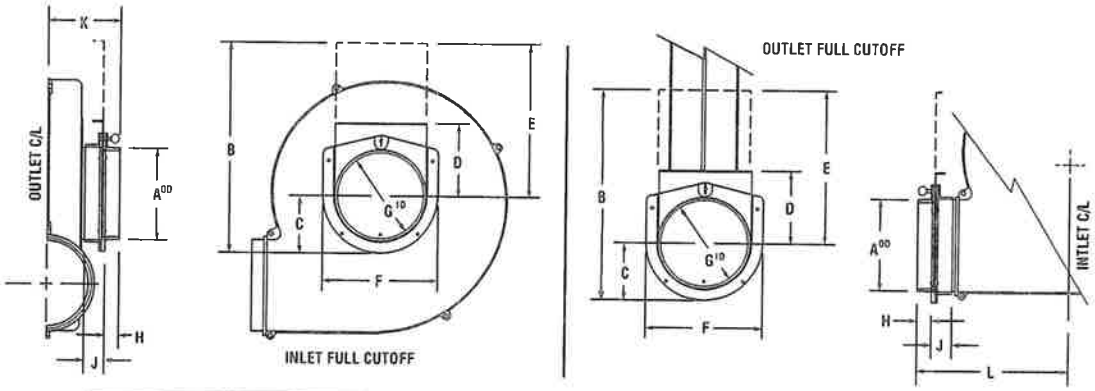
FAN SIZE	MOTOR FRAME SIZE	INLET DIA. A	OUTLET DIA. B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	NET WTS. NO MOTOR LBS.
AF-10	56, 143T, 145T, 56C, 143TC, 145TC, 182T	6	5	6 11/16	8 3/16	7 15/32	9	1 1/8	11 1/2	5	1 1/16	4	3 3/4	3 3/8	3 1/8	8	7	13/16	15 5/16	6 3/8	7 13/16	1/2	6	39
AF-12	56, 143T, 145T, 56C, 143TC, 145TC, 182T, 184T	7	6	7 3/4	9 1/4	8 1/2	10 7/16	1 1/8	11 1/2	5	1 1/16	4	4 1/4	3 5/8	3 3/8	8	7	13/16	15 13/16	7 5/16	8 7/8	1/2	6	46
AF-12	213T, 215T	7	6	7 3/4	9 1/4	8 1/2	10 7/16	1 1/8	11 1/2	6 5/16	1 1/16	4 3/8	4 1/4	3 5/8	4 1/16	8 3/8	–	2 1/16	18 5/8	7 5/16	8 7/8	9/16	4	46
AF-15	143T, 145T, 182T, 184T, 213T, 215T	7	8	9 3/8	11	10	12	1 5/16	15	6 5/16	1 3/4	4 7/8	5 7/8	4 7/16	② 5 1/8	8 3/8	–	2 1/16	② 20 1/2	7 7/8	10 15/16	9/16	4	79
		8																						
		10																						
AF-15	254T, 256T, 284TS, 286TS	7	8	9 3/8	11	10	12	1 5/16	15	7	1 3/4	4 7/8	5 7/8	4 7/16	② 5 1/8	16 1/4	–	2	② 27 13/16	7 7/8	10 15/16	11/16	4	121
		8																						
		10																						

MOTORS	
FRAME SIZE	WT. LBS.
56C	24
143T	32
145T	40
182T	58
184T	70
213T	100
215T	130
254T	240
256T	300
284TS	403
286TS	420



FAN SIZE	INLET	OUTLET	A	B	C	D	E	F	G	H	MATCHES 125/150 lb. ANSI FLANGE BOLT PATTERN		MATCHES 125/150 lb. ANSI FLANGE BOLT PATTERN EXCEPT HOLE DIA. = 7/16 (AFC STANDARD)	
											J	PART NUMBER	J	PART NUMBER
AF-8	3	X	7½	6	2⅜	¼	1¼	4	3⅛	—	¾	24149F	7/16	24149F-7/16
	4	4	9	7½	3⅜	¼	1¼	8	3⅛	6⅜	¾	24101F	7/16	24101F-7/16
AF-9	4	4	9	7½	3⅜	¼	1¼	8	3⅝	7⅜	¾	24101F	7/16	24101F-7/16
	5	X	10	8½	4⅜	¼	1¼	8	3⅝	—	¾	24103F	7/16	24103F-7/16
AF-10	X	5	10	8½	4⅜	¼	1¼	8	—	8⅛	¾	24103F	7/16	24103F-7/16
	6	X	11	9½	5½	5/16	1¼	8	3⅝	—	⅞	24106F	7/16	24106F-7/16
AF-12	X	6	11	9½	5½	5/16	1¼	8	—	9⅜	⅞	24106F	7/16	24106F-7/16
	7*	X	11	9½	6¼	5/16	1¼	8	3 15/16	—	⅞	24129F	7/16	24129F-7/16
AF-15	7*	X	11	9½	6¼	5/16	1¼	8	4¾	—	⅞	24129F	7/16	24129F-7/16
	8	8	13½	11¾	7½	½	1½	8	4 5/16	11 7/16	⅞	24044F	7/16	24044F-7/16
	10	X	16	14¼	9 11/16	½	1½	12	4 5/16	—	1	24130F	7/16	24130F-7/16

*O.D. and B.C. match 6" ANSI flange



INLET	OUTLET	SIZE	PART NO.	A	B	C	D	E	F	G	H	J	K	L
AF-8	—	3"	63649	2 5/16	7⅛	2⅜	3	5⅜	4	2½	1¼	1 7/16	5½	8⅛
AF-8	AF-8	4"	63650	3 5/16	9⅞	2¾	3¾	7⅛	5	3½	1¼	1 7/16	5½	8⅛
AF-9	AF-9												5⅝	8 5/16
AF-9	AF-10	5"	63651	4 5/16	12⅝	3⅝	4⅞	9	6¾	4½	1¼	1 7/16	5⅝	9⅜
AF-10	AF-12	6"	63652	5 5/16	13⅝	3¾	4¾	9⅞	7½	5½	1¼	1 7/16	5⅝	10⅝
AF-12	—	7"	63653	6 5/16	15⅝	4¼	5¼	11⅛	8½	6½	1¼	1 7/16	5⅞	10⅝
AF-15													6 1/16	12 1/16
AF-15	AF-15	8"	63654	7 5/16	18⅜	5	6⅝	13⅜	10	7½	1¼	1 7/16	6 1/16	12 1/16
AF-15	—	10"	63655	9 5/16	22⅝	6	7⅝	16⅝	12	9½	1¾	1 5/16	6 1/16	12 1/16

