Site Management Plan

Peter Cooper Superfund Site
Gowanda, New York

October 2010

0021-001-900

Prepared By:

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ENGINEERING &
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SITE MANAGEMENT PLAN

PETER COOPER LANDFILL SUPERFUND SITE
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1.0 INTRODUCTION

Benchmark Environmental Engineering and Science, PLLC (Benchmark) has prepared this Site Management Plan (SMP) for the Peter Cooper Landfill Superfund Site in the Village of Gowanda, Cattaraugus County, New York.

On February 12, 2009, a Consent Decree was entered in United States District Court outlining the terms and conditions under which the cooperating PRPs would perform remedial measures at the Site. A Remedial Design (RD) Work Plan describing the scope of the planned remedial measures was subsequently prepared by Benchmark and submitted to the USEPA in May 2009. The remedy was deemed substantially complete in August 2010. In general, the remedy involved:

- Excavating several hotspot soil/fill areas and consolidating this excavated material in the Elevated Fill Subarea.
- Covering the 5-acre Elevated Fill Subarea with a low-permeability soil cover, consistent with the requirements of 6 NYCRR Part 360, including seeding with a mixture to foster natural habitat.
- Installing a passive gas venting system in conjunction with a final cover system for the Elevated Fill Subarea.
- Collecting leachate seeps and discharging the seeps to the POTW collection system following pretreatment.
- Stabilizing the Creek bank.

The RD Work Plan provided for preparation of an SMP following remedial measures construction. The purpose of the SMP is to provide for the proper management of all Site remedy and post-construction components, including institutional controls. The components of the SMP include:

- An Operation, Maintenance, and Monitoring (OM&M) Plan describing ongoing measures that will be undertaken in the post-remedial period to assure the continued effectiveness of the remedy. The OM&M Plan includes post-remedial groundwater monitoring to verify that groundwater quality does not degrade from conditions measured during the site Remedial Investigation, requirements for maintenance of the engineering controls (i.e., cover soils and bank stabilization) installed as part of the Site remedy, and a 5-year review, per CERCLA, to confirm that the remedy continues to protect public health and the environment.

- A Soil/Fill Management Plan identifying procedures to be undertaken if future work or development activities on the Site uncover residual contamination, and protocols for handling excess soil generated from future work activities, if any.

- An Environmental Easement that describes the institutional controls incorporated into the remedy, and the means by which verification that the institutional controls remain enforced and in-effect will take place.

The USEPA and NYSDEC monitored the remedial actions to verify the work was performed in accordance with the RD Work Plan. A post-construction Remedial Action (RA) Report was prepared to document the remedial construction activities, including any deviations from the design.

2.0 SMP COMPONENTS

This SMP consists of the following three parts:

PART	TITLE
I	Operation, Maintenance & Monitoring Plan
II	Soil/Fill Management Plan
III	Environmental Easement (Institutional Controls)

PART I

OPERATION, MAINTENANCE & MONITORING PLAN

OPERATION, MAINTENANCE & MONITORING (OM&M) PLAN
for
SITE MANAGEMENT PLAN

PETER COOPER LANDFILL NPL SITE
GOWANDA, NEW YORK

September 2010 0021-001-900

OPERATION, MAINTENANCE & MONITORING PLAN
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1.0 INTRODUCTION

This Operation Maintenance & Monitoring (OM&M) Plan has been prepared to identify required monitoring and maintenance tasks for the constructed remedial measures at the Peter Cooper Landfill Superfund Site (also referred to as the "Peter Cooper Gowanda Site", or the "Site"), located in the Village of Gowanda, New York (see Figures 1 and 2). Accordingly, this Plan presents operation, maintenance and monitoring requirements for the Elevated Fill Subarea final cover system and seep/groundwater collection and pretreatment system, as well as groundwater, surface water, and landfill gas monitoring requirements.

In addition to the prescribed remedial measures called for by the Consent Decree, certain additional improvements are planned and/or were implemented to facilitate redevelopment of the site. As described in the Remedial Design Work Plan, the Village of Gowanda in association with the University at Buffalo Center for Integrated Waste Management developed a Reuse Assessment and Concept Plan (Reference 1) for the Site, which concluded that the "highest and best use" of the property would be as a multi-use recreational facility. The Reuse Assessment and Concept Plan envisions a publicly-available Site incorporating elements such as a walking/biking trail, fishing access, outdoor picnic areas, small boat launch and other related recreational features.

Following issuance of the Record of Decision for the Site, the Village of Gowanda (the Village) and the cooperating potentially responsible parties (CPRPs) entered into discussions concerning the Village's redevelopment goals. It was agreed that a municipal entity (i.e., the Gowanda Area Redevelopment Corporation, or "GARC") would take ownership of the site and that GARC and/or the Village would perform certain post-remedial operation, maintenance and monitoring activities in exchange for provision of select non-remedial construction activities (e.g., debris removal) and funding by the cooperating PRPs to facilitate park redevelopment. Prior to allowing public access to the site GARC and/or the Village will also place cover soils or construct impervious cover (e.g., concrete pad for a park pavilion) across the area of the site outside of the remediated Elevated Fill Subarea to satisfy New York State Department of Environmental Conservation (NYSDEC) requirements for Brownfield site redevelopment per 6NYCRR Part 375.

To provide a comprehensive post-remedial OM&M Plan, this document addresses both the constructed remedial measures called for under the Consent Decree as well as the planned park cover system. This final OM&M Plan will be employed with other post-construction site management measures (i.e., soil/fill management and institutional controls

certification) to assure the continued effectiveness of the remedial measures and park cover system.

1.1 Constructed Remedial Measures

Benchmark Environmental Engineering & Science, PLLC (Benchmark) substantially completed the remedial construction activities on a design-build basis during the period of July 2009 through November 2009, with final site restoration completed in July-August 2010. The following measures were constructed as more fully described in the Remedial Action Report for the site (Ref. 2):

- Groundwater/Seep Collection, Conveyance and Pretreatment System
- Creek Bank Erosion Protection
- Hotspot Removal
- Elevated Fill Subarea Cover System Improvements
- Passive Gas Venting System
- Groundwater Monitoring wells

Figure 3 provides a schematic showing the approximate location of the remedial measures. A brief description of the construction is presented below.

1.1.1 Site Preparation

Site preparation and grading initially involved mobilization of heavy equipment and temporary field offices, construction of storm water management and erosion controls, and implementation of community air monitoring. To facilitate heavy equipment access to the creek, the haul road constructed along the northeastern side of the Elevated Fill Subarea during the 1997 bank stabilization project completed by NYSEG was re-established and continued around the creek side of the Elevated Fill Subarea. Trees, shrubs and brush within the Elevated Fill Subarea work limits were then removed to facilitate construction and post-closure maintenance work. Woody vegetation and stumps within the work limits were chipped and disposed on-site in a layer no more than 2-inches thick beneath the barrier layer. Vegetation was then stripped off the Elevated Fill Subarea surface and disposed in a uniform layer beneath the cover soil.

1.1.2 Hotspot Soil Consolidation

Arsenic-impacted soil/fill in the LFSS-6 and SB-2 Subareas (totaling approximately 171 CY) was excavated to achieve the site-specific arsenic cleanup goal of 120 mg/kg.

Approximately 196 cubic yards of VOC-impacted soil/fill in the MWFP-3 Subarea was excavated to achieve the site-specific cleanup goals of 0.6 mg/kg for carbon tetrachloride, 0.3 mg/kg for chloroform, and 1.4 mg/kg for tetrachloroethene. The excavated soil/fill from these subareas was placed in the Elevated Fill Subarea before cover system construction. The soil/fill was placed in maximum 12-inch lifts and compacted wet of optimum moisture content to a minimum of 90 percent of the modified proctor maximum density as determined by the Modified Proctor Compaction Test. Backfill in the hotspot areas was from the same approved source as that employed for the cover system.

1.1.3 Elevated Fill Subarea Cover System Improvements

Following clearing and grubbing, the approximate 5-acre Elevated Fill Subarea was regraded to facilitate runoff. Non-settleable debris removed from the planned park redevelopment area that was considered suitable for onsite disposal and soils from the excavation of a clean utility corridor in the planned park redevelopment area were also placed, spread and compacted in the Elevated Fill Subarea. The existing cover was supplemented to provide for a minimum 18-inch thickness of recompacted (typically $1x10^{-7}$ cm/sec or lesser permeability) clay soil barrier layer and 6 inches of topsoil over the 5-acre area. The Elevated Fill Subarea cover was seeded per the contract specifications to provide for a good stand of grass that will foster natural habitat.

1.1.4 Groundwater/Seep Collection and Conveyance

The remedial measures for the Elevated Fill Subarea included re-grading of the adjacent bank (excluding the riprap-stabilized area on NYSEG's property) to remove existing concrete blocks and boulders and provide a uniform slope for reduced erosion potential. A seep collection trench was then excavated into the surface of the weathered shale bedrock at the toe of the slope to intercept and collect the seeps. A perforated drainage pipe and granular media envelope collect and transmit seeps/groundwater to a packaged leachate pump station. The seeps/groundwater are pumped to an onsite pretreatment building incorporating flow monitoring equipment and a metering pump to deliver oxidant (hydrogen peroxide or other oxidant) prior to discharge to the Village of Gowanda sanitary sewer. The slope of the regraded bank is lined with a geocomposite drainage layer, leading to the collection trench, covered by a geomembrane liner to prevent seep breakout and mitigate creek or surface water infiltration during high water conditions.

The liner extends vertically to the 100-year floodplain elevation, and is protected from erosion by a surface layer of large riprap over a non-woven geotextile fabric and gravel bed.

1.1.5 Passive Gas Venting System

Five passive gas vents were installed through the sludge fill in the Elevated Fill Subarea to relieve gas buildup beneath the cover system. Waste material excavated during gas vent installation was disposed within the consolidation area subgrade. The gas venting wells were constructed of 3-inch Schedule 40 PVC with a galvanized steel casing. Gas venting wells were installed a minimum of 10 feet into the waste and were screened in an approximate 3-foot diameter annular space filled with washed backfill material having a minimum permeability of 1 x 10^{-3} cm/s. The vents were constructed with individual, 16-foot tall risers to promote atmospheric dispersion of odor-causing constituents.

1.1.6 Groundwater Monitoring Network

The approved March 2009 Post-Remedial Groundwater and Surface Water Monitoring Plan, included as Appendix A, will be used to detect changes in Site conditions during the post-remedial monitoring period. Groundwater monitoring will include both water quality and water level monitoring. Samples will be collected on a semi-annual (spring and fall) basis for the first two years of monitoring, and may be reduced to annually thereafter if the data supports the reduction. The Post-Remedial Groundwater and Surface Water Monitoring Plan identifies groundwater and surface water sampling locations; collection procedures; analytical parameters and methodology; and data reporting and interpretation requirements.

1.2 Planned Park Cover System

The cover system to be constructed by GARC and/or the Village of Gowanda will be in place prior to allowing public use of the site. It is anticipated that GARC and/or the Village of Gowanda will initially regrade and fill the portion of the site outside of the Elevated Fill Subarea to eliminate low areas and provide level surfaces that will facilitate mowing and recreational use, followed by construction of the cover system in areas not otherwise covered by impervious parking, structures, etc. The cover system will generally involve: placement of 1-foot of clean soil cover soil having concentrations that meet the lower of NYSDEC Soil Cleanup Objectives (SCOs) for commercial use or protection of groundwater (per 6NYCRR Part 375-6) in areas designated for passive recreation; and

placement of 2-feet of clean soil cover meeting the lower of NYSDEC SCOs for restricted residential use or protection of groundwater (per 6NYCRR Part 375-6) in areas designated for active recreation.

2.0 PROGRAM RESPONSIBILITIES AND SITE CONTACTS

2.1 Program Responsibilities

The cooperating Potential Responsible Parties (CPRPs) and the Village of Gowanda have developed a coordinated plan to share post remedial responsibilities at the Peter Cooper Landfill Site. A general breakdown of the responsibilities to be performed by both parties is presented for each category below.

2.1.1 Seep/Groundwater Collection and Pretreatment System

The Village of Gowanda is responsible for operation, maintenance and monitoring of the seep/groundwater collection and pretreatment system. Anticipated OM&M work includes:

- Maintain collection system line (flushing, repairs if necessary).
- Operate and maintain lift station pumps.
- Maintain pretreatment system building and operate/maintain all included mechanical, electrical and HVAC equipment.
- Provide chemical oxidant for hydrogen sulfide control, as necessary.
- Perform influent/effluent sampling, analysis and reporting as necessary per the Significant Industrial User (SIU) Discharge Permit issued by Village of Gowanda (see Appendix F).
- Maintain and pay all utility fees.
- Plow and repair access to pretreatment building as necessary.

2.1.2 Cover System and Creek Bank Erosion Protection

The Village of Gowanda is responsible for maintenance of the cover system and creek bank erosion protection. OM&M work includes:

- Mowing or brush hogging (if required).
- Removal of undesirable/invasive species (e.g., shrubs, saplings, vectors).
- Filling of ruts and eroded areas with soil to finish grade.
- Seeding, fertilizing and mulching of bare patches and erosion repair areas to provide thick grass cover.
- Maintaining riprap cover over synthetic membrane.
- Repair or replacement of broken or damaged gas vent risers, fittings, appurtenances and supports.

2.1.3 Environmental Monitoring and Inspection

The CPRPs are responsible for implementing required post-remedial environmental monitoring (per Appendix A) as well as inspection of the Elevated Fill Subarea cover system and bank protection until such time as the CERCLA 5-year review is complete, at which point GARC may assume responsibility for these services. Benchmark or other qualified personnel may assist in providing these services, which include:

- Post-remedial groundwater, surface water and gas vent sampling and analysis
- Groundwater monitoring well repair (as necessary)
- Routine cover system and creek bank stabilization (riprap) inspections
- Elevated Fill Subarea inspection and environmental monitoring reports

2.1.4 Park Cover System and Redevelopment Improvements

The Village of Gowanda will be responsible for monitoring and maintaining the park cover system and all other improvements constructed for use of the Site as a public park. This will include all certifications required by the Site Management Plan that the park cover system and site use restrictions remain in place and in effect, and that Site groundwater is not being extracted (other than for environmental sampling and as provided by the seep/groundwater collection system remedial measure). In addition, the Village of Gowanda will be responsible for all repairs to the park cover system and remedial measures caused by vandalism.

2.2 Site Contacts

As indicated above, post-remedial operations, maintenance, and monitoring requirements as well as corrective measures, if necessary, are the responsibility of the CPRPs. The United States Environmental Protection Agency (USEPA) will serve as the regulating agency for these efforts. The contact persons for these parties are listed below:

<u>Representatives for CPRPs:</u>

Dr. Michael Joy
Lipman Biltekoff & Joy, LLP
333 International Drive
Williamsville, NY 14221

Mr. John Wittenborn
Kelley Drye & Warren, LLP
Washington Harbour, Suite 400
3050 K Street, NW
Washington, DC 20007-5108

Mr. Seth Davis
Elias Group, LLP
411 Theodore Fremd Avenue
Suite 102
Rye, New York 10580

Representatives for GARC:

Mr. Michael Hutchinson
Superintendent/Public Works
Village of Gowanda
27 E. Main Street
Gowanda, New York 14070

USEPA:

Ms. Sherrel Henry
Peter Cooper Landfill Superfund Site Project Coordinator
U.S. Environmental Protection Agency, Region II
Emergency and Remedial Response Division
290 Broadway - 20th Floor
New York, NY 10007-1866

NYSDEC:

Mr. Maurice Moore
New York State Department of Environmental Conservation
270 Michigan Avenue
Buffalo, New York 14203-2999

3.0 REMEDIAL MEASURES OPERATION, MAINTENANCE AND MONITORING

3.1 Groundwater and Surface Water Monitoring

The Post-Remedial Groundwater and Surface Water Monitoring Plan (see Appendix A to this Plan) will be used to detect changes in Site conditions following implementation of remedial measures. Benchmark or other CPRP-designated personnel will complete this work through the CERCLA 5-year review, at which point responsibility may shift to the Village. Groundwater monitoring includes both water quality and water level monitoring. Samples will be collected on a semi-annual (spring and fall) basis for the first two years of monitoring. Sample collection frequency and analytical parameters may be reduced thereafter (with USEPA approval) if the data supports the reduction. The Post-Remedial Groundwater and Surface Water Monitoring Plan identifies groundwater and surface water sampling locations; collection procedures; analytical parameters and methodology; and data reporting and interpretation requirements.

3.2 Elevated Fill Subarea Cover Monitoring

Inspection of the Elevated Fill Subarea cover system will be performed by Benchmark or other CPRP-designated personnel experienced in the construction and inspection of remedial measures involving cover systems. (As indicated above, this responsibility may shift to the Village following the CERCLA 5-year review). During the first year of post-closure care and monitoring, the Elevated Fill Subarea cover will be inspected on a minimum of two occasions coincidental with groundwater monitoring events. The cover will be inspected for:

- Integrity of cover, including:
  - Erosion or settling of cap materials
  - Cracking/breaches in cover
  - Loss of slope
  - Pooling or ponding of surface water
  - Loss of vegetative cover
  - Presence of undesirable plant or animal species
- Visible debris, litter and waste from illegal dumping activities.
- Integrity of gas vents.

- Integrity of monitoring wells, including but not limited to working locks, adequate surface seals and protective casings, and sediment intrusion.

Inspection findings will be recorded on the Post-Closure Field Inspection Report (see Appendix B). The results of the inspections will be transmitted to the USEPA Project Coordinator following review and any problems recorded over the course of the year will be summarized in the annual groundwater monitoring report described in Appendix A. After the first two years of post-closure monitoring, site inspections will be performed on an annual basis.

3.3 Creek Bank Erosion Protection Inspection

Concurrent with the Elevated Fill Subarea cover system inspection, the creek bank erosion protection will be inspected to check for floodwater damage or other concerns, including seep breakout. Observations will be recorded on the Post-Closure Field Inspection Report.

3.4 Routine Site Maintenance

A discussion of typical site maintenance requirements is presented below.

3.4.1 Cover System Maintenance

Cover system maintenance will be performed by the Village of Gowanda over the 30-year post-closure care period. Routine maintenance will include the hand or small equipment removal of woody vegetation on the cover system to prevent the development of deep - rooted vegetation. Mowing or brush-hogging may be required if hand removal is not sufficient. This operation will be scheduled annually, in mid-summer to avoid disturbance of potential ground-nesting wildlife.

The need for cover repairs due to minor erosion and/or settling will be determined each time the site is inspected. Inspection personnel will convey results to the Village of Gowanda to communicate repair needs. Any signs of erosion, burrowing or other site maintenance problems will be corrected as soon as possible. All bare spots in the final cover vegetation will be reseeded and fertilized. Seed and fertilizer will be of the same general type and quality as originally specified (see Appendix C).

If erosion or settling indicates the need for cover soil repair, it will be made following the same procedures and will use the same materials that were used during the original construction activities.

3.4.2 Access Drive

The access drive to the pretreatment building and lift station will be maintained by GARC so that routine inspections and required maintenance activities on these facilities can be carried out.

3.4.3 Gas Vent System

During the quarterly site inspections, gas vents will be inspected for overall integrity, plugging, and damage. Plugged gas vents will be assessed to determine the source of the blockage and mitigated during the inspection as necessary. Damaged gas vents will be repaired or rebuilt to restore them to original design configuration. Any sign of stressed vegetation (i.e., yellowed, browned, or absent) either immediately around the gas vents or across the site will be noted on the Post-Closure Inspection Report.

3.4.4 Groundwater Monitoring System

The integrity of all groundwater monitoring wells will be evaluated as part of routine groundwater monitoring events. Monitoring well integrity, including but not limited to sediment intrusion, working locks, adequate surface seals, and protective casings, will be evaluated. In addition, the well riser will be inspected for cracks and damage. Well repair, if necessary, will be performed to restore the well to original construction conditions.