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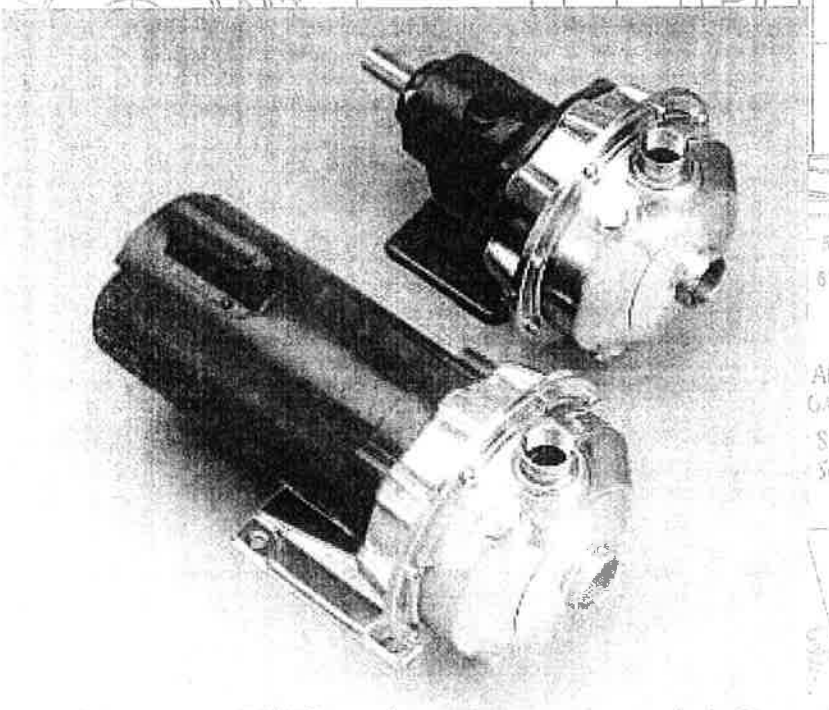
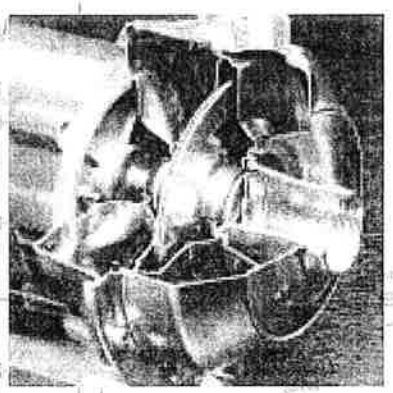
G&L Pumps



NPE
316L SS

NPE Series End Suction Centrifugal Pumps

Bombas Centrífugas de Succión Final Serie NPE



Goulds Pumps

ITT Industries

A Full Range of Product Features
Una Gama Total de Características del Producto

Superior Materials of Construction: Complete AISI 316L stainless steel liquid handling components and mounting bracket for corrosion resistance, quality appearance, and improved strength and ductility.

High Efficiency Impeller: Enclosed impeller with unique floating seal ring design maintains maximum efficiencies over the life of the pump without adjustment.

Casing and Adapter Features: Stainless steel construction with NPT threaded, centerline connections, easily accessible vent, prime and drain connections with stainless steel plugs. Optional seal face vent/flush available.

Mechanical Seal: Standard John Crane Type 21 with carbon versus silicon-carbide faces, Viton elastomers, and 316 stainless metal parts. Optional high temperature and chemical duty seals available.

Motors: NEMA standard open drip-proof, totally enclosed fan cooled or explosion proof enclosures. Rugged ball bearing design for continuous duty under all operating conditions.

Materiales Superiores de Construcción: *Componentes completos para manejo de líquidos en acero inoxidable AISI 316L y consola para el montaje para resistencia a la corrosión, apariencia de calidad, y fuerza y ductilidad mejoradas.*

Impulsor de Eficiencia Superior: *El impulsor encerrado con un diseño único de anillo del sello flotante, mantiene sin ajustes, la eficiencia máxima sobre la vida de la bomba.*

Características de la Carcasa y del Adaptador: *Construcción en acero inoxidable con NPT roscado, conexiones centrales, válvulas de fácil acceso, conexiones de cebado y drenaje con enchufes de acero inoxidable. Cara del sello válvula/chorro opcional disponible.*

Sello Mecánico: *Estándar John Crane Tipo 21 con carbón en contraste con caras de silicón-carbide, elastómeros de Viton, y partes metálicas de acero inoxidable 316. Sellos de alta temperatura y productos químicos están disponibles.*

Motores: *Estándar NEMA a prueba de goteo, ventilador totalmente encerrado o recintos a prueba de explosión. Diseño robusto de balineras de bolas para trabajo continuo en todas las condiciones de funcionamiento.*

Model: 1ST1C5E4

The various versions of the NPE are identified by a product code number on the pump label. This number is also the catalog number for the pump. The meaning of each digit in the product code number is shown at left.

Las diferentes versiones de la NPE se identifican con un número de código del producto en la etiqueta de la bomba. Este número es también el número del catálogo para la bomba. El significado de cada dígito en el número de código del producto se muestra a la izquierda.

NPE Product Line Numbering System
Línea de Producto NPE Sistema de Numeración

Example Product Code,
Ejemplo Código del Producto

1 ST 2 C 1 A 4 F

Seal Vent/Flush Option,
Opción de Sello Válvula/ChorroSeal Ven

Mechanical Seal and O-ring
4 = Pre-engineered standard
For optional mechanical seal modify catalog order no. with seal code listed below.

Sello Mecánico y Anillo 'O'
4 = Estándar aprobado
Para sello mecánico opcional modificar el número de orden del catálogo con el código del sello anotado abajo.

John Crane Type 21 Mechanical Seal (⅝" seal), *Sello Mecánico John Crane Tipo 21 (sello de ⅝")*

Seal Code, *Código del Sello*	Rotary, *Rotativo*	Stationary, *Estacionario*	Elastomers, *Elastómeros*	Metal Parts, *Partes Metálicas*	Part No., *Pieza Número*
[illegible]			[illegible]		[illegible]
4	Carbon	Silicon Carbide	Viton	316 SS	10K55
[illegible]	[illegible]		[illegible]		[illegible]
6	Carbon		Viton		10K62

Impeller Option . . . No Adder Required
For optional impeller diameters modify catalog order no. with impeller code listed. Select optional impeller diameter from pump performance curve.