If it is determined through long-term monitoring that a well no longer provides adequate information pertinent to post-closure monitoring or a monitoring well requires replacement, a well decommissioning request will be drafted, submitted to the USEPA for approval, and implemented in accordance with Benchmark's standard operating procedures presented in the Post-Remedial Groundwater and Surface Water Monitoring Plan (see Appendix A). A procedure for new well installation will be submitted for replacement wells, if required.

3.5 Seep/Groundwater Collection and Pre-Treatment System

3.5.1 General Description/Principle of Operation

As described in the Remedial Design Work Plan, the seep/groundwater collection and pretreatment system involves recovery of seeps and groundwater along the creek side of the Elevated Fill Subarea with pretreatment via oxidant addition to mitigate liberation of hydrogen sulfide vapors. The pump station is fitted with float switches to maintain levels at or below the collection piping inverts. Pumps will cycle between pump on (high level) and pump off (low level) and will alternate to prevent differential wear of the pumps. At the time of construction, the high level (pump on) was set at 19 feet 10 inches below the top of the lift station rim, and the low level (pump off) was set at 22 feet 6 inches below the top of the lift station rim. The recovered groundwater is pumped through a 2" HDPE force main into the pretreatment building, where the flow is recorded and oxidant is delivered via metering pump. A second 2" HDPE force main was installed between the pump station and the pretreatment building as a backup. The oxidant supplied at the time the treatment system was constructed was comprised of 50% hydrogen peroxide, which is a relatively powerful oxidant that converts sulfides to sulfates. Alternatively, other oxidants may be employed, including potassium permanganate. The resultant pretreated water is then discharged to the Village of Gowanda sanitary sewer system.

Electrical service and control panels for the pumps are housed in the pretreatment building, which is a pre-cast concrete building with a locking steel door. The building is located proximate to the gravel drive area on Palmer Street across from Broadway to facilitate access. Within the building, the HDPE force main transitions to Sch. 80 PVC piping. A tee-fitting with an insertion-type flow sensor/transmitter is used to monitor flow. The sensor transmits to a meter/recorder with instantaneous and total flow monitoring capabilities.

To prevent potential surcharge of the sanitary sewer due to continued pump operation during high flow events (as might occur during storm conditions), a manually adjustable flow control valve is located in the building. The valve is adjusted to assure discharge flow is controlled to a pre-established maximum rate acceptable to the Village of Gowanda's Department of Sewerage Management per the SIU permit.

3.5.2 Process Equipment Description

A description of each of the process equipment units is provided below. Manufacturer's cut sheets for the equipment as well as the manufacturer's recommended operation and maintenance procedures are included in Appendix E.

3.5.2.1 Lift Station Pumps

Lift station pumps are Liberty Pumps® model LEH103M2-2 pumps with three phase, 208-280 VAC 1 HP motors. As previously discussed, each pump automatically starts and stops via high and low float switches in the pump station. A third float serves as a high level alarm. Hand/off/auto (HOA) switches are located on the pump control panel located in the pretreatment building. Pump starters and overload protection are provided in the pretreatment building as well. The well pumps are typically set in auto mode to allow automatic start/stop; in this mode the pumps alternate such that the first pump runs and the second pump is idle; following a discharge cycle the second pump runs and the other pump becomes idle (i.e., they do not operate in lead-lag mode). Power to the pump starters is supplied from the building circuit panel (as are the building lighting, electric heater/fan and convenience outlets). Power supply to the pumps is furnished with lockable switches to provide lockout/tag out at the panel in lieu of local disconnect at the station.

3.5.2.2 Well Pump Flow Meter

The well pump flow meter is located on the pretreatment building influent force main from the lift station. The meter is comprised of GF Signet Model 2536 rotor-x flow sensor and GF Signet Model 8550-1 Flow Indicator/Transmitter. The meter monitors total and instantaneous flow. Power to the meter is from a regulated, low voltage DC source (24VDC). Calibration/zeroing procedures are contained in the manufacturer's literature in Appendix E. As indicated in Appendix E, It is important to note for calibration purposes that the "k-factor" for this flow meter arrangement is 352.44.

3.5.2.3 Peroxide Feed System

The peroxide feed pump is a Pulsatron Series C$_{PLUS}$ electronic metering pump (model LD03SAVTC9XXX) with a degassing head assembly capability of delivering oxidant at a minimum of 0.2 gph at ½ maximum line backpressure (250 psig). The pump is supplied

with power from a single phase, 110 VAC GFI outlet energized and de-energized coincidental with lift station pump activation/deactivation.

3.5.2.4 Hydrogen Peroxide Storage Tank

The hydrogen peroxide storage tank is a 120-gal double-walled HDPE upright storage tank with a 14" threaded top opening. Fittings are PVC with stainless steel bolts and EPDM gaskets. External tank dimensions are 31.00"D x 49.62"H, with a wall thickness rated for fluids up to a 1.9 specific gravity.

3.5.2.5 Portable Eyewash/Safety Shower

A portable eyewash/safety shower system is located within the treatment building. The system has capacity for a minimum of 15-gallons of potable water and is furnished with a preservative to provide a minimum of 6 months between water change outs. Pressure for the portable eyewash/safety shower system is provided via periodic compressed air charge.

3.5.3 Normal Operations

During typical operations, the lift station and oxidant pretreatment system operate in automatic mode as described above. The flow is adjusted to maintain intermittent pumping rates between 5 and 10 gpm. This prevents the pumps from running outside their recommended operating ranges, which could lead to premature failure or tripping of thermal protection switches. Flow rates are adjusted via a valve on the 1-1/2" PVC force main within the treatment building as measured on the system flow meter.

In addition to groundwater flows, key process operating variables include oxidant flow. The oxidant dosage rate is designed to assure that sufficient chemical is present to provide for adequate sulfide oxidation. If sufficient oxidant is not delivered, the potential exists for incomplete oxidation. Accordingly, it is desirable to dose slightly in excess of actual chemical demand to assure a lack of oxidant does not limit the conversion of sulfides to sulfates. There are several means by which to check that sufficient oxidant has been delivered. One such method is to monitor the effluent for dissolved oxygen (DO) content, which should meet the minimum requirements presented in the industrial discharge permit. In addition, routine industrial discharge sampling data should confirm the absence of sulfides above permitted levels. Finally, for certain oxidants (including hydrogen peroxide)

test strips can be purchased to check for the presence of the oxidant in the treated water. An indicator on the test strip turns color in response to the presence of the desired chemical. The test strip is then compared to a color test chart supplied with the test strips to determine the approximate concentration of residual oxidant in the pretreated groundwater/seeps. If a detectable concentration is measured it is reasonable to assume that oxidant delivery is sufficient for sulfide treatment. However, depending on the presence of other competing chemicals (iron, manganese, calcium, etc) excess oxidant may be undesired, as it might lead to fouling of the discharge piping.

If the oxidant dosing level requires adjustment based on the residual concentration, the dosing rate is adjusted via stroke length and frequency settings on the metering pump. This should initially involve increasing stroke frequency via the dial on the pump control panel. In general, increased stroke frequency provides for better dispersion than increased stroke length. If necessary, stroke length can be adjusted after stroke frequency is maximized.

3.5.4 Equipment Monitoring and Maintenance

Routine monitoring of the pump station and pretreatment system equipment will involve measuring and recording key operating variables on a regular basis throughout the life of the system. A summary of key operating variables is presented on the process monitoring log presented in Appendix D. It is recommended that these variables be recorded on a weekly basis, as they are used both to assist in tracking system performance as well as maintenance requirements. Specific routine maintenance activities that will be indicated based on the monitoring variables include:

- System instantaneous and total flow rate.
- Oxidant use, based on consumption rate indicated by tank level and refill.
- Eyewash/safety shower changeout and pressure recharge.
- Lift station inspection and pump maintenance.

In addition to the mechanical equipment monitoring described above, discharge monitoring will be performed on a routine basis in accordance with the industrial discharge permit issued by the Village of Gowanda. A sample valve on the force main within the

pretreatment building provides a means for collecting grab samples for analysis. In addition, the discharge piping was constructed with an inverted trap and access port to provide a convenient means for composite sample collection with an automatic composite sampler. If such equipment is used it should be battery powered or plugged into one of the convenience outlets in the pretreatment building; it should not be energized via the oxidant metering pump outlet as power is only supplied to that outlet intermittently when the submersible lift station pumps are operating.

3.6 Remedial Measures Performance Evaluation

The remedial measures performance evaluation will focus on the efficacy of the low-permeability cover system and groundwater/seep collection system in mitigating impacts to Cattaraugus Creek. This will be accomplished through a combination of downgradient groundwater monitoring, groundwater elevation monitoring, and surface water monitoring in Cattaraugus Creek. The Post-Remedial Groundwater and Surface Water Monitoring Plan, presented as Appendix A, describes the monitoring program in detail.

The performance evaluation compares the groundwater monitoring data to NYSDEC Class GA groundwater quality standards and guidance values, as well as historic and ongoing results to check for concentration trends. Surface water data is compared to NYSDEC Class C(T) surface water standards.

4.0 REDEVELOPMENT-RELATED MONITORING AND MAINTENANCE

4.1 Park Cover System

The park cover system, when constructed, will be maintained to provide a minimum of one foot of cover soil or suitable structural cover (buildings, paved roadways and lots, etc) over areas designated for passive recreation, and two feet of cover soil or suitable structural cover over areas designated for active recreation. Active recreation includes uses such as athletic fields, playground areas and other areas where a reasonable potential for contact with cover soils is expected. Passive recreation includes uses such as unpaved walking trails, non-paved parking and other uses with limited potential for contact with cover soils. Cover soil is vegetated with grasses or other vegetation to mitigate erosion. The Site Management plan provides additional detail concerning the cover system requirements.

The Village of Gowanda will routinely monitor the cover system to verify that cover soils have not been eroded, removed (e.g., by burrowing animals) or otherwise compromised. All such areas will be immediately repaired with cover soil meeting the following criteria:

- Soil originates from known sources having no evidence of disposal or releases of hazardous substances, hazardous, toxic or radioactive wastes, or petroleum.

- No off-site materials meeting the definition of a solid waste as defined in 6NYCRR, Part 360-1.2(a) is used as backfill.

- For active recreational areas, the soil meets the lower of the protection of groundwater or the protection of public health soil cleanup objectives for restricted residential-type uses, as set forth in Table 375-6.8(b).

- For passive recreational areas, the soil meets the lower of the protection of groundwater or the protection of public health soil cleanup objectives for commercial-type uses, as set forth in Table 375-6.8(b).

Similarly, for any areas where constructed cover is used to provide surface barrier between receptors and site soil/fill, the cover is inspected and routinely repaired, if

necessary, to prevent contact with soil/fill by receptors. This includes repair of potholes, broken concrete, etc.

4.2 Annual Inspection & Certification Program

The entire Peter Cooper Gowanda Site will be inspected at the frequency specified in the Site Management Plan by a Qualified Environmental Professional (QEP) representing GARC and/or the Village of Gowanda. This QEP will, at a minimum, hold a 4-year college degree in environmental sciences or engineering, and be supervised by a New York State Licensed Professional Engineer. The Annual Certification will be stamped and signed by a New York State Licensed Professional Engineer and certify and attest that the institutional controls and/or engineering controls employed at the Site (i.e., environmental easement and cover) are unchanged from the previous certification and

- Are in place and effective.
- Are performing as designed.
- That nothing has occurred that would impair the ability of the controls to protect the public health and environment.
- That nothing has occurred that would constitute a violation or failure to comply with any operation and maintenance plan for such controls.
- Access is available to the Site to evaluate continued maintenance of such controls.

The Annual Certification will be submitted to the New York State Department of Environmental Conservation and New York State Department of Health. Additional requirements concerning the annual inspection are identified in the Site Management Plan.

5.0 CONTINGENCY MEASURES

5.1 General

The objective of this Section is to establish procedures for handling cover system damage or other detrimental Site conditions that occur outside the scope of routine maintenance.

Natural occurrences such as storms, drought, and subsidence are considered "expected occurrences" and are addressed under Sections 3.0 and 4.0. Other occurrences that are not expected to occur but may be discovered during a routine post-closure inspection are presented below. All corrective action, where appropriate, is executed in a timely fashion after notifying the USEPA Site Project Coordinator.

5.2 Leachate Breakout

Leachate breakouts through the cover system or seep/groundwater collection system liner would typically be discovered during regularly scheduled site inspections. Breakouts are often characterized by clear or discolored localized seepage exhibiting sulfur or ammonia-type odor. The most likely location for such a breakout would be along the lower slope or toe of the consolidated fill area or the creek bank. Damage from such a breakout will be repaired as quickly as possible with materials and methods as specified in the remedial construction specifications (see Appendix C).

If cover repair/supplement methods to control leachate are unsuccessful, a work plan will be prepared for submittal to and approval by USEPA, to determine appropriate response efforts. These may include more aggressive actions to control, minimize, or eliminate the conditions that are contributing to leachate breakout, or collection and onsite or offsite treatment and disposal of leachate.

5.3 Severe Erosion and Compromise of Elevated Fill Subarea Cover System Integrity

Similar to leachate breakouts, erosion and a compromise of the Elevated Fill Subarea cover system integrity would be discovered during regularly scheduled site inspections. The cause of severe erosion will be investigated and repairs will be made consistent with the remedial construction specifications. These may include:

- Stripping and stockpiling topsoil and barrier protection layer material from the affected area for major soil cover material repairs.
- Regrading and recompacting the affected area with barrier soils in accordance with the specifications for barrier layer construction.
- Replacing topsoil and reseeding in accordance with the specifications for topsoil and turf.

If the cause of severe erosion is attributable to a condition that is likely to be frequently repeated (e.g., a surface water shedding pattern), a Work Plan will be submitted to USEPA describing a proposed design modification to mitigate the problem.

5.4 Unauthorized Dumping or Disposal

Unauthorized dumping or waste disposal will be reported to local law enforcement officials. Appropriate measures will be taken to determine the waste characteristics, containment requirements, and necessary removal techniques. The waste will be removed and disposed of at an approved disposal facility. Efforts will be taken to eliminate further dumping and restrict subsequent entry to the site. Persons found responsible for illegal dumping will be prosecuted according to the law and will be held accountable for all costs incurred in removing and disposing the waste.

5.5 Vectors

As a part of each site inspection event, evidence of vectors will be recorded and described in the Post-Closure Field Inspection Report. Vectors include but are not limited to rodents, insects and birds. In the event that a vector problem does arise, a plan for corrective action (e.g., trapping or extermination program implemented by licensed professionals) will be submitted to the USEPA for approval and implemented accordingly.

5.6 Air Contamination

Based on Remedial Investigation findings, gas venting to the atmosphere is not anticipated to present a health or fire risk. Should it be suspected that methane gas generation poses an explosion or human health hazard, Benchmark will notify the USEPA. If it is determined that such a hazard is present, a work plan will be developed, for submission to and approval by the USEPA, to determine if the venting system is functioning

properly and to determine the appropriate response actions. Possible response actions include replacing portions of the venting system, adding new vents, or installing an active gas withdrawal system. Any proposed remedial actions would be approved through the USEPA prior to implementation

5.7 Fire

Fires will be immediately reported to the local fire department. Fires will be quenched according to approved fire department protocol. Damage to the gas vents, surface drainage system, or final cover materials will be repaired where these systems have been compromised.

5.8 Vandalism

Vandalism will be reported to the local law enforcement authorities. If vandals have damaged the site, appropriate measures will be taken to eliminate or restrict future access. Vandalism to site structures, including gas and groundwater collection, groundwater monitoring and surface water management systems will be repaired as appropriate where the damage is determined to have compromised the integrity of the final cover or the function of the surface drainage system. Persons found in the act of site vandalism will be prosecuted according to the law and will be held responsible for all costs incurred in repairing the damage to pre-existing conditions.

5.9 Emergency Phone Numbers

The following telephone numbers should be used in the event of an emergency at the site:

<u>Hospital</u>
Bertrand Chaffee Hospital
224 East Main Street
Springville, NY 14141
(716) 592-2871

<u>Ambulance</u>
Gowanda Ambulance Service
56 Chestnut Street
Gowanda, NY 14070
(716) 532-2323

<u>Fire Department</u>
Gowanda Fire Dept.
27 E Main St. # 3
Gowanda, NY 14070
(716) 532-3434

<u>Police</u>
Gowanda Police Dept.
27 E Main Street
Gowanda, NY 14070
(716) 532-2020

The site location is: Peter Cooper Landfill Site
Palmer Street and Broadway
Gowanda, New York 14070

5.10 Emergency Procedures and Evacuation Route

Benchmark and employees or contractors hired by either GARC or the Village of Gowanda who may be working at the site are informed of the site location, layout, and potential site safety hazards. In case of an emergency, all on-site personnel meet at the northwest end of the access road where it intersects with Palmer Street and await further instruction. Figure 4 presents the hospital route. Directions to the hospital are as follows (approximately 1.5 miles):

1. From the Site turn right onto Palmer St.
2. Continue on Palmer Street until it becomes Commercial Street.
3. Continue on Commercial Street until it becomes South Water Street and turn right onto West Main Street (US-62/Route 39).
4. Turn left onto Buffalo Street (US-62/Route 39).
5. Turn right onto Sand Hill Road (US-62/Route 39) continue to follow US-62/Route 39.
6. Turn right on to Bagdad Road.
7. Turn right onto Route 39, continue to follow Route 39 for 13.7 miles.
8. Route 39 becomes East Main Street, turn left into Hospital at 224 East Main Street. Proceed to Emergency Room.

6.0 HEALTH AND SAFETY PLAN

The Health and Safety Contingency Plan (HSCP) developed for use during implementation of remedial measures is used by Benchmark during post-remedial on-site activities. Site representatives, contractors, and any other persons performing work at the Site are required to develop and enforce a HSCP as or more stringent than Benchmark's HSCP.

7.0 DOCUMENTATION REQUIREMENTS

7.1 Semi-Annual Reporting

All groundwater monitoring data is submitted to the site contacts listed in Section 2.0 on a semi-annual basis approximately 60 days after completion of sampling activities unless otherwise agreed to with the USEPA. This information is accompanied by a brief cover letter from Benchmark that summarizes the environmental data, describes the monitoring covered by the reporting period, and notifies the USEPA of any problems/corrective measures taken.

It is the intention of the Post-Remedial Groundwater and Surface Water Monitoring Plan to perform semi-annual (i.e., spring and fall) monitoring for the first two years of post-closure. Subsequent to completion and semi-annual report submission, a request for reduction in the groundwater monitoring frequency and parameters will be submitted to the USEPA.

7.2 Annual Reporting

An Annual Monitoring and Maintenance Summary Report, which includes the following, is prepared by Benchmark or other CPRP-designated representative and submitted to the site contacts listed in Section 2.0:

- Results of post-closure site inspections.
- A discussion of site maintenance activities.
- A summary of groundwater elevation measurements. These results are tabulated and used to prepare groundwater isopotential contour maps.
- A summary of semi-annual monitoring results including contraventions of New York State Water Quality Standards.
- A discussion of sample analytical results, including elevations of parameters above background concentrations.
- A discussion of changes in groundwater quality that has occurred throughout the year.
- Any proposed changes to the Post-Remedial Groundwater and Surface Water Monitoring Plan.

In addition, the certification report, described in Section 4.2, is prepared and submitted by GARC and/or the Village of Gowanda to the NYSDEC and NYSDOH annually.

8.0 REFERENCES

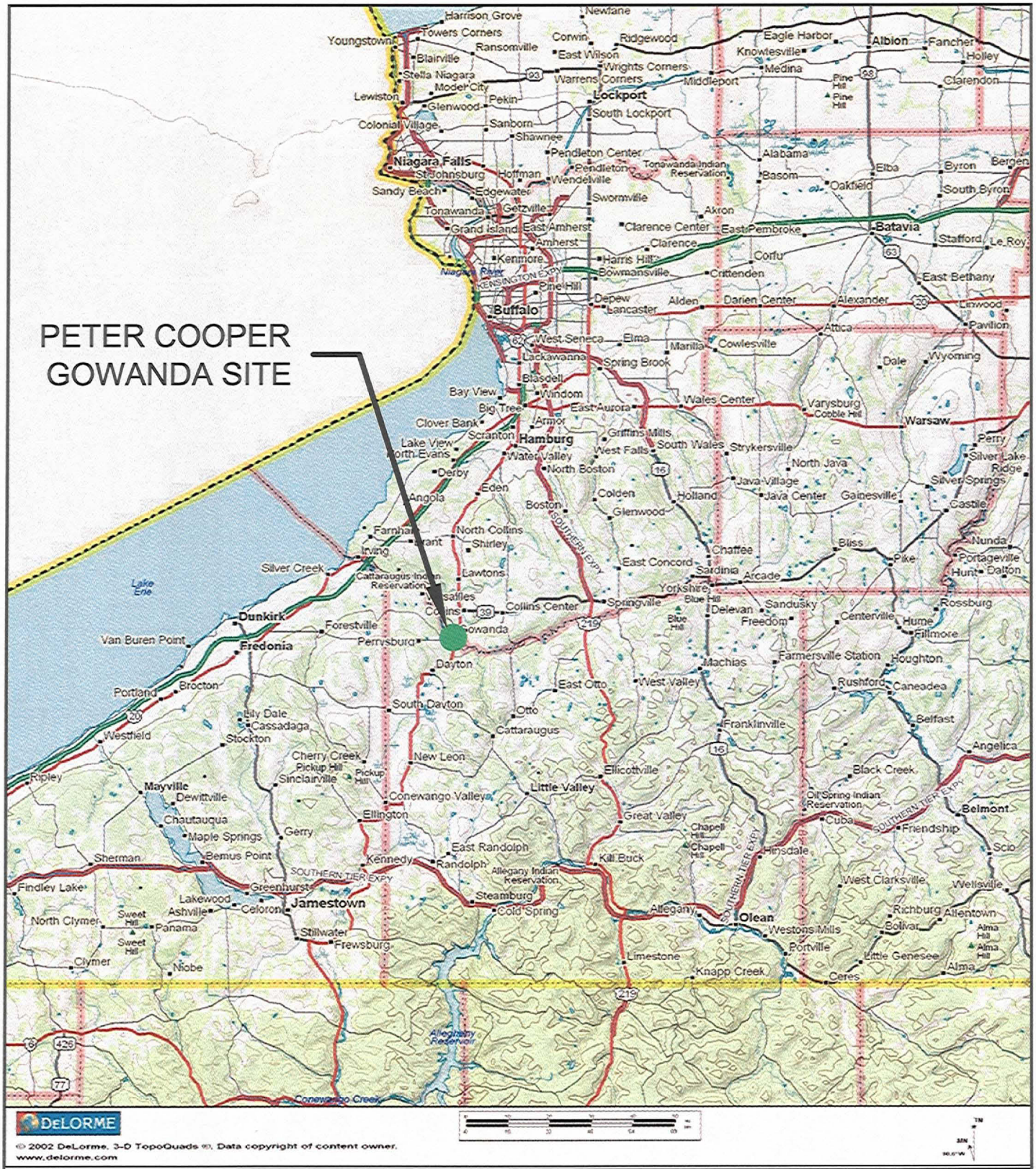
1. University at Buffalo Center for Integrated Waste Management, December 2002. *Reuse Assessment and Concept Plan – Peter Cooper Gowanda Superfund Site.*

2. Benchmark Environmental Engineering and Science, PLLC. September 2010. *Remedial Action Report for Peter Cooper Landfill Superfund Site, Gowanda, New York.*

FIGURES

F:\CAD\Benchmark\Collier Shannon\Gowanda Site\Site Management Plan\OM&M\Figure 1; Regional Vicinity Map.dwg, 9/16/2010 10:30:54 AM, Adobe PDF

FIGURE 1



BENCHMARK
Environmental Engineering & Science, PLLC
2558 HAMBURG TURNPIKE
SUITE 300
BUFFALO, NEW YORK 14218
(716) 856-0599

PROJECT NO.: 0021-001-900

DATE: SEPTEMBER 2010

DRAFTED BY: JCT

REGIONAL VICINITY MAP

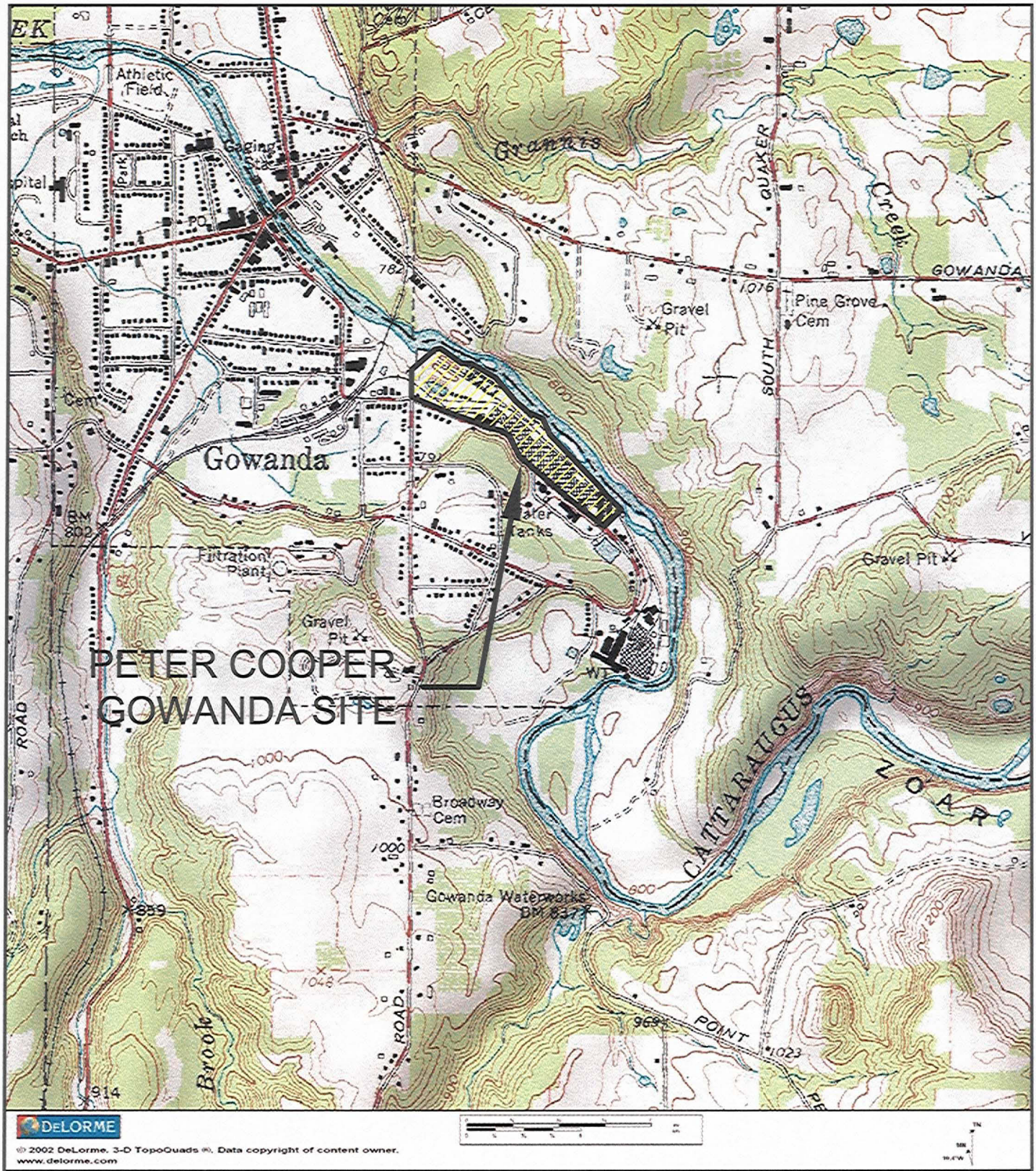
SITE MANAGEMENT PLAN - OM&M PLAN

PETER COOPER GOWANDA SITE
GOWANDA, NEW YORK

PREPARED FOR
RESPONDANTS FOR PETER COOPER GOWANDA SITE

F:\CAD\Benchmark\Collier Shannon\Gowanda Site\Site Management Plan\OM&M\Figure 2; Site Location Map.dwg, 9/16/2010 10:33:23 AM, Adobe PDF

FIGURE 2



BENCHMARK Environmental Engineering & Science, PLLC

2558 HAMBURG TURNPIKE
SUITE 300
BUFFALO, NEW YORK 14218
(716) 856-0599

PROJECT NO.: 0021-001-900

DATE: SEPTEMBER 2010

DRAFTED BY: JCT

SITE LOCATION MAP

SITE MANAGEMENT PLAN - OM&M PLAN

PETER COOPER GOWANDA SITE
GOWANDA, NEW YORK

PREPARED FOR
RESPONDANTS FOR PETER COOPER GOWANDA SITE

F:\CAD\Benchmark\Collier Shannon\Gowanda Site\Site Management Plan\OM&M\Figure 3; OMM Site Plan.dwg, 9/16/2010 4:00:45 PM, Adobe PDF

DATE: APRIL 2006 (REV. SEPTEMBER 2010)
DRAFTED BY: BCH (REV. AJZ)

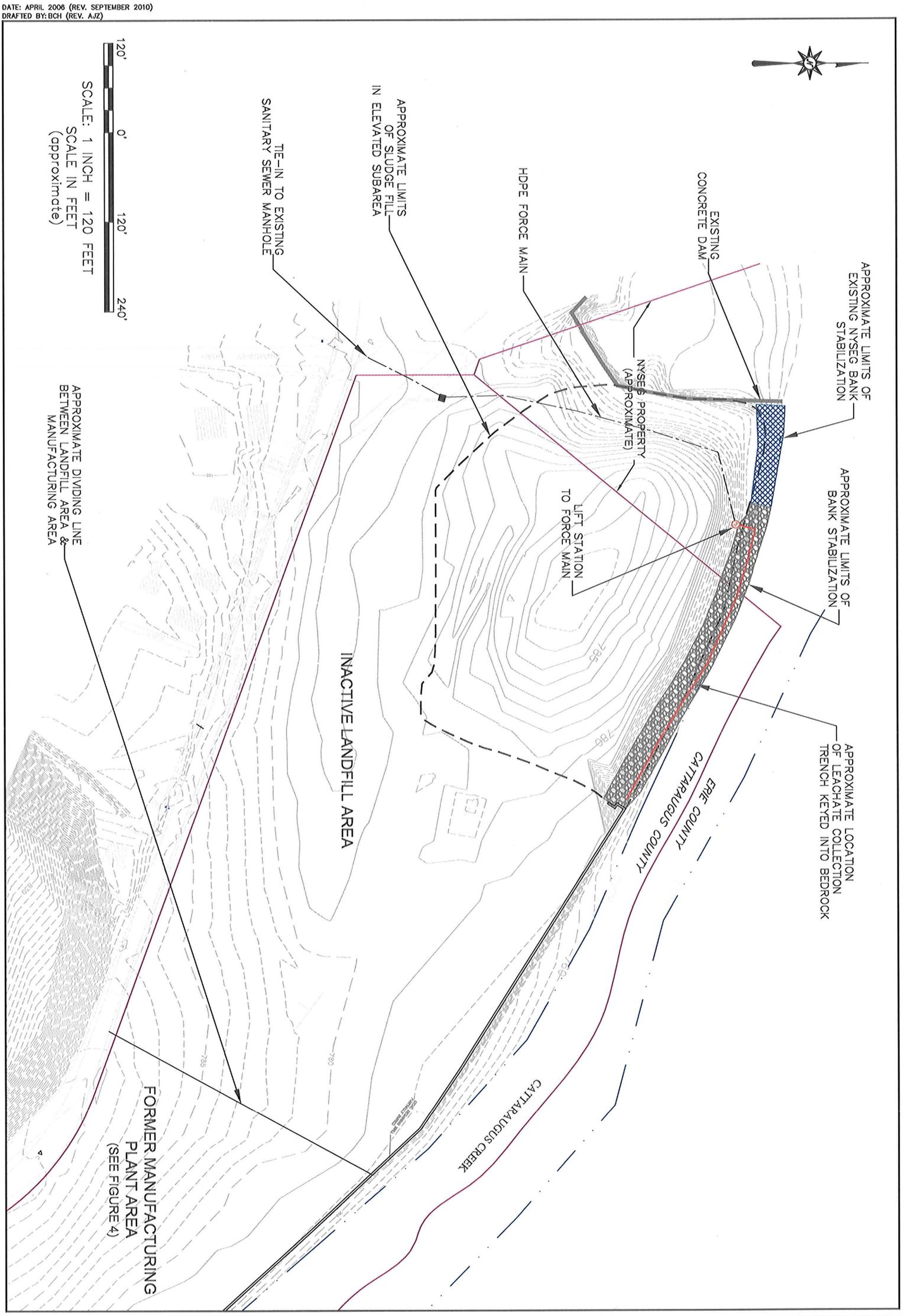


FIGURE 3

OM&M SITE PLAN

SITE MANAGEMENT PLAN - OM&M PLAN

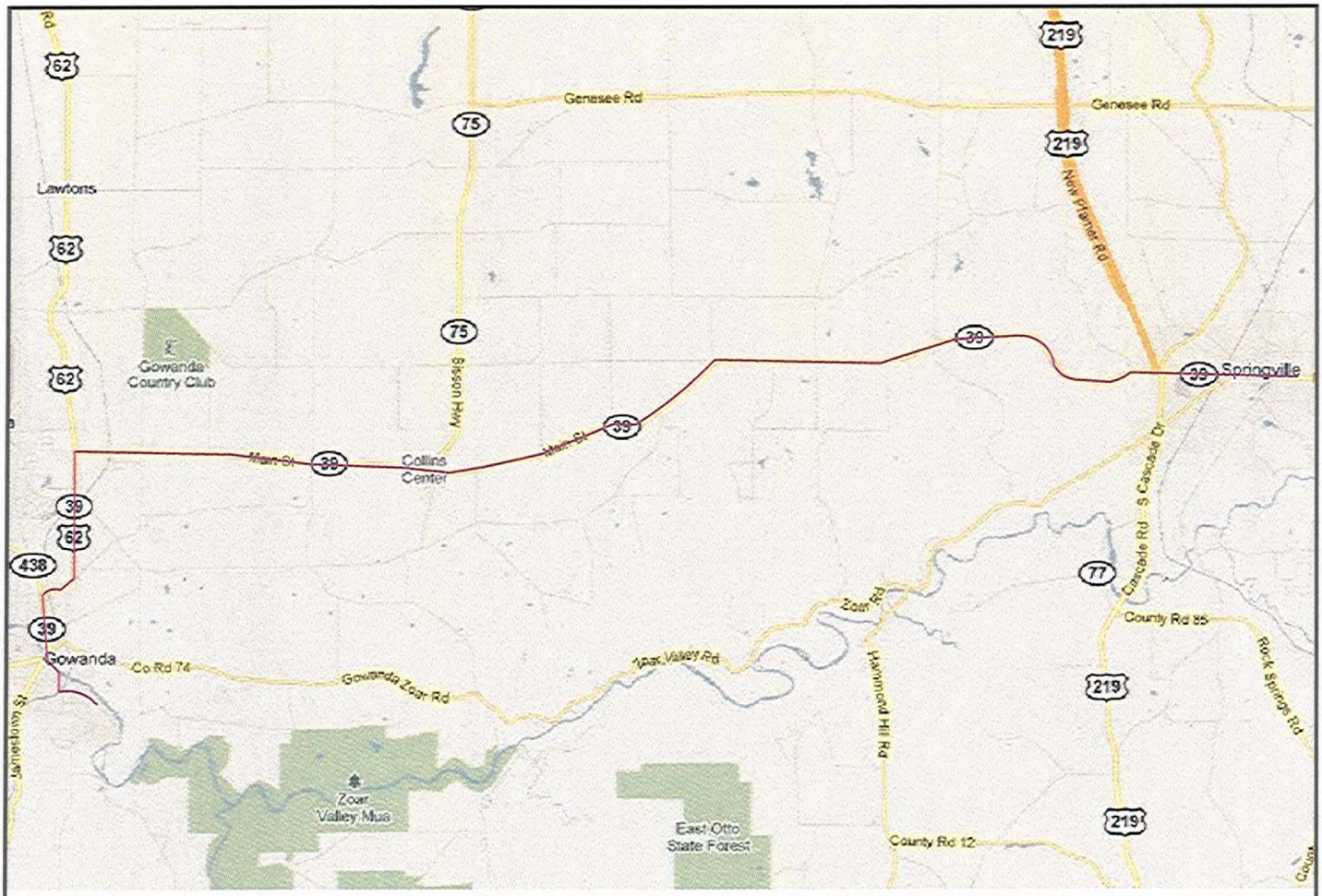
PETER COOPER GOWANDA SITE
GOWANDA, NEW YORK

PREPARED FOR
RESPONDENTS FOR PETER COOPER GOWANDA SITE

BENCHMARK Environmental Engineering & Science, PLLC
2558 HAMBURG TURNPIKE
SUITE 300
BUFFALO, NEW YORK 14218
(716) 856-0599

JOB NO.: 0021-001-900

FIGURE 4



Bertrand-Chaffee Hospital
224 East Main Street
Springville, New York 14141
Phone: (716) 592-2871
Emegency: 911

DIRECTIONS:

1) Head northwest on Palmer St toward Broadway Rd.
2) Take slight right at Commercial St.
3) Continue onto S Water St.
4) Turn right at West Main St.
5) Take first left onto Buffalo St.
6) Turn right at NY-39E/US-62N/Sand Hill Rd.
7) Continue to follow NY-39E/US-62N.
8) Turn right at NY-39E/Main St.
9) Continue to follow NY-39E.
10) Bertrand-Chaffee Hospital will be on the left.

N

2 MI 0' 2 MI 4 MI

SCALE: 1 INCH = 2 MILES
(approximate)

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC
2558 HAMBURG TURNPIKE
SUITE 300
BUFFALO, NY 14218
(716) 856-0599

PROJECT NO.: 0021-001-900
DATE: OCTOBER 2020
DRAFTED BY: JCT

HOSPITAL ROUTE MAP

SITE MANAGEMENT PLAN - OPERATION & MAINTENANCE

PETER COOPER GOWANDA SITE
GOWANDA, NEW YORK
PREPARED FOR
RESPONDANTS FOR PETER COOPER GOWANDA SITE

APPENDIX A

POST-REMEDIAL GROUNDWATER AND SURFACE WATER MONITORING PLAN

POST-REMEDIAL GROUNDWATER AND SURFACE WATER MONITORING PLAN

PETER COOPER LANDFILL NPL SITE
GOWANDA, NEW YORK

March 2009
Revised September 2010

0021-001-900

POST-REMEDIAL GROUNDWATER AND SURFACE WATER MONITORING PLAN

PETER COOPER LANDFILL NPL SITE GOWANDA, NEW YORK

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POST-REMEDIAL GROUNDWATER AND SURFACE WATER MONITORING PLAN

PETER COOPER LANDFILL NPL SITE GOWANDA, NEW YORK

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APPENDICES

1.0 PURPOSE AND OBJECTIVES

The purpose of this Post-Remedial Groundwater and Surface Water Monitoring Plan is to identify and document the methods that will be employed at the Peter Cooper Landfill NPL Site (referred to as the Peter Cooper Gowanda Site) to monitor the effectiveness of the remedial measures in protecting against detrimental impacts to Cattaraugus Creek. Accordingly, this Plan identifies groundwater and surface water sampling locations, collection procedures, analytical parameters and methodology, and data reporting and interpretation requirements that will be implemented following construction of the recommended remedial measures.