Código del Impulsor Opcional
Para impulsores con diámetros opcionales modificar el número de orden del catálogo con el código del impulsor anotado. Escoger el impul con diámetro opcional de la curva de funcionamiento de la bomba.

Impeller Code, *Código del Impulsor*	Pump Size, *Tamaño de la Bomba*		
	1 x 1¼ – 6	1¼ x 1½ – 6	1½ x 2 – 6
	Diameter	Diameter	Diameter
K	–	6⅛	–
G	–	5⁹⁄₁₆	5⅛
H	–	5½	5
A	6⅛	5¼	4¾
B	5¾	5⅛	4⅜
C	5⁹⁄₁₆	4⅞	4⅜
[illegible]			
E	4¹⁵⁄₁₆	[illegible]	[illegible]
[illegible]			

Driver, *Conductor*
1 = 1 PH, ODP 7 = 3 PH, XP
2 = 3 PH, ODP 8 = 575 V, XP
3 = 575 V, ODP 9 = 3 PH, TEFC
[illegible]
5 = 3 PH, TEFC [illegible]
[illegible]

HP Rating, *HP Potencia*
C = ½ HP [illegible]
[illegible]

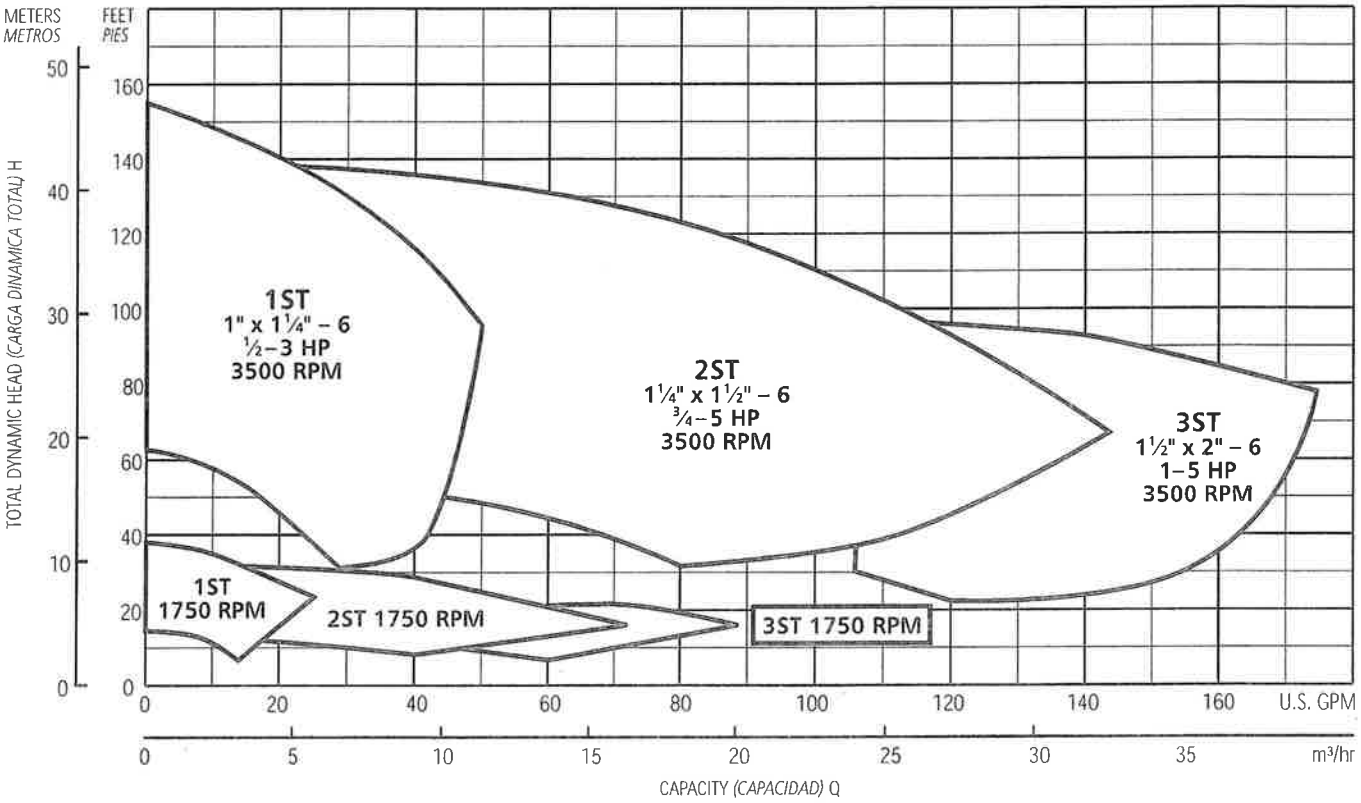
Driver: Hertz/Pole/RPM,
Conductor: Hercios/Polo/RPM
1 = 60 Hz, 2 pole, 3500 RPM
[illegible]
3 = 60 Hz, 6 pole, 1150 RPM
4 = 50 Hz, 2 pole, 2900 RPM
5 = 50 Hz, 4 pole, 1450 RPM

For frame mounted version, substitute the letters "FRM" in these positions.
Para la versión con el armazón montado, sustituya las letras "FRM" en estas posiciones.

Material
ST = Stainless steel, *Acero inoxidable*

Pump Size, *Tamaño de la Bomba*
1 = 1 x 1¼ – 6 [illegible]

Performance Coverage (60 Hz)
Alcance de Funcionamiento (60 Hz)



NOTES:

Not recommended for operation beyond printed H-Q curve.

For critical application conditions consult factory.

Not all combinations of motor, impeller and seal options are available for every pump model. Please check with G&L on non-cataloged numbers.

All standard 3500 RPM ODP and TEFC motors supplied by Goulds, have minimum of 1.15 service factor. Standard catalog units may utilize available service factor. Any motors supplied other than Goulds check available service factor.