This Plan contains eight sections:

- Section 2.0 identifies the post-remedial groundwater and surface water locations to be monitored.
- Section 3.0 identifies the monitoring parameters and frequency.
- Section 4.0 presents field sampling procedures to be employed at the site.
- Section 5.0 specifies analytical methods and quality control requirements.
- Section 6.0 presents corrective action measures to be taken in the event of changed field conditions or failure to meet quality assurance goals.
- Section 7.0 identifies data evaluation and reporting requirements
- Section 8.0 presents references cited in this report.

2.0 MONITORING NETWORK

The Remedial Investigation Report (Ref. 1) identifies two primary groundwater zones at the site: overburden and bedrock groundwater. Generally, there is a horizontal groundwater flow component within the overburden and bedrock toward Cattaraugus Creek. Groundwater in the overburden and bedrock ultimately discharges to Cattaraugus Creek creating an upward gradient toward the Creek within the bedrock (Ref. 1). Because of this upward gradient in the bedrock, downward migration of the Chemicals of Potential Concern (COPCs) (see Section 4.0 of this report) is not likely to occur; therefore, the overburden monitoring wells at the site are considered adequate to evaluate upgradient and downgradient groundwater quality. Additional monitoring will be conducted in Cattaraugus Creek, the receiving surface water body. A description of the monitoring network is presented in the following sections.

2.1 Groundwater Monitoring Locations

Groundwater monitoring will be performed at the network locations shown on Figure 1 and listed below. The "S" identifier indicates a shallow overburden monitoring well and the "R" identifier indicates a replacement monitoring well.

- Upgradient monitoring well MW-7S.
- Perimeter downgradient monitoring wells MWFP-2S, MWFP-3S, MW-2SR, and MW-5S.

In addition, the following locations shown on Figure 2 will be monitored for water elevation information to facilitate preparation of overburden isopotential maps:

- Monitoring wells MW-6S and MW-1SR.

Appendix A includes the borehole logs for the groundwater monitoring wells identified in this section.

2.2 Surface Water Monitoring Locations

Surface water monitoring will be performed at the three network locations shown on Figures 1 and 2; identified as: SW-1 (upstream), SW-2 (midstream), and SW-3 (downstream).

3.0 MONITORING PROGRAM

Environmental monitoring will be conducted at specific monitoring wells and surface water locations at the Site. Details concerning the planned monitoring frequency, parameters, and analytical methods are described below. Table 1 presents a summary of the monitoring program requirements.

3.1 Groundwater Monitoring

Groundwater monitoring will include both water quality and water level monitoring. Water level monitoring is intended to detect seasonal changes in the groundwater flow direction and to illustrate hydraulic capture along the Inactive Landfill/Cattaraugus Creek area of the site by the groundwater collection system. Groundwater elevation monitoring will be performed at all monitoring well/piezometer locations identified on Table 1.

Groundwater samples will be collected at the well locations identified in Section 2.1. Procedures for well sampling are discussed in Section 5.0. Groundwater levels will be recorded prior to well purging. Groundwater samples will be collected on a semi-annual (spring and fall) basis for the first two years of monitoring, and may be reduced to annually thereafter if the data supports the reduction. Groundwater samples will be analyzed for the laboratory and field parameters identified in Table 1.

3.2 Surface Water Monitoring

Surface water samples will be collected at the locations identified in Section 2.2. Procedures for surface water sampling are discussed in Section 5.0. As with the groundwater samples, surface water samples will be collected on a semi-annual (spring and fall) basis for the first two years of monitoring, and reduced to annually thereafter if the data supports the reduction. Surface water samples will be analyzed for the laboratory and field parameters identified in Table 1.

4.0 FIELD SAMPLING PROCEDURES

This section describes the sampling procedures that will be implemented at the Peter Cooper Gowanda Site during routine environmental monitoring events.

4.1 Pre-Sampling Preparation

Prior to a scheduled sampling event, the following steps will be taken by personnel responsible for sampling:

- Review the sampling procedures.
- Assemble and inspect all field equipment necessary for sample collection.
- Verify that equipment is clean and in proper working order.
- Field test equipment will be calibrated at the beginning of each sampling day, and will be checked and recalibrated according to manufacturer's specifications. Field instrumentation will be maintained and operated according to the applicable guidelines presented in Appendix B.
- Examine shuttles, bottles, labels and preservatives; contact laboratory immediately if any problems are discovered.
- Confirm sample delivery time and method of shipment with the laboratory.
- Establish a sampling team of at least two people.
- Establish monitoring well evacuation and sampling schedule for the activities of each day.
- Establish surface water sampling schedule for the activities of each day.

4.2 Groundwater Sampling

The following applicable field operating procedures (FOPs) to be employed for collecting representative groundwater samples from monitoring wells are provided in Appendix B:

- Groundwater Level Measurement
- Low Flow (Minimal Drawdown) Groundwater Purging Procedures
- Groundwater Sample Collection Procedures

Sample collection equipment will consist of a peristaltic pump and dedicated pump tubing following low-flow purge and sample collection procedures. Prior to sample collection, groundwater will be evacuated from each well at a low-flow rate (approximately

0.1 L/min) and field measurements for pH, Eh, specific conductance, temperature, turbidity, dissolved oxygen, visual and olfactory observations and water level will be periodically recorded and monitored for stabilization. Purging will be considered complete when pH, specific conductivity and temperature stabilize and when the turbidity is measured below 50 NTU, or stabilized above 50 NTU. Stability is defined as the variation between field measurements of 10 percent or less and no overall upward or downward trend in the measurements. Once field parameters have stabilized, groundwater samples will be collected and analyzed for the parameters presented in Table 1.

As described in FOP 031.0, groundwater samples collected for volatile organic compound (VOC) analysis will not be sampled directly through the peristaltic pump due to potential degassing (i.e., loss of VOCs) of the groundwater sample. Instead, upon collection of the VOC samples, the pump will be turned off and the pressure on the flexible walled tubing within the pump head maintained in order to prevent water within the tubing from escaping. The tubing will then be removed from the well and coiled as to prevent any contact with the ground surface. Upon removal of the tubing, the pressure on the pump head will be slowly released allowing the trapped groundwater to flow into the VOC sample jars. Prior to and immediately following collection of groundwater samples, field measurements for pH, specific conductance, temperature, turbidity, Eh, dissolved oxygen, visual and olfactory observations and water level will be recorded.

4.3 Surface Water Sampling

Applicable FOPs to be employed for collecting representative surface water samples are provided in Appendix B. Sample collection equipment will consist of pre-cleaned, pre-preserved laboratory provided sample bottles. Surface water samples will be collected via direct grab starting with the furthest downstream sample location and proceeding upstream to minimize impacts on sample quality.

Each surface water sample will be collected from each designated location by slowly submerging each sample bottle with minimal surface disturbance. For pre-preserved bottles, completely submerging the bottle and overfilling will be avoided to prevent preservative loss. Pre-preserved VOC vials will be filled from a second, unpreserved, pre-cleaned glass container to facilitate zero headspace filling. Prior to and immediately following collection of surface water samples, field measurements for pH, specific conductance, temperature, turbidity, Eh, dissolved oxygen, visual and olfactory observations will be recorded.

4.4 Post-Sampling Handling

All collected groundwater and surface water samples will be placed in pre-cleaned, pre-preserved laboratory provided sample bottles, cooled to 4°C in the field, and transported under proper chain-of-custody command to a qualified testing laboratory for analysis within proper holding times (see Section 6.2). A chain-of-custody form will be completed for each bulk container (i.e., cooler) of collected samples. The chain-of-custody form will be signed and dated by the person who performed sample collection, the person the samples were relinquished to for transport to the laboratory (if applicable) and the laboratory sample custodian who receives the samples. The FOP for sample labeling, storage, and shipment is presented in Appendix B. The types and frequencies of field QA/QC samples to be collected are discussed in Section 6.0 of this report.

4.5 Field Equipment Cleaning

Non-dedicated purging equipment and water level monitoring probes will be cleaned before each use in accordance with the procedure for Non-Disposable and Non-Dedicated Sampling Equipment Decontamination presented in Appendix B. Peristaltic pump tubing will be dedicated to each monitoring well and will not require cleaning other than that provided by the manufacturer. Dedicated equipment must be maintained within the sealed original manufacturer's packaging prior to installation at each monitoring location.

4.6 Documentation of Field Activities

The results of all field measurements and associated calculations will be recorded on standard forms included with the FOPs presented in Appendix B. During all activities, the following general information will be recorded on appropriate data sheets:

- Date
- Field sampling crew members
- Meteorological conditions
- Brief description of field activities planned for date indicated
- Tailgate Health and Safety meeting topics
- Location where work is performed
- Problems encountered and corrective actions taken
- All field measurements or descriptions made
- Any modifications made to sampling procedures

In addition, the following information will be recorded by the Field Team Leader during the collection of all environmental samples:

- Sample Locations and summary of the samples collected
- Completeness of the sampling effort
- Sample descriptions
- Results of all field measurements
- Results of field instrument calibrations
- Sample preservation used (if applicable)
- Chain-of-custody information.

All original forms and field notebooks will be placed in a project record file maintained at an agreed upon location.

5.0 SAMPLE ANALYTICAL PROGRAM

5.1 Parameters for Physical/Chemical Analysis

Tables 1 and 2 list the parameters to be analyzed in the groundwater and surface water monitoring programs.

5.2 Analytical Methods/Protocols

Table 2 presents the methods to be used for chemical analysis of all samples collected during this monitoring program. The sampling holding times, preservation, and container requirements are also presented.

5.3 Groundwater Monitoring Program Field Quality Control Samples

The following field quality control samples will be analyzed in support of the groundwater monitoring program at the Peter Cooper Gowanda Site:

- **Trip Blanks** - A sufficient number of trip blanks for VOC analysis will be prepared by the laboratory and delivered to the sampling team prior to a sampling event. One sealed blank will be carried into the field per day along with the sample containers for each day that volatile organic samples are collected. Trip blanks will be transported and handled in the same manner as the actual samples. The results of the trip blank analysis will be reviewed to evaluate if the potential for sample contamination during transportation and handling exists.
- **Blind Duplicate** - One blind duplicate will be collected and analyzed per 20 samples collected during each groundwater/surface water sampling event. The field sample containers will be returned to the laboratory identified only as the "blind duplicate". The well or sample location will be recorded in the Project Field Book and on the respective Water Sample Collection Log (see Appendix B) and the results will be compared to review analytical precision.
- **MS/MSD** – A sufficient volume of sample will be collected at one sampling location per sampling event for matrix spike/matrix spike duplicate (MS/MSD) analysis. The laboratory will report the results of the MS/MSD analysis, which will be reviewed for sampling and analysis precision and accuracy.

5.4 Laboratory Quality Control/Reporting Requirements

Laboratory quality control and reporting requirements will be as identified in the sections below.

5.4.1 General

- The laboratory will perform all standard in-house QA/QC necessary to control the introduction of contamination in the lab and to insure the accuracy and precision of the data.
- The laboratory will strictly adhere to the quality control requirements specified in the analytical method references presented in Table 2.
- All laboratories involved in the monitoring program must be certified in the New York State Department of Health (NYSDOH) National Environmental Laboratory Approval Program (NELAP) for the parameters being analyzed.

5.4.2 Laboratory Quality Control Analyses

The laboratory will analyze the following quality control samples in addition to the field quality control samples described above:

- **Method Blanks** – Method Blanks will be analyzed at least once per batch. If a particular reagent or piece of analytical equipment used is changed during preparation of a sample batch, additional testing will be required.
- **Surrogates** – For volatile organic analyses, surrogate standards are added to each sample and recoveries are calculated for method performance accuracy. Surrogate standard recoveries will be reported according to USEPA SW-846 reporting and deliverable requirements.

5.4.3 Reporting and Deliverable Requirements

The laboratory(ies) must adhere to USEPA SW-846 reporting and deliverable requirements unless otherwise directed. The laboratory will submit the analytical report within 30 business days of receipt of the last batch of samples. The analytical report will also include for each sample:

- Sample location/sample number
- Date collected
- Date extracted or digested
- Date analyzed
- Analytical methodology (including preparation methodology)

- Method detection limits
- Sample dilution factor (if applicable)
- Chain-of-Custody forms

The analytical report also must contain a case narrative that will describe all QA/QC problems encountered during sample analysis. For each sample for which QA/QC problems are encountered, the following specific information will be reported in the case narrative:

- Sample identification number
- Sample matrix
- Parameters analyzed
- Data acceptance criteria exceeded
- Specific analytical problems that occurred
- Corrective action taken or attempted to resolve the problem(s)

5.5 Custody Procedures

Sample custody is controlled and maintained throughout the sample collection and analysis process. These procedures track and control the possession of sample from their source, in the field, to their final disposition, the laboratory. Laboratory chain-of-custody procedures further track the custody of samples during their tenure at the laboratory. A sample is in custody if it is:

- In someone's physical possession;
- In someone's view after being in physical possession;
- In a designated secure area; or
- Placed in a locked container by an authorized individual.

This section discusses procedures to be used to adequately control and document sample custody.

5.5.1 Chain-of-Custody (COC) Forms

Chain-of-custody (COC) forms will be used to document the possession and transfer of custody of all samples. Typical information that will be supplied on the forms includes, but is not limited to:

- Field sample identification;
- Sample date and time of collection;

- Type of sample container;
- Sample location and depth (if applicable);
- Size and number of containers; and
- Analyses required.

.

The COC form will be initiated and signed by the field sampling team. The method of shipment, name of the courier and any other pertinent information should be entered in the "remarks" section. The original copy accompanies the sample shipment and a copy is retained by the Field Team Leader. The completed COC form will be placed in a resealable plastic bag and taped to the underside of the lid of the cooler containing the samples designated on the form. A copy of the carrier air-bill (if applicable) will be retained as part of the permanent COC documentation.

When relinquishing custody, the transferor and transferee must sign, date and time the COC form. Each person accepting custody of sample(s) will note their condition on the form. This record documents transfer of custody of samples from the sampler to another person, to the laboratory or to/from a secure storage area.

5.5.2 Custody Seals

Custody seals are preprinted adhesive-backed seals with security slots designed to break if the seals are disturbed. Custody seals should be placed on sample shipping containers as necessary to detect tampering. Seals must be signed and dated prior to using. Clear strapping tape should be placed over the seals to ensure that the seals are not accidentally broken during shipment, while maintaining an accurate assessment of the shipment integrity.

5.5.3 Field Custody Procedures

The sample packaging and shipment procedures summarized below will ensure that the samples will arrive at the laboratory with the COC intact. The procedures for sample numbering are included in Appendix B. The basic COC sequence is as follows:

1. Use laboratory supplied sample containers.
2. Collect and preserve sample (if not pre-preserved) and seal container.
3. Complete sample label and place on container.

4. Document the sampling procedures and related information in the Project Field Book and on a Water Sample Collection Log form.
5. Complete COC record form.
6. Custody transfers from field sampling personnel to anyone else documented with signatures, date and time on COC record form.
7. Pack sample containers for shipment with proper preservatives and custody forms into cooler.

The Field Team Leader is personally responsible for the care and custody of the samples until they are transferred or properly dispatched. All bottles will be identified by the use of sample labels with unique sample numbers. The sample numbering system is presented in the FOP for sample labeling; storage and shipment (see Appendix B). The Field Team Leader is also responsible for the following:

- Ensuring only precleaned sample containers will be used and the coolers and/or boxes containing the empty sample containers are sealed with a custody tape seal during transportation to the field and while in storage prior to use. In the field, the precleaned sample containers will be stored in a secure location.
- Maintaining custody to so that as few individuals as possible handle the samples.
- Accurate recording and maintenance of all sample data in the Project Field Book and ensuring all appropriate forms are completed.
- Determine whether proper custody procedures were followed during the sampling event and decide if additional samples are required.
- Ensure proper completion of COC for each cooler in which samples are shipped. The samples must be shipped to the laboratory as soon as practical and must arrive within 24 hours of shipping.

5.5.4 Laboratory Custody Procedures

Laboratory custody procedures for sample receiving and log-in; sample storage and numbering; tracking during sample preparation and analysis; and storage of data will be performed in accordance with the analytical laboratory's quality assurance/quality control (QA/QC) procedures.

6.0 CORRECTIVE ACTION

Corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or performance that can affect data quality. Corrective action can occur during field activities, laboratory analyses, data validation (if applicable) and data assessment. All corrective action proposed and implemented will be documented on a Corrective Measures Report (see sample report in Appendix C). Corrective action should be implemented only after approval by the Project Manager, or his or her designee. If immediate corrective action is required, approvals should be secured by telephone from the Project Manager.

It shall be the responsibility of the project team, sampling team and laboratory staff to ensure that all measurement and sampling procedures are followed as specified and that measurement data meet the prescribed acceptance criteria. If problems are discovered, prompt corrective action will be taken.

6.1 Field Corrective Action

If errors in field procedures are found during the observation or review of field activities by project staff, corrective action will be initiated. Nonconformance to the QA/QC requirements of the field procedures will be identified immediately by project staff that know or suspect that a procedure is not being performed in accordance with the requirements. The Project Manager or his/her designee will be informed immediately upon discovery of all deficiencies. Timely action will be taken if corrective action is necessary.

Corrective actions in the field may be required when the sample network is changed or when sampling procedures and/or field analytical procedures require modification, due to unexpected conditions. In general, the Field Team Leader and Project Manager may identify the need for corrective action. The Project Manager will approve the corrective measure that will be that will be implemented by the field team and it will be the responsibility of the Project Manager to ensure that corrective action has been implemented.

Corrective actions will be documented in the Project Field Book and on a Corrective Measures Report (see sample report in Appendix C). No staff member will initiate corrective action without prior communication of findings to the Project Manager. If corrective actions are insufficient, work may be stopped by the Project Manager. Once a corrective action is implemented, the effectiveness of the action will be verified by the Project Manger.

6.2 Laboratory Corrective Action

Corrective actions may be initiated if the quality assurance goals of the project are not achieved. The initial step in a corrective action is to instruct the analytical laboratory to examine its procedures to assess whether analytical or computational errors caused the anomalous result. Sample collection and handling procedures will be concurrently reviewed to assess whether they could have contributed to the anomalous result. If no error in laboratory procedures or sample collection and handling procedures can be identified, then the laboratory Project Director will assess whether reanalysis or resampling is required, or whether any protocol should be modified for future sampling events.

6.3 Corrective Action during Data Assessment

The need for corrective action may be identified during the data assessment process. Potential types of corrective action may include resampling by the field team or reinjection/reanalysis of samples by the laboratory. These actions are dependent upon the ability to mobilize the field team, and whether the data to be collected is necessary to meet the QA objectives (e.g., the holding times for samples is not exceeded, etc.). All required corrective actions will be documented by the Project Manager and/or the laboratory.

7.0 DATA EVALUATION AND REPORTING

7.1 Groundwater Collection System

Groundwater monitoring data generated in support of the Peter Cooper Gowanda Site will be entered into a computer spreadsheet. The spreadsheet will be used to generate graphs showing the status and history of individual sampling points and compounds. The graphs and spreadsheets will also be used for historical trend analysis, to track environmental conditions as well as to assess performance of the remedial measures. A letter report will be prepared following the first semi-annual monitoring event. The letter reports will include:

- Sample collection date
- Groundwater elevation data
- Groundwater analytical results as compared to Class GA groundwater quality standards
- Surface water Analytical results as compared to Class 'D' Surface Water Quality Standards
- Upgradient well designation
- Sample location number
- QA/QC values
- Method detection limits
- Field sampling notes
- Chain-of-custody forms

An annual report will be prepared following the second semi-annual sampling event. In addition to the information described above, the annual report will include the following:

- A groundwater isopotential contour map for shallow overburden groundwater.
- A discussion of sample analytical results including elevations of parameters above background concentrations and historical trends evident from the data.
- A discussion of changes in water quality that has occurred from the previous year.