NOTAS:

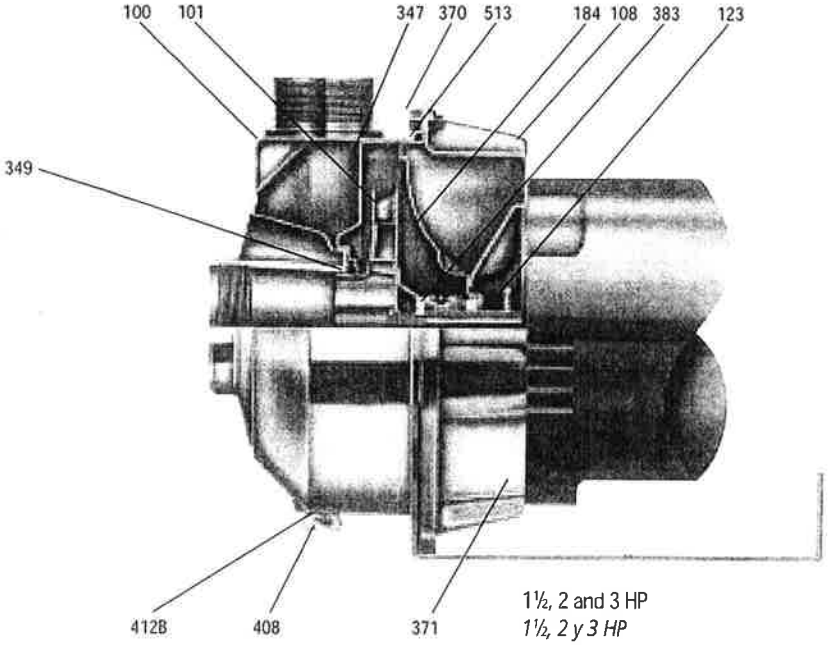
No se recomienda para funcionamiento superior al impreso en la curva H-Q.

Para condiciones de aplicaciones críticas consultar con la fábrica.

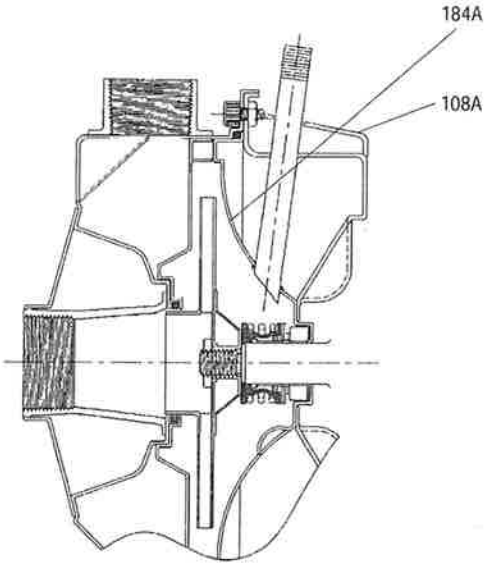
No todas las combinaciones de las opciones de motor, impulsor y sello están disponibles para cada modelo de bombas. Por favor verifique con G&L en los números no catalogados.

Todos los motores estándar de 3500 RPM, ODP (abiertos resguardados) y TEFC (totalmente encerrados con enfriamiento forzado) provistos por Goulds tienen un factor mínimo de servicio de 1,15. Las unidades estándar de catálogo pueden utilizar el factor de servicio disponible. Verificar el factor de servicio disponible de todo motor no provisto por Goulds.

NPE Close Coupled Pump Major Components: Materials of Construction
Bomba Cerrada Acoplada NPE Componentes Principales: Materiales de Construcción

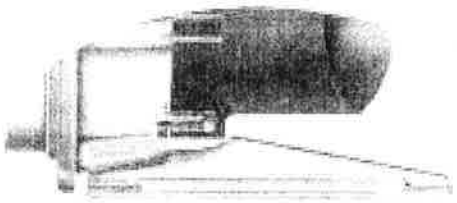


1½, 2 and 3 HP
1½, 2 y 3 HP



Seal Face Vent/Flush Option,
Opción Cara del Sello Válvula/Chorro

Item No., *Parte No.*	Description, *Descripción*	Materials, *Materiales*
100	Casing, *Carcasa*	AISI 316L SS, *AISI 316L Acero inoxidable*
101	Impeller, *Impulsor*	
108	Motor adapter, *Adaptador del motor*	
108A	Motor adapter seal vent/flush, *Sello válvula/chorro del adaptador del motor*	
123	Deflector, *Deflector*	BUNA-N
184	Seal housing, *Alojamiento del sello*	AISI 316L SS, *AISI 316L Acero inoxidable*
184 A	Seal housing seal vent/flush, *Sello válvula/chorro del alojamiento del sello*	
347	Guidevane, *Difusor*	
349	Seal ring, guidevane; *Anillo del sello, difusor*	Viton
370	Socket head screws, casing; *Encajes cabezas de tornillos, carcasa*	AISI 410 SS, *AISI 410 Acero inoxidable*
371	Bolts, motor; *Tornillos, motor*	Plated steel, Acero chapeado
383	Mechanical seal, *Sello mecánico*	**see chart, *ver tabla*
408	Drain and vent plug, casing; *Enchufes de drenaje y válvula, carcasa*	AISI 316L SS, *AISI 316L Acero inoxidable*
412B	O-ring, drain and vent plug; *Anillo 'O', enchufe de drenaje y válvula*	Viton
513	O-ring, casing; *Anillo 'O', carcasa*	
Motor *Motor*	NEMA standard, 56J flange; *NEMA estándar, brida 56J*	