- A calculation and discussion of hydraulic loadings to the surface water body and corresponding potential for localized contravention of surface water quality standards, similar to the evaluation performed in the RI (Ref. 1).
- A discussion of any proposed changes to the Peter Cooper Gowanda Site Monitoring Plan.
- A review of the data to either reduce the sampling frequency or reduce the parameter list, if warranted.

8.0 REFERENCES

1. Geomatrix Consultants, Inc. & Benchmark Environmental Engineering and Science, PLLC, Revised November 2003. *Remedial Investigation Report – Final, Peter Cooper Landfill Site, Gowanda, New York.*

TABLES

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

TABLE 1

GROUNDWATER & SURFACE WATER MONITORING PLAN

Peter Cooper Landfill NPL Site
Gowanda, New York

Sample Location	Est. Number of Samples Per Event	Parameters	Frequency
Upgradient Monitoring Well			
MW-7S	1	TCL VOCs Total Metals[2] Field Measurements[3] Water Quality Parameters[4]	Semi-Annually
FMPA Monitoring Network Wells (water level and quality)			
MWFP-2S	1	TCL VOCs (chlorinated aliphatics only) Total Metals[2] Field Measurements[3]	Semi-Annually
MWFP-3S	1		
ILA Monitoring Network Wells (water level and quality)			
MW-2SR	1	TCL VOCs Total Metals[2] Field Measurements[3] Water Quality Parameters[4]	Semi-Annually
MW-5	1		
QA/QC Samples[1]			
Trip Blank	1	TCL VOCs	Semi-Annually
Blind Duplicate	1	TCL VOCs Total Metals[2]	Semi-Annually
Matrix Spike	1		
Matrix Spike Duplicate	1		
Monitoring Network Surface Water			
SW-1	1	TCL VOCs Total Metals[2] Water Quality[4] Field Measurements[3]	Semi-Annually
SW-2	1		
SW-3	1		
Monitoring Network Wells (water level only)			
MW-6	--	--	Semi-Annually
MW-1SR			

Notes:

1. QA/QC samples will be collected at a frequency of 1 per 20 for each matrix.
2. Total metals include: arsenic, chromium, hexavalent chromium, manganese; if field measured turbidity is greater than 50 NTU, dissolved metals will also be collected.
3. Field measurements include: pH, temperature, specific conductance, turbidity, Eh
4. Water quality parameters include: ammonia, hardness, chloride, total sulfide

Acronyms:

FMPA = Former Manufacturing Plant Area of the Site
ILA = Inactive Landfill Area of the Site
TCL = Target Compound List
VOCs = Volatile Organic Compounds

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

TABLE 2

SAMPLE CONTAINER, VOLUME, PRESERVATION & HOLDING TIME REQUIREMENTS

Peter Cooper Landfill NPL Site
Gowanda, New York

Matrix	Parameter	Method (Reference 1)	Container Type	Minimum Volume	Preservation (Cool to 4°C for all samples)	Holding Time from Sample Date
Groundwater/ Surface Water	TCL VOCs	8260B	glass vial	2-40 ml	HCl to pH<2, Zero Headspace	14 days
	Total Metals [1]	6010B/7196A	plastic	600 ml	HNO_3 to pH<2	6 months
	Ammonia	350.2	plastic	500 ml	H_2SO_4 to pH<2	28 days
	Chloride	300	plastic	50 ml	Cool to 4 °C	28 days
	Hardness, Total	130.2	plastic	100 ml	H_2SO_4 to pH<2	6 months
	Sulfide, Total	376.2	plastic	50 ml	$C_4H_6O_4Zn$+NaOH	7 days

References:

1. Test Methods for Evaluating Solid Wastes, USEPA SW-846, Update III, 1991.

Notes:

1. Total metals include: arsenic, chromium, hexavalent chromium, manganese; if field measured turbidity is greater than 50 NTU, dissolved metals will also be collected.

Acronyms:

SVOC = Semi-Volatile Organic Compounds
TCL = Target Compound List
VOC = Volatile Organic Compounds

FIGURES

F:\CAD\Benchmark\Collier Shannon\Gowanda Site\GROUNDWATER MONITORING PLAN\Figure 1; Former Manufacturing Plant Area.dwg, 9/16/2010 3:53:04 PM, Adobe PDF

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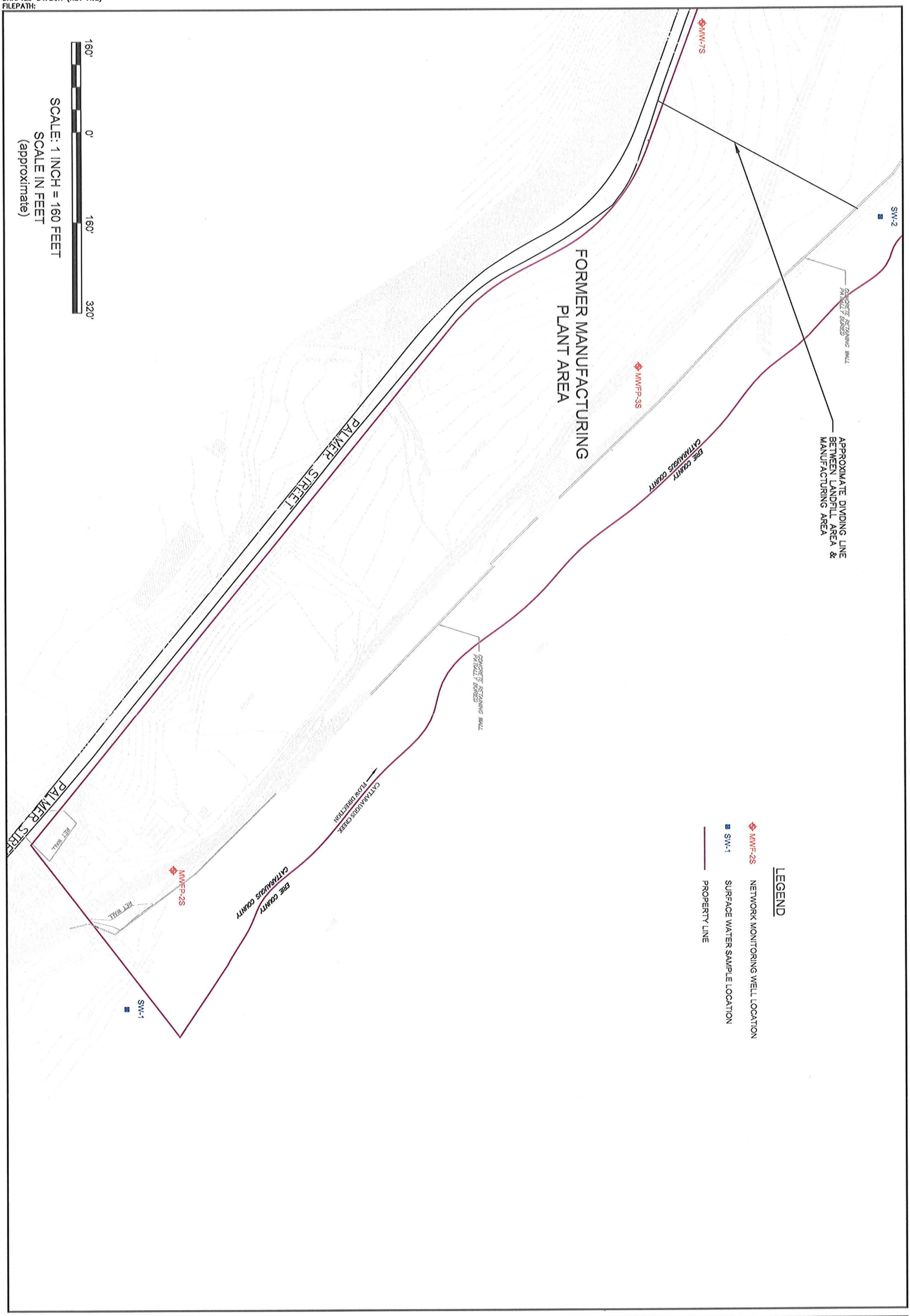

FIGURE 1

GROUNDWATER & SURFACE WATER MONITORING LOCATIONS - FORMER MANUFACTURING PLANT AREA

GROUNDWATER MONITORING PLAN

PETER COOPER GOWANDA SITE
GOWANDA, NEW YORK

PREPARED FOR
RESPONDANTS FOR PETER COOPER GOWANDA SITE

BENCHMARK Environmental Engineering & Science, PLLC
2558 HAMBURG TURNPIKE
SUITE 300
BUFFALO, NEW YORK 14218
(716) 856-0599

JOB NO.: 0021-001-900

F:\CAD\Benchmark\Collier Shannon\Gowanda Site\GROUNDWATER MONITORING PLAN\Figure 2; Inactive Landfill Area.dwg, 9/16/2010 3:53:54 PM, Adobe PDF

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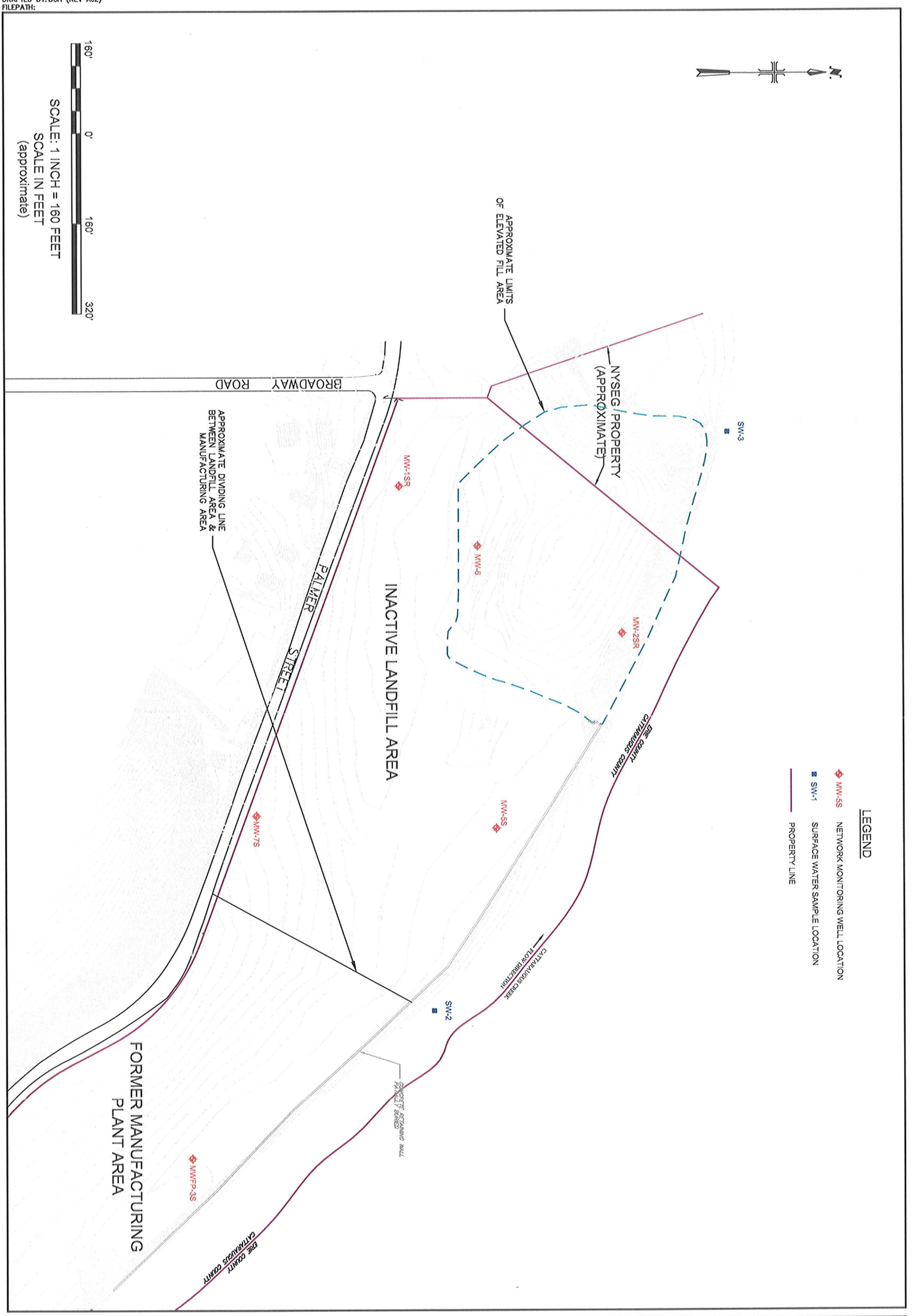


FIGURE 2

GROUNDWATER & SURFACE WATER MONITORING LOCATIONS - INACTIVE LANDFILL AREA

GROUNDWATER MONITORING PLAN

PETER COOPER GOWANDA SITE
GOWANDA, NEW YORK

PREPARED FOR
RESPONDANTS FOR PETER COOPER GOWANDA SITE

BENCHMARK Environmental Engineering & Science, PLLC
2558 HAMBURG TURNPIKE
SUITE 300
BUFFALO, NEW YORK 14218
(716) 856-0599

JOB NO.: 0021-001-900

APPENDIX A

BOREHOLE LOGS FOR NETWORK MONITORING WELLS

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING NO. MW-1R SHEET 1 OF

PROJECT LOCATION: Gowanda, N.Y.

CLIENT: Peter Cooper

SAMPLER
TYPE: Split Spoon
HAMMER: 140 lbs.
FALL: 30"

GROUND WATER
DEPTH DATE 4/13/87 ELEV. 772.37
DEPTH DATE 5/14/87 ELEV. 771.37

FILE NO.: 1171.005.130

BORING CO.: Parratt-Wolfe
FOREMAN: Mark Beck
OBG GEOLOGIST: Peter Bogardus

BORING LOCATION: Upgradient
GROUND ELEVATION: 777.40
DATES: STARTED: 12/17/87
ENDED: 12/17/87

DEPTH	SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRN/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRTUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SPL. O/OO	FIELD TESTING SP. COND.	FIELD TESTING pH	R M K S
0						Not Sampled (See ID)						
5												
10												
15												

5' of screen installed from 10.4 - 5.4
of sand pack from 10.5 - 3.5
of Bentonite pellets from 3.5 - 1.5
.5 of cement/bentonite grout 1.5 - 0

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG
File Name: PC005B.BL

Report of Boring No. MW-5
Sheet 1 of 1

Project Location: Gowanda, NY

Client: Peter Cooper

SAMPLER
Type: SPLIT SPOON
Hammer: 140 lbs.
Fall: 30"

Ground Water Depth 773.4 Date 12/15/86
Depth 773.01 Date 4/13/87

File No. 1171-005-130

Boring Co.: Parratt-Wolfe
Foreman: Mark Beck
OBG Geologist: Peter Bogardus

Boring Location: edge of fill material
Ground Elevation: 781.38
Dates: Started:08/20/86
Ended:08/20/8

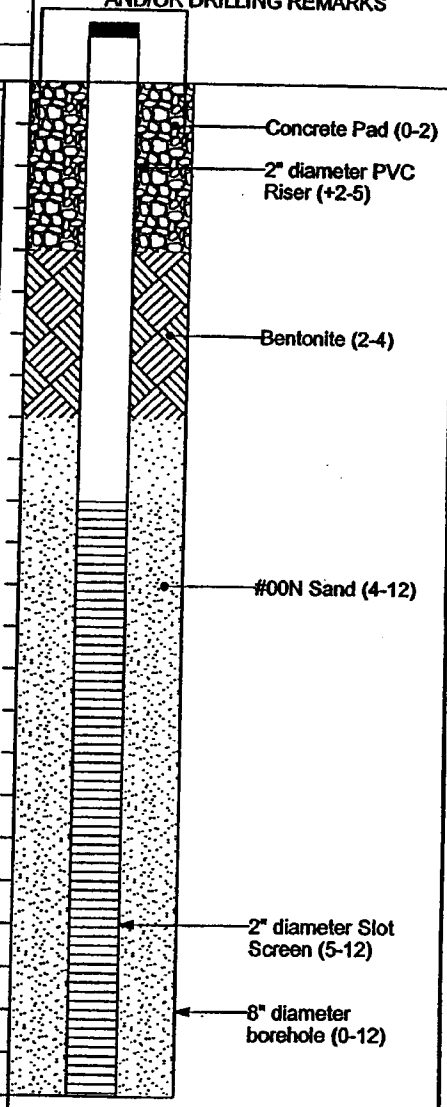
Depth	Sample "N" Value	Sample Penetrn/ Recovery	Sample Depth	Sample Blows /6"	Sample Description	Stratum Change Depth	Equipment Installed	Field Testing Sal. 0/00	Field Testing So. Cond.	Field Testing HNU	R m k s
0			0-2		Dry brown silt and fine sand, root hairs, medium sand and gravel	3'					
3-5	7	6"	3-5	3-5 2-5	Odor present, no return						
5-6	1	12"	5-6	WOH 1-WOH	Grey-black silt same coarse gravel, trace of clay					.2	
8-10	9	12"	8-10	5-4 5-6	Wet black cinder fuel odor, sandy	7'				2.1	
10	8	12"	10-12	7-5 3-6	Same as above, piece of shale stuck in nose	10'				1.1	
	1	8"	13-15	WOH WOH	Black gravel wet, odor, silt and clay in nose					1.1	
15	2		15-17	WOH-1 1	Grey wet silt, and fine sand, trace clay, fine to medium sand	15'				6.8	
20	45	12"	18-20	18-19 26-25	Grey Weathered Shale	18'				1.3 1.2	
25											
30											
35											
40											
45											
50											
55											

4' of screen installed from 18' to 14'
3.8' of packed sand installed from 18' to 14.2'
2' of bentonite pellets installed from 14.2' to 12.2'
12.2' of bentonite grout cement installed from 12.2' to surface

PROJECT: Peter Cooper RI/FS Gowanda, New York	**Log of Well No. MWFP-2S**
BORING LOCATION: See RI Figures for Boring Locations	TOP OF CASING ELEVATION: 785.2 / DATUM: fmsl
DRILLING CONTRACTOR: Nothnagle Drilling	DATE STARTED: 10/3/00 / DATE FINISHED: 10/3/00
DRILLING METHOD: HSA (4 1/4" I.D.)	TOTAL DEPTH: 12.0 feet bgs / SCREEN INTERVAL: 5-12
DRILLING EQUIPMENT: CME-75	DEPTH TO WATER: FIRST / COMPL. / CASING: 2-inch PVC
SAMPLING METHOD: 2" dia. Stainless Steel Split Spoons	LOGGED BY: JV
HAMMER WEIGHT: 140 lb / DROP: 30"	RESPONSIBLE PROFESSIONAL: Richard H. Frappa / REG. NO.