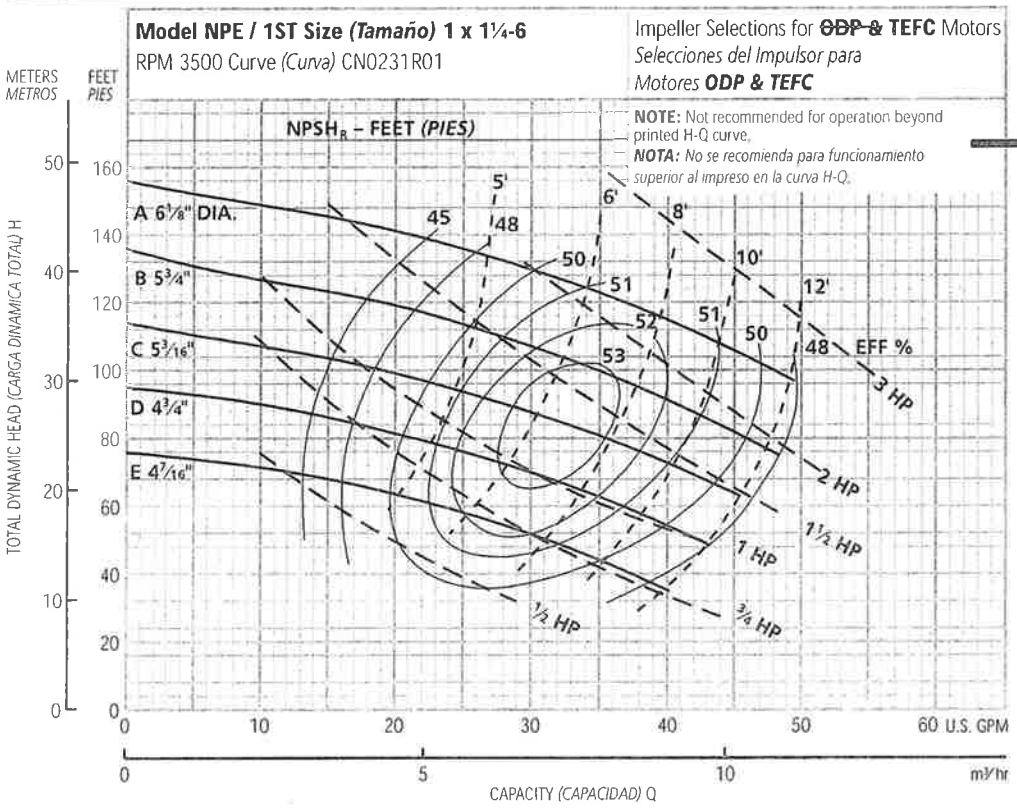


½, ¾ and 1 HP
½, ¾ y 1 HP

Footed motor for 1750 RPM and 5 HP ODP and TEFC, all explosion proof see page 13.

Motor con pie para 1750 RPM, 5 HP ODP y TEFC, a prueba de explosiones en la página 13.

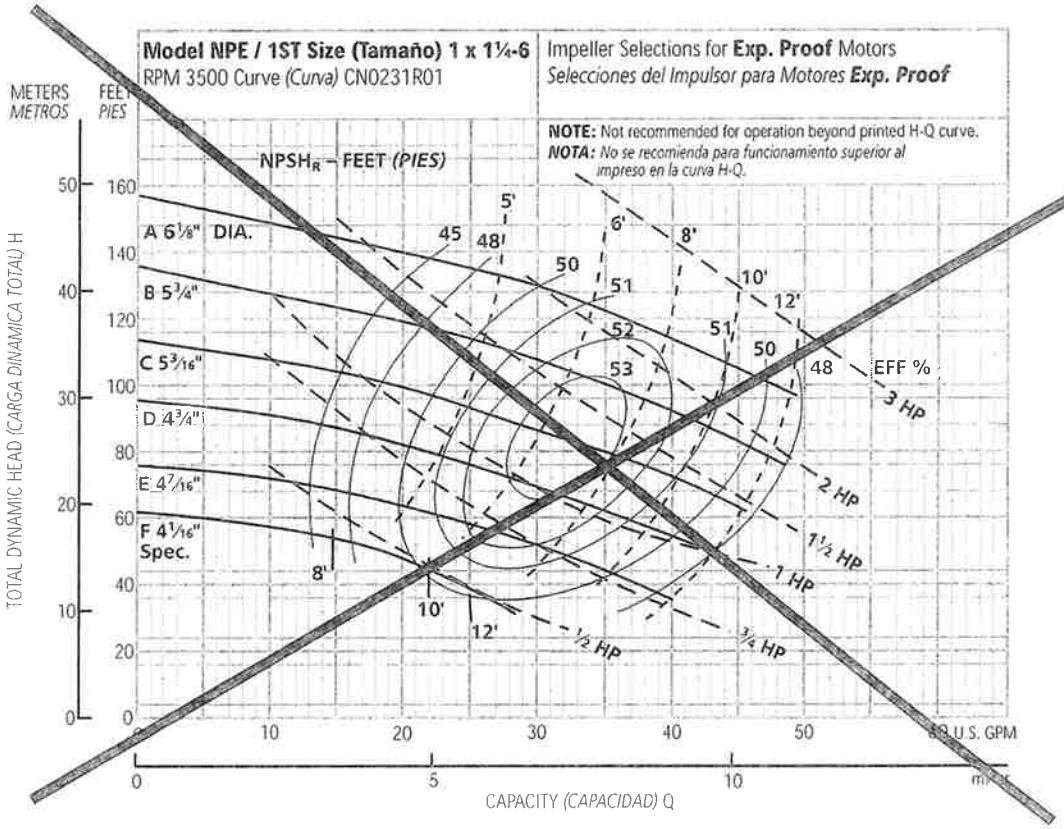
Performance Curves – 60 Hz, 3500 RPM
Curvas de Funcionamiento – 60 Hz, 3500 RPM



Ordering Code, *Código de Pedido*	Standard HP Rating, *Estándar HP Potencia*	Imp. Dia.
E	½	4⁷⁄₁₆"
C	1	5³⁄₁₆
B	1½	5¾
A	2	6⅛

NOTE: Although not recommended, the pump may pass a ⅛" sphere.

NOTA: *Si bien no se recomienda, la bomba puede pasar una esfera de ⅛".*



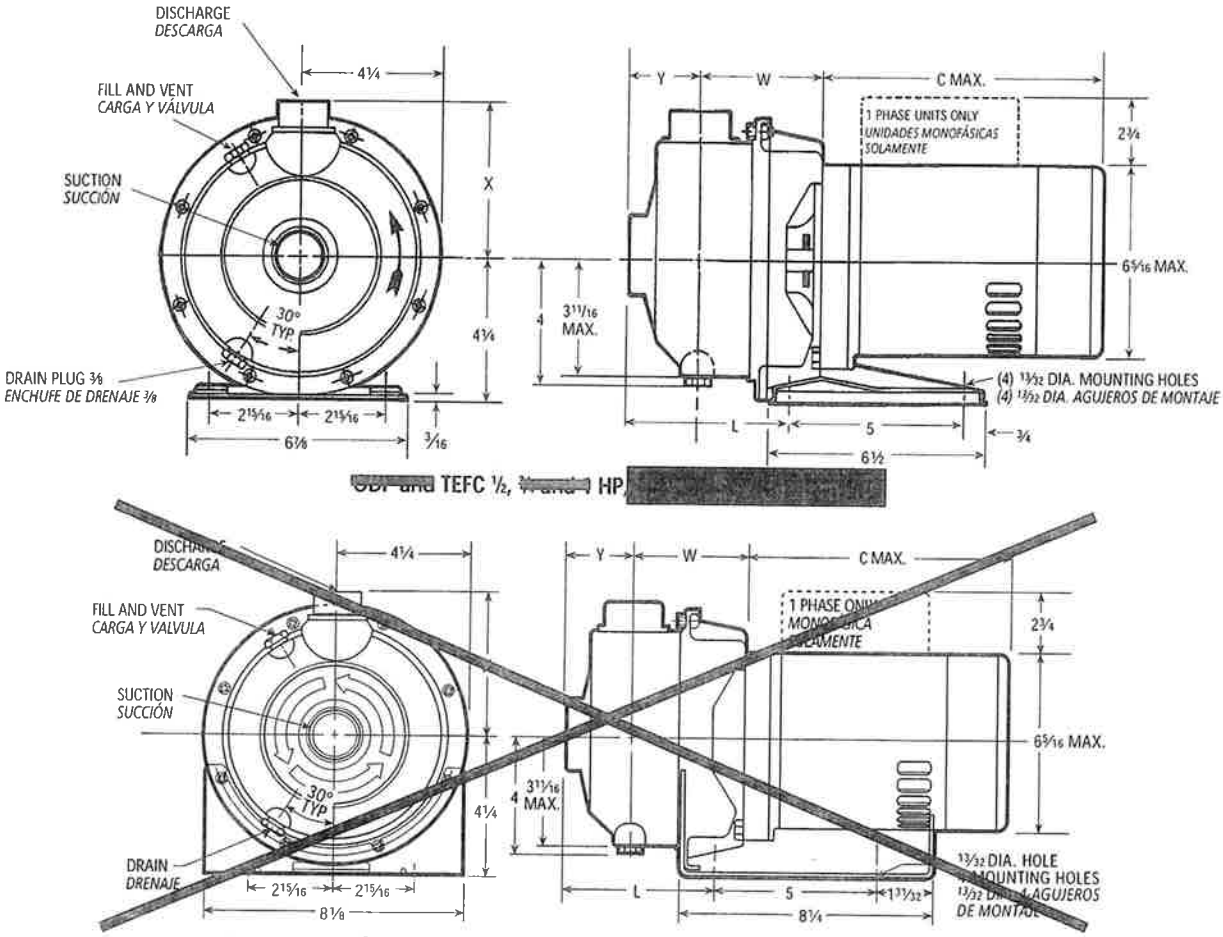
Ordering Code, *Código de Pedido*	Standard HP Rating, *Estándar HP Potencia*	Imp. Dia.
F	½	4¹⁄₁₆" spec.
E	¾	4⁷⁄₁₆
D	1	4¾
C	1½	5³⁄₁₆
B	2	5¾
A	3	6⅛

NOTE: Although not recommended, the pump may pass a ⅛" sphere.

NOTA: *Si bien no se recomienda, la bomba puede pasar una esfera de ⅛".*

NPE Close Coupled – Dimensions, Weights and Specifications
NPE Acople Cerrado – Dimensiones, Pesos y Especificaciones

Clockwise Rotation Viewed from Drive End
Rotación en Dirección de las Agujas del Reloj Visto desde el Extremo del Motor



ODP and TEFC 1½, 2 and 3 HP, *ODP y TEFC 1½, 2 y 3 HP*

Specifications
Especificaciones

Capacities to:
75 GPM (283L/min) at 1750 RPM
150 GPM (550L/min) at 3500 RPM

Heads to:
39 feet (12 m) at 1750 RPM
150 feet (46 m) at 3500 RPM

Working pressures to:
125 PSIG (9 bars)

Maximum temperatures to:
212°F (100°C) with standard seal or 250°F (121°C) with optional high temperature seal.

Direction of rotation:
Clockwise when viewed from motor end.

Motor specifications:
NEMA 56J frame, 1750 RPM, ½ HP. 3500 RPM ½ through 5 HP. Open drip-proof, totally enclosed fan-cooled or 2 HP explosion proof enclosures. Stainless steel shaft with ball bearings.

Single phase: Voltage 115/230 ODP and TEFC. (3 HP model – 230 V only) Built-in overload with auto-reset provided.

Three phase: Voltage 208-230/460 ODP, TEFC and EX PROOF.

NOTE: For three phase motors, overload protection must be provided in starter unit. Starter and heaters must be ordered separately.

Capacidades:
75 GPM (283L/min) a 1750 RPM
150 GPM (550L/min) a 3500 RPM

Cargas:
39 pies (12 m) a 1750 RPM
150 pies (46 m) a 3500 RPM

Presión de trabajo:
125 PSIG (9 baras)

Temperatura máxima:
212°F (100°C) con sello estándar o 250°F (121°C) con sello opcional para alta temperatura.

Dirección de rotación:
En dirección de las agujas del reloj visto desde el extremo final del motor.

Motores:
Armazón 56J NEMA, 1750 RPM ½ HP. 3500 RPM ½ a 5 HP. Cubiertas abiertas resguardadas, totalmente encerradas enfriadas por ventilador o a prueba de explosiones de 2 HP. Eje de acero inoxidable con balineras de bolas.