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ 6 inches	OVM (ppm)	DESCRIPTION NAME (USCS Symbol): color, moist, % by weight, plast., structure, cementation, react. w/HCl, geo. inter.
					Surface Elevation: 784.3
1	1		18	0	**SILT AND FINE SAND (SM-ML):** very dark greyish brown 10YR 3/2, dry, 40-50% fines, 40-50% fine sand, 5% gravel, 5% organic matter/roots, medium plasticity
2					**SAND with GRAVEL (SW):** very dark brown 10YR 2/2, dry to slightly moist, 80% sand, fine to medium grained, 15% gravel, 5% low plasticity fines, some coal pieces
3	2		10	0	**SILTY SAND (SM):** very dark brown 10YR 2/2, moist, 65% fine to medium grained sand, 20% low plasticity fines, 15% gravel, trace coal
4					
5	3		7	0	**WEATHERED BRICK:** very pale brown 10YR 7/4, moist
6					**SILTY SAND (SM):** very dark brown 10YR 2/2, moist, 65% fine to medium grained sand, 20% low plasticity fines, 15% gravel, trace coal -more fines
7	4		5	0	**SILT with GRAVEL (ML):** dark reddish grey 5YR 3/2, moist to wet, 60% fines (peat-like decayed wood), 20% gravel, 10% fine sand, 10% wood pieces, medium plasticity, slight musty odor, fill
8					
9	5		3	0	**SILT with GRAVEL (ML):** black 1 FOR GLEY 2.5/N, wet, 60% fines, 25% well graded angular gravel, 15% well graded sand, medium plasticity, trace wood pieces, slight coal-like odor, soft, fill
10					
11	6		26	0	**WEATHERED BEDROCK**
12					
13					
14					
15					

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS



WELL_OVM MWFP2S.GPJ (11/02)

Project No. 5771	Geomatrix Consultants	Figure

PROJECT: Peter Cooper RI/FS Gowanda, New York	**Log of Well No. MWFP-3S**
BORING LOCATION: See RI Figures for Boring Locations	TOP OF CASING ELEVATION: 780.7 / DATUM: fmsl
DRILLING CONTRACTOR: Nothnagle Drilling	DATE STARTED: 10/3/00 / DATE FINISHED: 10/3/00
DRILLING METHOD: HSA (4 1/4" I.D.)	TOTAL DEPTH: 11.5 feet bgs / SCREEN INTERVAL: 5-11.5
DRILLING EQUIPMENT: CME-75	DEPTH TO WATER: FIRST / COMPL. / CASING: 2-inch PVC
SAMPLING METHOD: 2" dia. Stainless Steel Split Spoons	LOGGED BY: JV
HAMMER WEIGHT: 140 lbs. / DROP: 30"	RESPONSIBLE PROFESSIONAL: Richard H. Frappa / REG. NO.

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/6 inches	OVM (ppm)	DESCRIPTION NAME (USCS Symbol): color, moist, % by weight, plast., structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Surface Elevation: 778.5	
1					See log for well MWFP-3D for soil description.	Concrete Pad (0-2)
2						
3						Bentonite (2-4)
4						
5						
6						#00N Sand (4.0-11.5)
7						
8						
9						2" diameter Slot Screen (5.0-11.5)
10						
11						8" diameter borehole (0-11.5)
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

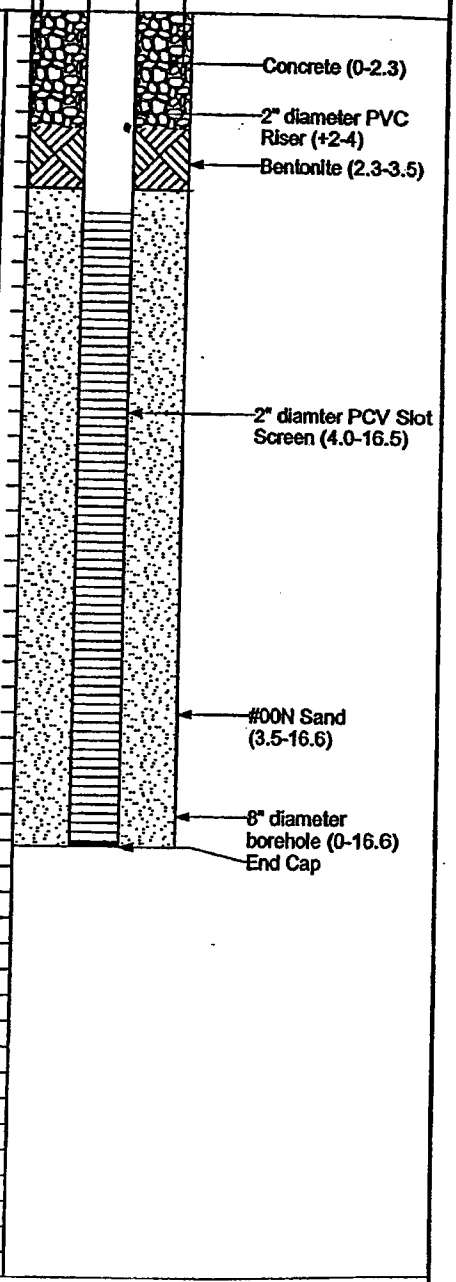
PROJECT: Peter Cooper RI/FS
Gowanda, New York

Log of Well No. MW-7S

BORING LOCATION: See RI Figures for Boring Locations	TOP OF CASING ELEVATION: 787.8	DATUM: fmsl
DRILLING CONTRACTOR: Nothnagle Drilling	DATE STARTED: 9/26/00	DATE FINISHED: 9/26/00
DRILLING METHOD: HSA (4 1/4" I.D.)	TOTAL DEPTH: 16.6 feet bgs	SCREEN INTERVAL: 4.0-16.5
DRILLING EQUIPMENT: CME-75	DEPTH TO WATER: | FIRST | COMPL.	CASING: 2-Inch PVC
SAMPLING METHOD: 2" dia. Stainless Steel Split Spoons	LOGGED BY: JV	
HAMMER WEIGHT: 140 lbs. | DROP: 30"	RESPONSIBLE PROFESSIONAL: Richard H. Frappa	REG. NO.

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6 inches	OVM (ppm)	DESCRIPTION: NAME (USCS Symbol): color, moist, % by weight, plast., structure, cementation, react. w/HCl, geo. inter.
					Surface Elevation: 786.1
					See log for MW-7D for soil description

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS



O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG
File Name: PC004B.BL

Report of Boring No. MW-5
Sheet 1 of 1

Project Location: Bowanda, NY
Client: Peter Cooper

SAMPLER
Type: SPLIT SPOON
Hammer: 140 lbs.
Fall: 30"

Ground Water Depth 772.33 Date 12/15/86
Depth 771.60 Date 4/13/86

File No. 1171-005-130

Boring Co.: Parratt-Wolfe
Foreman: Mark Beck
D&G Geologist: Peter Bogardus

Boring Location: east of fill area
Ground Elevation: 778.98
Dates: Started:08/20/86
Ended:08/20/8

Depth	Sample "N" Value	Sample Penetra/ Recovery	Sample Depth	Sample Blows /6"	Sample Description	Stratum Change Depth	Equipment Installed	Field Testing Sal. 0/00	Field Testing Sp. Cond.	Field Testing HNU
0	-	12	0-2		Dry brown silt and gravel, root hairs (fill)	3'				
5	11	14	5-7	8-5 6-3	Black dry cinders, some silt pieces of wood	5'				.4
10	18	14	10-12	10-8 11-6	Orange - red, fine to coarse sand and fine gravel, chunks of cement and wood wet at 8' - hard at 10'	10'				2
15	50+	12	15-16	50/0	Wet sand and gravel, chunks of cement, iron oxide stain.	15'				.1
20					Grey Weathered Shale	17'				
					B.O.H.					
25										
30										
35										
40										
45										
50										
55										

2' of screen installed from 15' to 13'
2.5' of packed sand installed from 15' to 12.5'
10' of bentonite pellets installed from 12.5' to 10'
4" protective guard pipe installed

APPENDIX B

FIELD OPERATING PROCEDURES (FOPS)

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

FIELD OPERATING PROCEDURES

Calibration and Maintenance of Portable Field pH/Eh Meter

FOP 008.0

CALIBRATION AND MAINTENANCE OF PORTABLE FIELD pH/Eh METER

PURPOSE

This guideline describes a method for calibration of a portable pH/Eh meter. The pH/Eh meter measures the hydrogen ion concentration or acidity of a water sample (pH function), and the oxidation/reduction potential of a water sample (Eh function). Calibration is performed to verify instrument accuracy and function. All field instruments will be calibrated, verified and recalibrated at frequencies required by their respective operating manuals or manufacturer's specifications, but not less than once each day that the instrument is in use. Field personnel should have access to all operating manuals for the instruments used for the field measurements. This procedure also documents critical maintenance activities for this meter.

ACCURACY

The calibrated accuracy of the pH/Eh meter will be:

pH ± 0.2 pH unit, over the temperature range of ± 0.2 C.

Eh ± 0.2 millivolts (mV) over the range of ± 399.9 mV, otherwise ± 2 mV.

PROCEDURE

Note: Meters produced by different manufacturers may have different calibration procedures. These instructions will take precedence over the procedure provided herein. This procedure is intended to be used as a general guideline, or in the absence of available manufacturer's instructions.

1. Obtain and active the meter to be used. As stated above, initial calibrations will be performed at the beginning of each sampling day.

2. Immerse the sensing probe in a container of certified pH 7.0 buffer solution traceable to the National Bureau of Standards.

3. Measure the temperature of the buffer solution, and adjust the temperature setting accordingly.

4. Compare the meter reading to the known value of the buffer solution while stirring. If the reading obtained by the meter does not agree with the known value of the buffer solution, recalibrate the meter according to the manufacturer's instructions until the desired reading is obtained. This typically involves accessing and turning a dial or adjustment screw while measuring the pH of the buffer solution. The meter is adjusted until the output agrees with the known solution pH.

5. Repeat Steps 2 through 5 with a pH 4.0 and 10.0 buffer solution to provide a three-point calibration. Standards used to calibrate the pH meter will be of concentrations that bracket the expected values of the samples to be analyzed, especially for two-point calibrations (see note below).

Note: Some pH meters only allow two-point calibrations. Two-point calibrations should be within the suspected range of the groundwater to be analyzed. For example, if the groundwater pH is expected to be approximately 8, the two-point calibration should bracket that value. Buffer solutions of 7 and 10 should then be used for the two-point calibration.

6. Document the calibration results and related information in the Project Field Book and on an **Equipment Calibration Log** (see attached sample). Information will include, at a minimum:

   - Time, date, and initials of the field team member performing the calibration
   - The unique identifier for the meter, including manufacturer, model, and serial number
   - The brand and expiration dates of buffer solutions
   - The instrument readings
   - The instrument settings (if applicable)

- Pass or fail designation in accordance with the accuracy specifications presented above
- Corrective action taken (see Maintenance below) in the event of failure to adequately calibrate

MAINTENANCE

- When not in use, or between measurements, keep the pH/Eh probe immersed in or moist with buffer solutions.

- Check the meter batteries at the end of each day and recharge or replace as needed.

- Replace the pH/Eh probe any time that the meter response time becomes greater than two minutes or the meeting system consistently fails to retain its calibrated accuracy for a minimum of ten sample measurements.

- If a replacement of the pH/Eh probe fails to resolve instrument response time and stability problems, obtain a replacement instrument (rental instruments) and/or order necessary repairs/adjustment.

ATTACHMENTS

Equipment Calibration Log (sample)

FOP 008.0

CALIBRATION AND MAINTENANCE OF PORTABLE FIELD pH/Eh METER

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

EQUIPMENT CALIBRATION

PROJECT INFORMATION:

Project Name: _____ Date: _____

Project No.: _____

Client: _____ Instrument Source: ☐ BM ☐ Rental

METER TYPE	UNITS	TIME	MAKE/MODEL	SERIAL NUMBER	CAL. BY	STANDARD	READING	SETTI
☐ pH meter	units		Myron L Company Ultra Meter 6P	606987		4.00		
						7.00		
						10.01		
☐ Turbidity meter	NTU		Hach 2100P Turbidimeter	970600014560		< 0.4		
						20		
						100		
						800		
☐ Sp. conductance meter	uS/mS		Myron L Company Ultra Meter 6P	606987		LS @ 25 °C		
☐ PID	ppm		Photovac 2020 PID			open air zero		MIBK re
						____ ppm Iso. Gas		factor =
☐ Particulate meter	mg/m^3					zero air		
☐ Oxygen	%					open air		
☐ Hydrogen sulfide	ppm					open air		
☐ Carbon monoxide	ppm					open air		
☐ LEL	%					open air		
☐ Radiation Meter	uR/h					background area		
☐								

SAMPLE

ADDITIONAL REMARKS: _____

PREPARED BY: _____ **DATE:** _____

BENCHMARK
ENVIRONMENTAL
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SCIENCE, PLLC

FIELD OPERATING PROCEDURES

Calibration and Maintenance of Portable Field Turbidity Meter

FOP 009.0

CALIBRATION AND MAINTENANCE OF PORTABLE FIELD TURBIDITY METER

PURPOSE

This guideline describes the method for calibration of the HACH 2100P portable field turbidity meter. Turbidity is one water quality parameter measured during purging and development of wells. Turbidity is measured as a function of the samples ability to transmit light, expressed as Nephelometric Turbidity Units (NTUs). The turbidity meter is factory calibrated and must be checked daily prior to using the meter in the field. Calibration is performed to verify instrument accuracy and function. This procedure also documents critical maintenance activities for this meter.

ACCURACY

Accuracy shall be ± 2% of reading below 499 NTU or ± 3% of reading above 500 NTU with resolution to 0.01 NTU in the lowest range. The range key provides for automatic or manual range selection for ranges of 0.00 to 9.99, 0.0 to 99.9 and 0 to 1000 NTU. Another key provides for selecting automatic signal averaging. Pressing the key shall toggle signal averaging on or off.

PROCEDURE

Calibration of the 2100P Turbidimeter is based on formazin, the primary standard for turbidity. The instrument's electronic and optical design provides long-term stability and minimizes the need for frequent calibration. The two-detector ratioing system compensates for most fluctuations in lamp output. **A formazin recalibration should be performed at least once every three months,** more often if experience indicates the need. During calibration, use a primary standard such as StablCal™ Stabilized Standards or formazin standards.

CALIBRATION AND MAINTENANCE OF PORTABLE FIELD TURBIDITY METER

Note: Meters produced by different manufacturers may have different calibration check procedures. These manufacturers' instructions will take precedence over the procedure provided here. This procedure is intended to be used as a general guideline, or in the absence of available manufacturer's instructions.

Note: Because the turbidity meter measures light transmission, it is critical that the meter and standards be cared for as precision optical instruments. Scratches, dirt, dust, etc. can all temporarily or permanently affect the accuracy of meter readings.

Preparing StablCal Stabilized Standards in Sealed Vials

Sealed vials that have been sitting undisturbed for longer than a month must be shaken to break the condensed suspension into its original particle size. Start at *step 1* for these standards. If the standards are used on at least a weekly interval, start at *step 3*.

Note: These instructions do not apply to < 0.1 NTU StablCal Standards; < 0.1 NTU StablCal Standards should not be shaken or inverted.

1. Shake the standard vigorously for 2-3 minutes to re-suspend any particles.
2. Allow the standard to stand undisturbed for 5 minutes.
3. Gently invert the vial of StablCal 5 to 7 times.
4. Prepare the vial for measurement using traditional preparation techniques. This usually consists of oiling the vial (see *Section 2.3.2 on page 11 of the manual*)

and marking the vial to maintain the same orientation in the sample cell compartment (see *Section 2.3.3 on page 12 of the manual*). This step will eliminate any optical variations in the sample vial.

5. Let the vial stand for one minute. The standard is now ready for use in the calibration procedure.

Calibration Procedure

1. Turn the meter on.

2. Shake pre-mixed formazin primary standards in accordance with the above procedure.

3. Wipe the outside of the < 0.1 NTU standard and insert the sample cell in the cell compartment by aligning the orientation mark on the cell with the mark on the front of the cell compartment.

4. Close the lid and press **I/O**.

5. Press the **CAL** button. The **CAL** and **S0** icons will be displayed and the 0 will flash. The four-digit display will show the value of the **S0** standard for the previous calibration. If the blank value was forced to 0.0, the display will be blank. Press the right arrow key (→) to get a numerical display.

6. Press **READ**. The instrument will count from 60 to 0, read the blank and use it to calculate a correction factor for the 20 NTU standard measurement. If the dilution water is ≥ 0.5 NTU, E 1 will appear when the calibration is calculated (*see Section 3.6.2.3 on page 31 of the manual*). The display will automatically increment to the next standard. Remove the sample cell from the cell compartment

Note: The turbidity of the dilution water can be "forced" to zero by pressing → rather than reading the dilution water. The display will show "S0 NTU" and the ↑ key must be pressed to continue with the next standard.

7. Repeat steps 1 through 7 for the 20, 100 and 800 standards.

8. Following the 800 NTU standard calibration, the display will increment back to the **S0** display. Remove the sample cell from the cell compartment.

9. Press **CAL** to accept the calibration. The instrument will return to measurement mode automatically.

10. Document the calibration results and related information in the Project Field Book and on an **Equipment Calibration Log** (see attached sample). Information will include, at a minimum:
    - Time, date, and initials of the field team member performing the calibration
    - The unique identifier for the meter, including manufacturer, model, and serial number
    - The brand of calibration standards
    - The instrument readings
    - The instrument settings (if applicable)
    - Pass or fail designation in accordance with the accuracy specifications presented above
    - Corrective action taken (see Maintenance below) in the event of failure to adequately calibrate.

Note: Pressing CAL completes the calculation of the calibration coefficients. If calibration errors occurred during calibration, error messages will appear after CAL is pressed. If E 1 or E 2 appear, check the standard preparation and review the calibration; repeat the calibration if necessary. If "CAL?" appears, an error may have

occurred during calibration. If "CAL?" is flashing, the instrument is using the default calibration.

NOTES

- If the **I/O** key is pressed during calibration, the new calibration data is lost and the old calibration will be used for measurements. Once in calibration mode, only the **READ, I/O,** ↑ , and →keys function. Signal averaging and range mode must be selected before entering the calibration mode.

- If **E 1** or **E 2** are displayed, an error occurred during calibration. Check the standard preparation and review the calibration; repeat the calibration if necessary. Press **DIAG** to cancel the error message (**E 1** or **E 2**). To continue without repeating the calibration, press **I/O** twice to restore the previous calibration. If "**CAL?**" is displayed, an error may have occurred during calibration. The previous calibration may not be restored. Either recalibrate or use the calibration as is.

- To review a calibration, press **CAL** and then ↑ to view the calibration standard values. As long as **READ** is never pressed and **CAL** is not flashing, the calibration will not be updated. Press **CAL** again to return to the measurement mode.

MAINTENANCE

- **Cleaning**: Keep the turbidimeter and accessories as clean as possible and store the instrument in the carrying case when not in use. Avoid prolonged exposure to sunlight and ultraviolet light. Wipe spills up promptly. Wash sample cells with non-abrasive laboratory detergent, rinse with distilled or demineralized water, and air dry. Avoid scratching the cells and wipe all moisture and fingerprints off the cells before inserting them into the instrument. Failure to do so can give inaccurate readings. See *Section 2.3.1 on page 11 of the manual* for more information about sample cell care.

- **Battery Replacement**: AA alkaline cells typically last for about 300 tests with the signal-averaging mode off, about 180 tests if signal averaging is used. The "battery" icon flashes when battery replacement is needed. Refer to *Section 1.4.2 on page 5 of the manual* for battery installation instructions. If the batteries are changed within 30

seconds, the instrument retains the latest range and signal average selections. If it takes more than 30 seconds, the instrument uses the default settings. If, after changing batteries, the instrument will not turn off or on and the batteries are good, remove the batteries and reinstall them. If the instrument still won't function, contact Hach Service or the nearest authorized dealer.

- **Lamp Replacement**: The procedure in *Section 4.0 on page 49 of the manual* explains lamp installation and electrical connections. Use a small screwdriver to remove and install the lamp leads in the terminal block. The instrument requires calibration after lamp replacement.