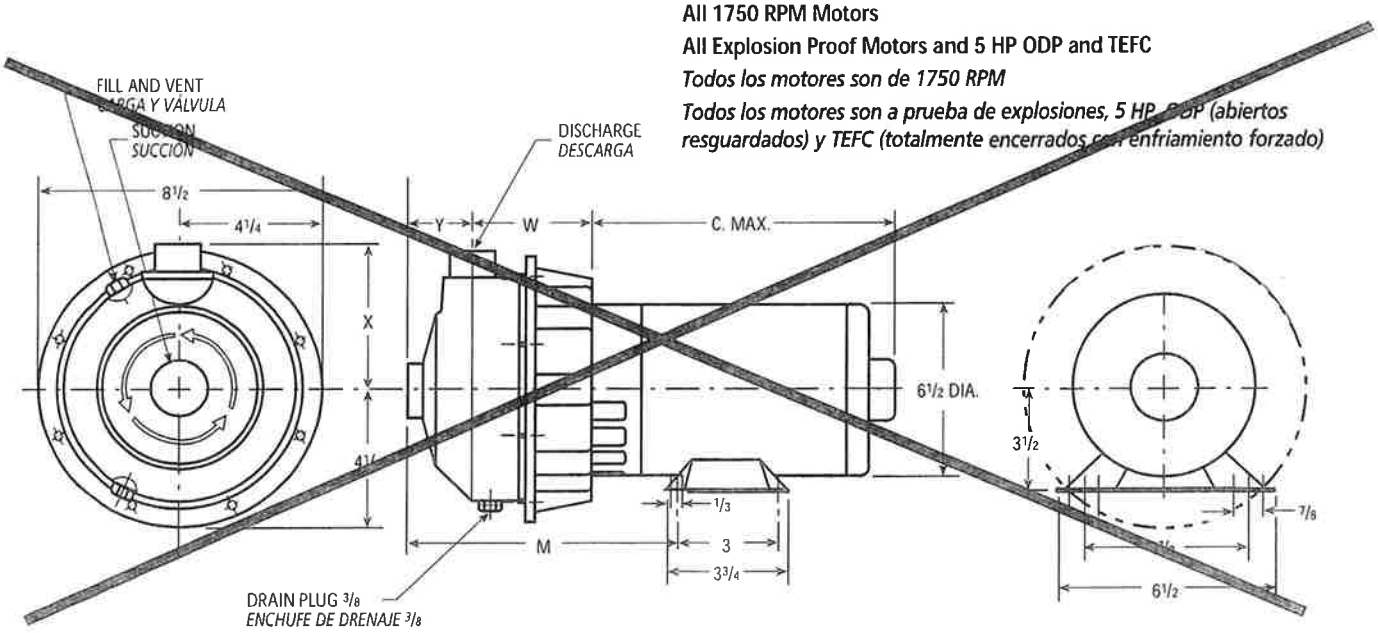
Monofásicos: *Voltaje 115/230 ODP y TEFC. (modelo 3 HP – 230 voltios solamente) Se proporciona protección térmica contra sobrecarga construida con reseteo automático.*

Trifásicos: *Voltaje 208-230/460 ODP, TEFC y EX PROOF.*

NOTA: *Para motores trifásicos se debe de proporcionar la protección térmica contra sobrecarga en la unidad de arranque. El arrancador y los calentadores se deben pedir por separado.*

NPE Close Coupled with Footed Motor, 1750 RPM and Explosion-proof Motors
NPE Acople Cerrado con Motor con Patas, 1750 RPM y Motores a Prueba de Explosión

All 1750 RPM Motors
All Explosion Proof Motors and 5 HP ODP and TEFC
Todos los motores son de 1750 RPM
Todos los motores son a prueba de explosiones, 5 HP ODP (abiertos resguardados) y TEFC (totalmente encerrados con enfriamiento forzado)



Dimensions – Determined by Pump,
Dimensiones – Determinadas por la Bomba

Pump, *Bomba*	Suction, *Succión*	Discharge, *Descarga*	HP	W	X	Y	L	M
1ST	1¼	1	½ – 3	3 5/16	4 ⅜	2	4 9/16	7 5/16

Available Motor Weights and Dimensions,
Pesos y Dimensiones Disponibles del Motor

HP	Motor Weights, *Pesos del Motor*						C Max. Length, *(Longitud)*
	1 Phase, *Monofásicos*			3 Phase, *Trifásicos*			
	ODP	TEFC	EXP	ODP	TEFC	EXP	
½	[illegible]	[illegible]	[illegible]	[illegible]	18	[illegible]	9 15/16
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	22	26	49	23	21	30	11
1½	28	35	56	27	27	37	11 5/16
2	33	39	60	32	33	44	12 1/16
3	40	43	—	41	37	—	12 7/16
5	42	—	—	42	45	—	14¼

Dimensions in inches, weights in pounds.
Dimensiones en pulgadas, pesos en libras.

NOTES:

1. Pump will be shipped with top vertical discharge position as standard. For other orientations, remove casing bolts, rotate discharge to desired position, replace and tighten 6mm bolts to 5 – 6 lbs.-ft.
2. Motor dimensions may vary with motor manufacturers.
3. Dimensions in inches, weights in pounds.
4. For explosion proof motor dimensions consult factory for information.
5. Not to be used for construction purposes unless certified.

NOTAS:

1. Las bombas se transportarán con la descarga vertical superior como estándar. Para otras orientaciones, retirar los tornillos de la carcasa, rotar la descarga a la posición deseada, y reemplazar y apretar los tornillos de 6mm a 5 – 6 libras-pies.

2. Las dimensiones del motor puede que varíen con los fabricantes.

3. Dimensiones en pulgadas, pesos en libras.

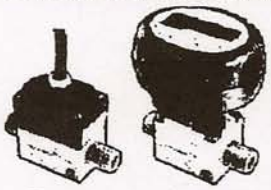
4. Para las dimensiones de los motores a prueba de explosión consultar con la fábrica para información.

5. No usar para propósitos de construcción sin certificar.

Flowmeters/Totalizers & Cold-Water Totalizers

For information about flowmeters/totalizers and totalizers, see pg. 539. For information about pipe size, see pgs. 2-3.

Extended-Life Water Flowmeters and Flowmeters/Totalizers



Flowmeter *Flowmeter/ Totalizer*

No moving parts means there's less wear and maintenance so these flowmeters/totalizers last longer. They work by creating vortices (whirls of water) that are proportional to the velocity of your flowing media. Mount horizontally or vertically. Body is made of Ryton and is rated NEMA 4X (for use outdoors and in washdown and corrosive environments). Maximum pressure is 150 psi at 70° F. Temperature range is –4° to +176° F. Connections are NPT male.

Flowmeters transmit a pulse output signal to a data recorder, logger, or display (not included). They operate on 12-24 VDC and include 3 feet of cable with wire leads. O-ring is Viton.

Flowmeters/totalizers have an eight-digit LCD that indicates flow rate (in gallons per minute) as well as total flow volume (up to 99,999,999 gallons). Display is nonresettable. Digit height is ⅜". Battery included.

Flow Range, gpm	Accuracy	Pipe Size	O'all Lg.	Flowmeters Each	Flowmeters/ Totalizers Each
0.105-1.1	±3%	¾"	5⅛"	3437K61.. $532.14	3437K51.. $869.37
0.75-11.4	±1%	¾"	5⅛"	3437K63.. 575.00	3437K53.. 899.23
2.2-35.1	±1%	1¼"	7½"	3437K64.. 594.64	3437K54.. 1043.25

NSF-Certified Cold-Water Totalizers

Totalizer

Totalizer with Remote LCD

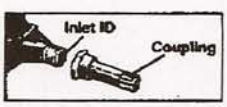
Perfect for cold-water service, these totalizers have a brass body that meets NSF 61 for drinking water and a low-flow indicator that detects leaks in the system. All have a nonresettable dial that indicates the total flow volume. Mount horizontally. Fittings are bronze and O-ring is neoprene. Accuracy is ±1.5%. Maximum pressure is 150 psi at 70° F. Temperature range is 33° to 80° F. Meet AWWA (American Water Works Association) C700 standards. All include couplings.

Style A—Coupling connections are NPT male. *Totalizers* register up to 10,000,000 gallons. *Totalizers with remote LCD* register up to 9,999,990 gallons; they generate a pulse to the remote display every gallon.

Style B—Coupling connections are NPT female. *Totalizers* register up to 100,000,000 gallons. *Totalizers with remote LCD* register up to 99,999,000 gallons; they generate a pulse to the remote display every 10 gallons.

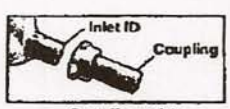
Style C—Coupling connections are NPT male. *Totalizers* register up to 1,000,000 cubic feet. *Totalizers with remote LCD* register up to 999,990 cubic feet; they generate a pulse to the remote display every cubic foot.

Totalizers with remote LCD allow you to place the display up to 500 feet away from the totalizer—ideal when the totalizer is located in an inaccessible or inconvenient area. Display is nonresettable. Digit height is ¼". Battery included. *Cable for remote LCD* (sold separately below) is required for connecting the display to the totalizer.



Flow Range		Inlet ID	Coupling Pipe Size	O'all Lg.	Totalizers Each	Totalizers with Remote LCD Each
A... 0.5-20	gallons per minute	⅝"	½"	12½"	4041K21... $90.21	3786K91... $304.12
A... 0.5-20	gallons per minute	⅝"	¾"	12¾"	4041K22... 89.23	3786K92... 311.43
A... 0.75-30	gallons per minute	¾"	¾"	14¼"	4041K61... 154.76	3786K81... 361.70
~~*A*... 0.75-30~~	~~gallons per minute~~	~~¾"~~	~~1"~~	~~14½"~~	~~4041K62... 175.67~~	~~3786K82... 409.18~~
A... 1-50	gallons per minute	1"	1"	16¼"	4041K23... 224.27	3786K93... 458.48
~~*A*... 1-50~~	~~gallons per minute~~	~~1"~~	~~1¼"~~	~~16⅜"~~	~~4041K24... 305.49~~	~~3786K94... 514.92~~
B... 2-100	gallons per minute	1½"	1½"	12⅝"	4041K25... 537.52	3786K95... 762.41
B... 2.5-160	gallons per minute	2"	2"	15¼"	4041K26... 816.16	3786K96... 1030.63
C... 0.067-2.67	cubic feet per minute	⅝"	½"	12½"	4041K71... 90.21	3786K41... 304.12
C... 0.067-2.67	cubic feet per minute	⅝"	¾"	12¾"	4041K72... 92.26	3786K42... 311.43
C... 0.134-6.68	cubic feet per minute	1"	1"	16¼"	4041K73... 224.27	3786K43... 458.48
C... 0.134-6.68	cubic feet per minute	1"	1¼"	16⅜"	4041K74... 305.49	3786K44... 514.92
Cable for Remote LCD					70985K81 Per Foot	$0.12

Cold-Water Totalizers with Switch



Coupling with NPT Male Connection

The switch on these piston-style totalizers closes each time the set amount of water passes through the totalizer. Switches are single pole, single throw normally open (SPST-NO). They turn one circuit from "off" to "on" and can be used to activate a pump, valve, or alarm. They operate on 20/10 amps at 120/250 VAC and include screw terminal connections.

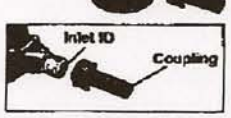
Totalizers have a nonresettable dial that registers the total flow volume up to 9,999,999 gallons. Mount horizontally. Body is bronze. O-ring is Buna-N. Temperature range is 35° to 105° F. All include couplings; connections are NPT male, unless noted.

To Order: Please specify the amount of water that will close the switch each time that amount passes through. For 4187K41-K45, please specify: 5, 10, 20, 25, 50, 100, 200, 250, or 500 gallons. For 4187K47 and K48, please specify: 50, 100, 200, 250, 500, or 1000 gallons.

Flow Range, gpm	Accuracy	Max. psi @ 70° F	Inlet ID	Coupling Pipe Size	O'all Lg.	Each
0.25-20	±1.5%	150	⅝"	½"	12¼"	4187K41... $445.45
0.25-20	±1.5%	150	⅝"	¾"	12½"	4187K42... 452.73
0.5-30	±1.5%	150	¾"	¾"	14"	4187K43... 618.18
0.75-50	±1.5%	150	1"	1"	16"	4187K45... 836.36
2-100	±1.5%	150	1½"	1½"	18⅝"	4187K47■... 1320.00
2-160	±1.5%	150	2"	2"	21⅝"	4187K48■... 1690.91

■ Couplings have NPT female connections.

Corrosion-Resistant Cold-Water Totalizers



Deionized water won't damage these totalizers—all are made of polycarbonate for added corrosion resistance. Totalizers have a nonresettable dial that registers the total flow volume up to 9,999,999 gallons. Mount horizontally. O-ring is Buna-N. Temperature range is 35° to 105° F. All include couplings; connections are NPT male.

Flow Range, gpm	Accuracy	Max. psi @ 70° F	Inlet ID	Coupling Pipe Size	O'all Lg.	Each
0.25-15	±1.5%	70	⅝"	½"	12¼"	4119K41... $232.73
0.25-15	±1.5%	70	⅝"	¾"	12½"	4119K42... 238.18

	Per Pair
Replacement ½" Pipe Size Couplings	4119K77... $25.00
Replacement ¾" Pipe Size Couplings	4119K79... 25.00