ATTACHMENTS

Equipment Calibration Log (sample)

FOP 009.0

CALIBRATION AND MAINTENANCE OF PORTABLE FIELD TURBIDITY METER

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

EQUIPMENT CALIBRATION

PROJECT INFORMATION:

Project Name: _____ Date: _____

Project No.: _____

Client: _____ Instrument Source: ☐ BM ☐ Rental

METER TYPE	UNITS	TIME	MAKE/MODEL	SERIAL NUMBER	CAL. BY	STANDARD	READING	SETTI
☐ pH meter	units		Myron L Company Ultra Meter 6P	606987		4.00		
						7.00		
						10.01		
☐ Turbidity meter	NTU		Hach 2100P Turbidimeter	970600014560		< 0.4		
						20		
						100		
						800		
☐ Sp. conductance meter	uS/mS		Myron L Company Ultra Meter 6P	606987		µS @ 25 °C		
☐ PID	ppm		Photovac 2020 PID			open air zero		MIBK re
						____ ppm Iso. Gas		factor =
☐ Particulate meter	mg/m^3					zero air		
☐ Oxygen	%					open air		
☐ Hydrogen sulfide	ppm					open air		
☐ Carbon monoxide	ppm					open air		
☐ LEL	%					open air		
☐ Radiation Meter	uR/h					background area		
☐								

SAMPLE

ADDITIONAL REMARKS:

PREPARED BY: _____ **DATE:** _____

BENCHMARK
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FIELD OPERATING PROCEDURES

Calibration and Maintenance of Portable Specific Conductance Meter

FOP 012.0

CALIBRATION AND MAINTENANCE OF PORTABLE SPECIFIC CONDUCTANCE METER

PURPOSE

This guideline describes a method for calibration of a portable specific conductance meter. This meter measures the ability of a water sample to conduct electricity, which is largely a function of the dissolved solids within the water. The instrument has been calibrated by the manufacturer according to factory specifications. This guideline presents a method for checking the factory calibration of a portable specific conductance meter. A calibration check is performed to verify instrument accuracy and function. All field test equipment will be checked at the beginning of each sampling day. This procedure also documents critical maintenance activities for this meter.

ACCURACY

The calibrated accuracy of the specific conductance meter will be within ± 1 percent of full-scale, with repeatability of ± 1 percent. The built-in cell will be automatically temperature compensated from at least 32° to 160° F (0° to 71°C).

PROCEDURE

Note: The information included below is equipment manufacturer- and model-specific, however, accuracy, calibration, and maintenance procedures for this type of portable equipment are typically similar. The information below pertains to the Myron L Company Ultrameter Model 6P. The actual equipment to be used in the field will be equivalent or similar.

CALIBRATION AND MAINTENANCE OF PORTABLE SPECIFIC CONDUCTANCE METER

1. Calibrate all field test equipment at the beginning of each sampling day. Check and recalibrate the specific conductance meter according to the manufacture's specifications.

2. Use a calibration solution of known specific conductivity and salinity. For maximum accuracy, use a Standard Solution Value closest to the samples to be tested.

3. Rinse conductivity cell three times with proper standard.

4. Re-fill conductivity cell with same standard.

5. Press **COND** or **TDS**, then press **CAL/MCLR**. The "CAL" icon will appear on the display.

6. Press the **↑/MS** or **MR/↓** key to step the displayed value toward the standard's value or hold a key down to cause rapid scrolling of the reading.

7. Press CAL/MCLR once to confirm new value and end the calibration sequence for this particular solution type.

8. Repeat steps 1 through 7 with additional new solutions, as necessary.

9. Document the calibration results and related information in the Project Field Book and on an **Equipment Calibration Log** (see attached sample), indicating the meter readings before and after the instrument has been adjusted. This is important, not only for data validation, but also to establish maintenance schedules and component replacement. Information will include, at a minimum:
    - Time, date and initials of the field team member performing the calibration
    - The unique identifier for the meter, including manufacturer, model, and serial number
    - The brand and expiration date of the calibration standards
    - The instrument readings: before and after calibration

- The instrument settings (if applicable)
- The overall adequacy of calibration including the Pass or fail designation in accordance with the accuracy specifications presented above.
- Corrective action taken (see Maintenance below) in the event of failure to adequately calibrate.

MAINTENANCE

NOTE: Ultrameters should be rinsed with clean water after use. Solvents should be avoided. Shock damage from a fall may cause instrument failure.

Temperature Extremes

Solutions in excess of 160°F/71°C should not be placed in the cell cup area; this may cause damage. Care should be exercised not to exceed rated operating temperature. Leaving the Ultrameter in a vehicle or storage shed on a hot day can easily subject the instrument to over 150°F voiding the warranty.

Battery Replacement

Dry Instrument THOROUGHLY. Remove the four bottom screws. Open instrument carefully; it may be necessary to rock the bottom slightly side to side to release it from the RS-232 connector. Carefully detach battery from circuit board. Replace with 9-volt alkaline battery. Replace bottom, ensuring the sealing gasket is installed in the groove of the top half of case. Re-install screws, tighten evenly and securely.

CALIBRATION AND MAINTENANCE OF PORTABLE SPECIFIC CONDUCTANCE METER

NOTE: Because of nonvolatile EEPROM circuitry, all data stored in memory and all calibration settings are protected even during power loss or battery replacement.

Cleaning Sensors

The conductivity cell cup should be kept as clean as possible. Flushing with clean water following use will prevent buildup on electrodes. However, if very dirty samples — particularly scaling types — are allowed to dry in the cell cup, a film will form. This film reduces accuracy. When there are visible films of oil, dirt, or scale in the cell cup or on the electrodes, use a foaming non-abrasive household cleaner. Rinse out the cleaner and your Ultrameter is ready for accurate measurements.

NOTE: Maintain a log for each monitoring instrument. Record all maintenance performed on the instrument on this log with date and name of the organization performing the maintenance.

ATTACHMENTS

Equipment Calibration Log (sample)

FOP 012.0

CALIBRATION AND MAINTENANCE OF PORTABLE SPECIFIC CONDUCTANCE METER

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

EQUIPMENT CALIBRATION

PROJECT INFORMATION:

Project Name: Date:

Project No.:

Client: Instrument Source: ☐ BM ☐ Rental

METER TYPE	UNITS	TIME	MAKE/MODEL	SERIAL NUMBER	CAL. BY	STANDARD	READING	SETTI
☐ pH meter	units		Myron L Company Ultra Meter 6P	606987		4.00		
						7.00		
						10.01		
☐ Turbidity meter	NTU		Hach 2100P Turbidimeter	970600014560		< 0.4		
						20		
						100		
						800		
☐ Sp. conductance meter	uS/mS		Myron L Company Ultra Meter 6P	606987		µS @ 25 °C		
☐ PID	ppm		Photovac 2020 PID			open air zero		MIBK re factor =
						____ ppm Iso. Gas		
☐ Particulate meter	mg/m³					zero air		
☐ Oxygen	%					open air		
☐ Hydrogen sulfide	ppm					open air		
☐ Carbon monoxide	ppm					open air		
☐ LEL	%					open air		
☐ Radiation Meter	uR/h					background area		
☐								

SAMPLE

ADDITIONAL REMARKS:

PREPARED BY: **DATE:**

BENCHMARK
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FIELD OPERATING PROCEDURES

Groundwater Level Measurement

FOP 022.0

GROUNDWATER LEVEL MEASUREMENT

PURPOSE

This procedure describes the methods used to obtain accurate and consistent water level measurements in monitoring wells, piezometers and well points. Water levels will be measured at monitoring wells and, if practicable, in supply wells to estimate purge volumes associated with sampling, and to develop a potentiometric surface of the groundwater in order to estimate the direction and velocity of flow in the aquifer. Water levels in monitoring wells will be measured using an electronic water level indicator (e-line) that has been checked for operation prior to mobilization.

PROCEDURE

1. Decontaminate the e-line probe and a lower portion of cable following the procedures referenced in the Benchmark Field Operating Procedure for Non-Disposable and Non-Dedicated Sampling Equipment Decontamination. Store the e-line in a protected area until use. This may include wrapping the e-line in clean plastic until the time of use.

2. Unlock and remove the well protective cap or cover and place on clean plastic.

3. Lower the probe slowly into the monitoring well until the audible alarm sounds. This indicates the depth to water has been reached.

4. Move the cable up and down slowly to identify the depth at which the alarm just begins to sound. Measure this depth against the mark on the lip of the well riser used as a surveyed reference point (typically the north side of the riser).

5. Read depth from the graduated cable to the nearest 0.01 foot. Do not use inches. If the e-line is not graduated, use a rule or tape measure graduated in 0.01-foot increments to measure from the nearest reference mark on the e-line cable.

6. Record the water level on a Water Level Monitoring Record (sample attached).

7. Remove the probe from the well slowly, drying the cable and probe with a clean paper wipe. Be sure to repeat decontamination before use in another well.

8. Replace well plug and protective cap or cover. Lock in place as appropriate.

ATTACHMENTS

Water Level Monitoring Record (sample)

REFERENCES

Benchmark FOPs:
040 Non-Disposable and Non-Dedicated Sampling Equipment Decontamination

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WATER LEVEL MONITORING RECORD

Project Name: Client:
Project No.: Location:
Field Personnel: Date:
Weather:

SAMPLE

Well No.	Time	Top of Riser Elevation (fmsl)	Static Depth to Water (fbTOR)	Groundwater Elevation (fmsl)	Total Depth (fbTOR)	Last Total Depth Measurement (fbTOR)

Comments/Remarks:

PREAPRED BY: DATE:

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FIELD OPERATING PROCEDURES

Groundwater Sample Collection Procedures

FOP 024.0

GROUNDWATER SAMPLE COLLECTION PROCEDURES

PURPOSE

This procedure describes the methods for collecting groundwater samples from monitoring wells and domestic supply wells following purging and sufficient recovery. This procedure also includes the preferred collection order in which water samples are collected based on the volatilization sensitivity or suite of analytical parameters required.

PROCEDURE

Allow approximately 3 to 10 days following well development before performing purge and sample activities at any well location. Conversely, perform sampling as soon as practical after sample purging at any time after the well has recovered sufficiently to sample, or within 24 hours after evacuation, if the well recharges slowly. If the well does not yield sufficient volume for all required laboratory analytical testing (including quality control), a decision should be made to prioritize analyses based on contaminants of concern at the site. If the well takes longer than 24 hours to recharge, the Project Manager should be consulted. The following two procedures outline sample collection activities for monitoring and domestic type wells.

Monitoring Wells

1. Purge the monitoring well in accordance with the Benchmark FOPs for Groundwater Purging Procedures Prior to Sample Collection or Low Flow (Minimal Drawdown) Groundwater Purging & Sampling Procedures. Perform sampling as soon as practical after purging at any time after the well has recovered sufficiently to sample, or within 24 hours after evacuation, if the well recharges slowly. If the well does not yield sufficient volume for all required laboratory analytical testing (including quality control), a decision should be made to prioritize analyses based on contaminants of concern at the site. Analyses will be prioritized in the order of the parameters volatilization sensitivity. After volatile organics have been collected, field parameters

must be measured from the next sample collected. If a well takes longer than 24 hours to recharge, the Project Manager should be consulted.

2. Sampling equipment that is not disposable or dedicated to the well will be decontaminated in accordance with the Benchmark Field Operating Procedure for Non-Disposable and Non-Dedicated Sampling Equipment Decontamination.

3. Calibrate all field meters (i.e., pH/Eh, turbidity, specific conductance, dissolved oxygen, PID etc.) in accordance with the Benchmark Field Operating Procedure for Calibration and Maintenance of the specific field meter.

4. Prepare the electronic water level indicator (e-line) in accordance with the procedures referenced in the Benchmark Field Operating Procedure for Groundwater Level Measurement and decontaminate the e-line probe and a lower portion of cable following the procedures referenced in the Benchmark Field Operating Procedure for Non-disposable and Non-dedicated Sampling Equipment Decontamination. Store the e-line in a protected area until use. This may include wrapping the e-line in clean plastic until the time of use.

5. Inspect the well/piezometer for signs of vandalism or damage and record condition on the Groundwater Field Form (sample attached). Specifically, inspect the integrity of the following: concrete surface seal, lock, protective casing and well cover, well casing and J-plug/cap. Report any irregular findings to the Project Manager.

6. Unlock and remove the well protective cap or cover and place on clean plastic to avoid introducing foreign material into the well.

7. Calibrate the photoionization detector (PID) in accordance with the Benchmark Field Operating Procedure for Calibration and Maintenance of Portable Photoionization Detector.

8. Monitor the well for organic vapors using a PID, as per the Work Plan. If a reading of greater than 5 ppm is recorded, the well should be allowed to vent until levels drop below 5 ppm before proceeding with purging. Record PID measurements on a well-specific Groundwater Field Form (sample attached).

9. Lower the e-line probe slowly into the monitoring well and record the measurement on a well-specific Groundwater Field Form (sample attached).

10. Groundwater samples will be collected directly from the sampling valve on the flow through cell (low-flow), discharge port of a standard pump assembly (peristaltic, pneumatic, submersible, or Waterra™ pump) or bailer (stainless steel, PVC or polyethylene) into appropriate laboratory provided containers. In low-yielding wells at which the flow through cell is not used, the samples may be collected using a disposable bailer.

11. If disposable polyethylene bailers are used, the bailer should be lowered *slowly* below the surface of the water to minimize agitation and volatilization. For wells that are known to produce turbid samples (values greater than 50 NTU), the bailer should be lowered and retrieved at a rate that limits surging of the well.

12. Sampling data will be recorded on a Groundwater Field Form (sample attached).

13. Pre-label all sample bottles in the field using a waterproof permanent marker in accordance with the Benchmark Sample Labeling, Storage and Shipment FOP. The following information, at a minimum, should be included on the label:

    - Project Number;
    - Sample identification code (as per project specifications);
    - Date of sample collection (mm, dd, yy);
    - Time of sample collection (military time only) (hh:mm);
    - Specify "grab" or "composite" sample type;
    - Sampler initials;
    - Preservative(s) (if applicable); and
    - Analytes for analysis (if practicable).

14. Collect a separate sample of approximately 200 ml into an appropriate container prior to collecting the first and following the last groundwater sample collected to measure the following field parameters:

Parameter	Units
Dissolved Oxygen	parts per million (ppm)

Specific Conductance	μmhos/cm or μS or mS
pH	pH units
Temperature	°C or °F
Turbidity	NTU
Eh (*optional*)	mV
PID VOCs (*optional*)	ppm

Record all field measurements on a Groundwater Field Form (sample attached).

15. Collect samples into pre-cleaned bottles provided by the analytical laboratory with the appropriate preservative(s) added based on the volatilization sensitivity or suite of analytical parameters required, as designated in the **Sample Collection Order** section below.

16. Lower the e-line probe slowly into the monitoring well and record the measurement on a well-specific Groundwater Field Form (sample attached).

17. The samples will be labeled, stored and shipped in accordance with the Benchmark Field Operating Procedure for Sample Labeling, Storage and Shipment Procedures.

Domestic Supply Wells

1. Calculate or estimate the volume of water in the well. It is desirable to purge at least one casing volume before sampling. This is controlled, to some extent, by the depth of the well, well yield and the rate of the existing pump. If the volume of water in the well cannot be calculated, the well should be purged continuously for no less than 15 minutes.

2. Connect a sampling tap to an accessible fitting between the well and the pressure tank where practicable. A hose will be connected to the device and the hose discharge located 25 to 50 feet away. The well will be allowed to pump until the lines and one well volume is removed. Flow rate will be measured with a container of known volume and a stopwatch.

3. Place a clean piece of polyethylene or Teflon™ tubing on the sampling port and collect the samples in the order designated below and in the sample containers supplied by the laboratory for the specified analytes. ***DO NOT*** use standard garden hose to collect samples.

4. Sampling results and measurements will be recorded on a Groundwater Field Form (sample attached) as described in the previous section.

5. Collect samples into pre-cleaned bottles provided by the analytical laboratory with the appropriate preservative(s) added based on the volatilization sensitivity or suite of analytical parameters required, as designated in the **Sample Collection Order** section below.

6. The samples will be labeled, stored and shipped in accordance with the Benchmark Field Operating Procedure for Sample Labeling, Storage and Shipment Procedures.

SAMPLE COLLECTION ORDER

All groundwater samples, from monitoring wells and domestic supply wells, will be collected in accordance with the following.

1. Samples will be collected preferentially in recognition of volatilization sensitivity. The preferred order of sampling if no free product is present is:

    - Field parameters
    - Volatile Organic Compounds (VOCs)
    - Purgeable organic carbons (POC)
    - Purgeable organic halogens (POH)
    - Total Organic Halogens (TOX)
    - Total Organic Carbon (TOC)
    - Extractable Organic Compounds (i.e., BNAs, SVOCs, etc.)
    - Total petroleum hydrocarbons (TPH) and oil and grease
    - PCBs and pesticides
    - Total metals (Dissolved Metals)
    - Total Phenolic Compounds

capable of defending the sampling effort without the assistance or translation of the sampling crew.

The minimum information to be recorded daily with an indelible pen in the Project Field Book and/or field data sheets includes date and time(s), name of the facility, name(s) of the sampling crew, site conditions, the wells sampled, a description of how the sample shipment was handled, and a QA/QC summary. After the last entry for the day in the Project Field Book, the Field Team Leader should sign the bottom of the page under the last entry and then draw a line across the page directly under the signature.

PRECAUTIONS/RECOMMENDATIONS

The following precautions should be adhered to prior to and during sample collection activities:

- Field vehicles should be parked downwind (to avoid potential sample contamination concerns) at a minimum of 15 feet from the well and the engine turned off prior to PID vapor analysis and VOC sample collection.

- Ambient odors, vehicle exhaust, precipitation, or windy/dusty conditions can potentially interfere with obtaining representative samples. These conditions should be minimized and should be recorded in the field notes. Shield sample bottles from strong winds, rain, and dust when being filled.

- The outlet from the sampling device should discharge below the top of the sample's air/water interface, when possible. The sampling plan should specify how the samples will be transferred from the sample collection device to the sample container to minimize sample alterations.

- Cyanide
- Sulfate and Chloride
- Turbidity
- Nitrate (as Nitrogen) and Ammonia
- Preserved inorganics
- Radionuclides
- Unpreserved inorganics
- Bacteria
- Field parameters

2. Document the sampling procedures and related information in the Project Field Book and on a Groundwater Field Form (sample attached).

DOCUMENTATION

The three words used to ensure adequate documentation for groundwater sampling are accountability, controllability, and traceability. Accountability is undertaken in the sampling plan and answers the questions who, what, where, when, and why to assure that the sampling effort meets its goals. Controllability refers to checks (including QA/QC) used to ensure that the procedures used are those specified in the sampling plan. Traceability is documentation of what was done, when it was done, how it was done, and by whom it was done, and is found in the field forms, Project Field Book, and chain-of-custody forms. At a minimum, adequate documentation of the sampling conducted in the field consists of an entry in the Project Field Book (with sewn binding), field data sheets for each well, and a chain-of-custody form.

As a general rule, if one is not sure whether the information is necessary, it should nevertheless be recorded, as it is impossible to over-document one's fieldwork. Years may go by before the documentation comes under close scrutiny, so the documentation must be

- The order of sampling should be from the least contaminated to the most contaminated well to reduce the potential for cross contamination of sampling equipment (see the Sampling Plan or Work Plan).

- Samples should not be transferred from one sampling container to another.

- Sampling equipment must not be placed on the ground, because the ground may be contaminated and soil contains trace metals. Equipment and supplies should be removed from the field vehicle only when needed.

- Smoking and eating should not be allowed until the well is sampled and hands are washed with soap and water, due to safety and possibly sample contamination concerns. These activities should be conducted beyond a 15-foot radius of the well.

- No heat-producing or electrical instruments should be within 15 feet of the well, unless they are intrinsically safe, prior to PID vapor analysis.

- Minimize the amount of time that the sample containers remain open.

- Do not touch the inside of sample bottles or the groundwater sample as it enters the bottle. Disposable gloves may be a source of phthalates, which could be introduced into groundwater samples if the gloves contact the sample.

- Sampling personnel should use a new pair of disposable gloves for each well sampled to reduce the potential for exposure of the sampling personnel to contaminants and to reduce sample cross contamination. In addition, sampling personnel should change disposable gloves between purging and sampling operations at the same well.

- Sampling personnel should not use perfume, insect repellent, hand lotion, etc., when taking groundwater samples. If insect repellent must be used, then sampling personnel should not allow samples or sampling equipment

to contact the repellent, and it should be noted in the documentation that insect repellent was used.

- Complete the documentation of the well. A completed assemblage of paperwork for a sampling event includes the completed field forms, entries in the Project Field Book (with a sewn binding), transportation documentation (if required), and possibly chain-of-custody forms.

ATTACHMENTS

Groundwater Field Form (sample)

REFERENCES

1. Wilson, Neal. *Soil Water and Ground Water Sampling*, 1995

Benchmark FOPs:

007 *Calibration and Maintenance of Portable Dissolved Oxygen Meter*
008 *Calibration and Maintenance of Portable Field pH/Eh Meter*
009 *Calibration and Maintenance of Portable Field Turbidity Meter*
011 *Calibration and Maintenance of Portable Photoionization Detector*
012 *Calibration and Maintenance of Portable Specific Conductance Meter*
022 *Groundwater Level Measurement*
023 *Groundwater Purging Procedures Prior to Sample Collection (optional)*
031 *Low Flow (Minimal Drawdown) Groundwater Purging & Sampling Procedures (optional)*
040 *Non-Disposable and Non-Dedicated Sampling Equipment Decontamination*
046 *Sample Labeling, Storage and Shipment Procedures*

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

GROUNDWATER FIELD FORM

Project Name: Date:

Location: Project No.: Field Team:

Well No.			Diameter (inches):			Sample Time:			
Product Depth (fbTOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (fbTOR):			Casing Volume:			Purpose: ☐ Development ☐ Sample			
Total Depth (fbTOR):			Purge Volume (gal):			Purge Method:			
Time	Water Level (fbTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
	0 Initial								
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
Sample Information:			Date: (if different from above)						
	S1								
	S2								

Well No.			Diameter (inches):			Sample Time:			
Product Depth (fbTOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (fbTOR):			Casing Volume:			Purpose: ☐ Development ☐ Sample			
Total Depth (fbTOR):			Purge Volume (gal):			Purge Method:			
Time	Water Level (fbTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
	0 Initial								
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
Sample Information:			Date: (if different from above)						
	S1								
	S2								

SAMPLE

REMARKS:

Note: All water level measurements are in feet, distance from top of riser.

Volume Calculation

Diam.	Vol. (g/ft)
1"	0.041
2"	0.163
4"	0.653
6"	1.469

Stabilization Criteria

Parameter	Criteria
pH	± 0.1 unit
SC	± 3%
Turbidity	± 10%
DO	± 0.3 mg/L
ORP	± 10 mV

PREPARED BY:

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FIELD OPERATING PROCEDURES

Low-Flow (Minimal Drawdown) Groundwater Purging & Sampling Procedure

FOP 031.0

LOW FLOW (MINIMAL DRAWDOWN) GROUNDWATER PURGING & SAMPLING PROCEDURES

PURPOSE

This procedure describes the methods used for performing low flow (minimal drawdown) purging, also referred to as micro-purging, at a well prior to groundwater sampling to obtain a representative sample from the water-bearing zone. This method of purging is used to minimize the turbidity of the produced water. This may increase the representativeness of the groundwater samples by avoiding the necessity of filtering suspended solids in the field prior to preservation of the sample.

Well purging is typically performed immediately preceding groundwater sampling. The sample should be collected as soon as the parameters measured in the field (i.e., pH, specific conductance, dissolved oxygen, Eh, temperature, and turbidity) have stabilized.

PROCEDURE

1. Water samples should not be taken immediately following well development. Sufficient time should be allowed to stabilize the groundwater flow regime in the vicinity of the monitoring well. This lag time will depend on site conditions and methods of installation but may exceed one week.

2. Prepare the electronic water level indicator (e-line) in accordance with the procedures referenced in the Benchmark's Groundwater Level Measurement FOP and decontaminate the e-line probe and a lower portion of cable following the procedures referenced in the Benchmark's Non-disposable and Non-dedicated Sampling Equipment Decontamination FOP. Store the e-line in a protected area until use. This may include wrapping the e-line in clean plastic until the time of use.

3. Calibrate all sampling devices and monitoring equipment in accordance with manufacturer's recommendations, the site Quality Assurance Project Plan (QAPP) and/or Field Sampling Plan (FSP). Calibration of field

instrumentation should be followed as specified in Benchmark's Calibration and Maintenance FOP for each individual meter.

4. Inspect the well/piezometer for signs of vandalism or damage and record condition on the Groundwater Field Form (sample attached). Specifically, inspect the integrity of the following: concrete surface seal, lock, protective casing and well cover, well casing and J-plug/cap. Report any irregular findings to the Project Manager.

5. Unlock and remove the well protective cap or cover and place on clean plastic to avoid introducing foreign material into the well.

6. Monitor the well for organic vapors using a PID, as per the Work Plan. If a reading of greater than 5 ppm is recorded, the well should be allowed to vent until levels drop below 5 ppm before proceeding with purging.

7. Lower the e-line probe slowly into the monitoring well and record the initial water level in accordance with the procedures referenced in Benchmark's Groundwater Level Measurement FOP. Refer to the construction diagram for the well to identify the screened depth.

8. Decontaminate all non-dedicated pump and tubing equipment following the procedures referenced in the Benchmark's Non-disposable and Non-dedicated Sampling Equipment Decontamination FOP.

9. Lower the purge pump or tubing (i.e., low-flow electrical submersible, peristaltic, etc.) slowly into the well until the pump/tubing intake is approximately in the middle of the screened interval. Rapid insertion of the pump will increase the turbidity of well water, and can increase the required purge time. This step can be eliminated if dedicated tubing is already within the well.

   Placement of the pump close to the bottom of the well will cause increased entrainment of solids, which may have settled in the well over time. Low-flow purging has the advantage of minimizing mixing between the overlying

stagnant casing water and water within the screened interval. The objective of low-flow purging is to maintain a purging rate, which minimizes stress (drawdown) of the water level in the well. Low-flow refers to the velocity with which water enters the pump intake and that is imparted to the formation pore water in the immediate vicinity of the well screen.

10. Lower the e-line back down the well as water levels will be frequently monitored during purge and sample activities.

11. Begin pumping to purge the well. The pumping rate should be between 100 and 500 milliliters (ml) per minute (0.03 to 0.13 gallons per minute) depending on site hydrogeology. Periodically check the well water level with the e-line adjusting the flow rate as necessary to stabilize drawdown within the well. If possible, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 feet or less). If the water level exceeds 2 feet below static and declining, slow the purge rate until the water level generally stabilizes. Record each pumping rate and water level during the event.

    The low flow rate determined during purging will be maintained during the collection of analytical samples. At some sites where geologic heterogeneities are sufficiently different within the screened interval, high conductivity zones may be preferentially sampled.

12. Measure and record field parameters (pH, specific conductance, Eh, dissolved oxygen (DO), temperature, and turbidity) during purging activities. In lieu of measuring all of the parameters, a minimum subset could be limited to pH, specific conductance, and turbidity or DO.

    Water quality indicator parameters should be used to determine purging needs prior to sample collection in each well. Stabilization of indicator parameters should be used to determine when formation water is first encountered during purging. In general, the order of stabilization is pH, temperature, and specific conductance, followed by Eh, DO and turbidity. Performance criteria for determination of stabilization should be based on water-level drawdown, pumping rate and equipment specifications for measuring indicator

parameters. An in-line flow through cell to continuously measure the above parameters may be used. The in-line device should be disconnected or bypassed during sample collection.

13. Purging will continue until parameters of water quality have stabilized. Record measurements for field indicator parameters (including water levels) at regular intervals during purging. The stability of these parameters with time can be used to guide the decision to discontinue purging. Proper adjustments must be made to stabilize the flow rate as soon as possible.

14. Record well purging and sampling data in the Project Field Book or on the Groundwater Field Form (sample attached). Measurements should be taken approximately every three to five minutes, or as merited given the rapidity of change.

15. Purging is complete when field indicator parameters stabilize. Stabilization is achieved after all field parameters have stabilized for three successive readings. Three successive readings should be within ± 0.1 units for pH, ± 3% for specific conductance, ± 10 mV for Eh, and ± 10% for turbidity and dissolved oxygen. These stabilization guidelines are provided for rough estimates only, actual site-specific knowledge may be used to adjust these requirements higher or lower.

    An in-line water quality measurement device (e.g., flow-through cell) should be used to establish the stabilization time for several field parameters on a well-specific basis. Data on pumping rate, drawdown and volume required for parameter stabilization can be used as a guide for conducting subsequent sampling activities.

16. Collect all project-required samples from the discharge tubing at the flow rate established during purging in accordance with Benchmark's Groundwater Sample Collection Procedures FOP. **If a peristaltic pump and dedicated tubing is used, collect all project-required samples from the discharge tubing as stated before, however volatile organic compounds should be collected in accordance with the procedure presented in the next**

section. Continue to maintain a constant flow rate such that the water level is not drawn down as described above. Fill sample containers with minimal turbulence by allowing the ground water to flow from the tubing along the inside walls of the container.

17. If field filtration is recommended as a result of increased turbidity, an in-line filter equipped with a 0.45-micron filter should be utilized.

18. Replace the dedicated tubing down the well taking care to avoid contact with the ground surface.

19. Restore the well to its capped/covered and locked condition.

20. Upon purge and sample collection completion, slowly lower the e-line to the bottom of the well/piezometer. Record the total depth to the nearest 0.01-foot and compare to the previous total depth measurement. If a significant discrepancy exists, re-measure the total depth. Record observations of purge water to determine whether the well/piezometer had become silted due to inactivity or damaged (i.e., well sand within purge water). Upon confirmation of the new total depth and determination of the cause (i.e., siltation or damage), notify the Project Manager following project field activities.

PERISTALTIC PUMP VOC SAMPLE COLLECTION PROCEDURE

The collection of VOCs from a peristaltic pump and dedicated tubing assembly shall be collected using the following procedure.

1. Once all other required sample containers have been filled, turn off the peristaltic pump. The negative pressure effects of the pump head have not altered groundwater remaining within the dedicated tubing assembly and as such, this groundwater can be collected for VOC analysis.

2. While maintaining the pressure on the flexible tubing within the pump head assembly, carefully remove and coil the polyethylene tubing from the well; taking care to prevent the tubing from coming in contact with the ground

surface and without allowing groundwater to escape or drain from the tubing intake.

3. Once the polyethylene tubing is removed, turn the variable speed control to zero and reverse the pump direction.

4. Slowly increase the pump rate allowing the groundwater within the polyethylene tubing to be "pushed" out of the intake end (i.e., positive displacement) making sure the groundwater within the tubing is not "pulled" through the original discharge end (i.e., negative displacement). Groundwater pulled through the pump head assembly CANNOT be collected for VOC analysis.

5. Slowly fill each VOC vial by holding the vial at a 45-degree angle and allowing the flowing groundwater to cascade down the side until the vial is filled with as minimal disturbance as possible. As the vial fills, slowly rotate the vial to vertical. **DO NOT OVERFILL THE VIAL, AS THE PRESERVATIVE WILL BE LOST.** The vial should be filled only enough so that the water creates a slight meniscus at the vial mouth.

6. Cap the VOC vials leaving no visible headspace (i.e., air-bubbles). Gently tap each vial against your hand checking for air bubbles.

7. If an air bubble is observed, slowly remove the cap and repeat Steps 5 and 6.

ATTACHMENTS

Groundwater Field Form (sample)

REFERENCES

United States Environmental Protection Agency, 540/S-95/504, 1995. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures.*

Benchmark FOPs:

007 *Calibration and Maintenance of Portable Dissolved Oxygen Meter*
008 *Calibration and Maintenance of Portable Field pH/Eh Meter*
009 *Calibration and Maintenance of Portable Field Turbidity Meter*
011 *Calibration and Maintenance of Portable Photoionization Detector*
012 *Calibration and Maintenance of Portable Specific Conductance Meter*
022 *Groundwater Level Measurement*
024 *Groundwater Sample Collection Procedures*
040 *Non-Disposable and Non-Dedicated Sampling Equipment Decontamination*
046 *Sample Labeling, Storage and Shipment Procedures*

LOW FLOW (MINIMAL DRAWDOWN) GROUNDWATER PURGING & SAMPLING PROCEDURES

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

GROUNDWATER FIELD FORM

Project Name: Date:

Location: Project No.: Field Team:

Well No.			Diameter (inches):			Sample Time:			
Product Depth (fbTOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (fbTOR):			Casing Volume:			Purpose: ☐ Development ☐ Sample			
Total Depth (fbTOR):			Purge Volume (gal):			Purge Method:			
Time	Water Level (fbTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
	0 Initial								
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
Sample Information:			Date: (if different from above)						
	S1								
	S2								

Well No.			Diameter (inches):			Sample Time:			
Product Depth (fbTOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (fbTOR):			Casing Volume:			Purpose: ☐ Development ☐ Sample			
Total Depth (fbTOR):			Purge Volume (gal):			Purge Method:			
Time	Water Level (fbTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
	0 Initial								
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
Sample Information:			Date: (if different from above)						
	S1								
	S2								

SAMPLE

REMARKS:

Note: All water level measurements are in feet, distance from top of riser.

Volume Calculation

Diam.	Vol. (g/ft)
1"	0.041
2"	0.163
4"	0.653
6"	1.469

Stabilization Criteria

Parameter	Criteria
pH	± 0.1 unit
SC	± 3%
Turbidity	± 10%
DO	± 0.3 mg/L
ORP	± 10 mV

PREPARED BY:

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FIELD OPERATING PROCEDURES

Non-Disposable and Non-Dedicated Sampling Equipment Decontamination

FOP 040.1

NON-DISPOSABLE AND NON-DEDICATED SAMPLING EQUIPMENT DECONTAMINATION

PURPOSE

This procedure is to be used for the decontamination of non-disposable and non-dedicated equipment used in the collection of environmental samples. The purpose of this procedure is to remove chemical constituents from previous samples from the sampling equipment. This prevents these constituents from being transferred to later samples, or being transported out of controlled areas.

HEALTH AND SAFETY

Nitric acid is a strong oxidizing agent as well as being extremely corrosive to the skin and eyes. Solvents such as acetone, methanol, hexane and isopropanol are flammable liquids. Limited contact with skin can cause irritation, while prolonged contact may result in dermatitis. Eye contact with the solvents may cause irritation or temporary corneal damage. Safety glasses with protective side shields, neoprene or nitrile gloves and long-sleeve protective clothing must be worn whenever acids and solvents are being used.

PROCEDURE – GENERAL EQUIPMENT

Bailers, split-spoons, steel or brass split-spoon liners, Shelby tubes, submersible pumps, soil sampling knives, and similar equipment will be decontaminated as described below.

1. Wash equipment thoroughly with non-phosphate detergent and potable-quality water, using a brush where possible to remove any particulate matter or surface film. If the sampler is visibly coated with tars or other phase-separated hydrocarbons, pre-wash with acetone or isopropanol, or by steam cleaning. Decontamination will adhere to the following procedure:

a. Rinse with potable-quality water; if the sampling equipment is very oily and use of a solvent is necessary, rinse with pesticide-grade isopropanol.

b. Rinse with potable-quality water;

c. Rinse with deionized water demonstrated analyte-free, such as distilled water;

d. Air dry; and

e. Store in a clean area or wrap in aluminum foil (shiny side out) or new plastic sheeting as necessary to ensure cleanliness.

2. All non-dedicated well evacuation equipment, such as submersible pumps and bailers, which are put into the well, must be decontaminated following the procedures listed above. All evacuation tubing must be dedicated to individual wells (i.e., tubing cannot be reused). However, if submersible pump discharge tubing must be reused, the tubing and associated sample valves or flow-through cells used in well purging or pumping tests will be decontaminated as described below:

a. Pump a mixture of potable water and a non-phosphate detergent through the tubing, sample valves and flow cells, using the submersible pump.

b. Steam clean or detergent wash the exterior of the tubing, sample valves, flow cells and pump.

c. Pump potable water through the tubing, sample valve, and flow cell until no indications of detergent (e.g. foaming) are observed.

d. Double rinse the exterior of the tubing with potable water.

e. Rinse the exterior of the tubing with distilled water.

f. Store in a clean area or wrap the pump and tubing assembly in new plastic sheeting as necessary to ensure cleanliness until ready for use.

3. All unused sample bottles and sampling equipment must be maintained in such a manner that there is no possibility of casual contamination.

4. Manage all waste materials generated during decontamination procedures as described in the Benchmark Field Operating Procedure for Management of Investigation Derived Waste.

PROCEDURE – SUBMERSIBLE PUMPS

Submersible pumps used in well purging or purging tests will be decontaminated thoroughly each day before use as well as between well locations as described below:

Daily Decontamination Procedure:

1. Pre-rinse: Operate the pump in a basin containing 8 to 10 gallons of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

2. Wash: Operate the pump in 8 to 10 gallons of non-phosphate detergent solution (i.e., Alconox) for 5 minutes and flush other equipment with fresh detergent solution for 5 minutes.

3. Rinse: Operate the pump in a basin of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

4. Disassemble pump.

5. Wash pump parts with a non-phosphate detergent solution (i.e., Alconox). Scrub all pump parts with a test tube brush or similar device.

6. Rinse pump with potable water.

7. Rinse the inlet screen, the shaft, the suction interconnection, the motor lead assembly, and the stator housing with distilled/deionized water.

8. Rinse the impeller assembly with 1% nitric acid (HNO_3).

9. Rinse the impeller assembly with isopropanol.

10. Rinse the impeller assembly with distilled/deionized water.

Between Wells Decontamination Procedure:

1. Pre-rinse: Operate the pump in a basin containing 8 to 10 gallons of potable water for 5 minutes.

2. Wash: Operate the pump in 8 to 10 gallons of non-phosphate detergent solution (i.e., Alconox) for 5 minutes.

3. Rinse: Operate the pump in a basin of potable water for 5 minutes.

4. Final rinse the pump in distilled/deionized water.

ATTACHMENTS

None

REFERENCES

Benchmark FOPs:
032 Management of Investigation-Derived Waste

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FIELD OPERATING PROCEDURES

Sample Labeling, Storage, and Shipment Procedures

FOP 046.0

SAMPLE LABELING, STORAGE & SHIPMENT PROCEDURES

PURPOSE

The collection and analysis of samples of environmental media, including soils, groundwater, surface water, and sediment, are the central activities of the field investigation. These samples must be properly labeled to preserve its identity, and properly stored and shipped in a manner that preserves its integrity and chain of custody. This procedure presents methods for these activities.

SAMPLE LABELING PROCEDURE

1. Assign each sample retained for analysis a unique 9-digit alphanumeric identification code or as indicated in the Project Work Plan. Typically, this code will be formatted as follows:

Sample I.D. Example: GW051402047	
GW	**Sample matrix** GW = groundwater; SW = surface water; SUB = subsurface soil; SS = surface soil; SED = sediment; L = leachate; A = air
05	Month of sample collection
14	Day of sample collection
02	Year of sample collection
047	Consecutive sample number

2. Consecutive sample numbers will indicate the individual sample's sequence in the total set of samples collected during the investigation/sampling event. The sample number above, for example, would indicate the 47th sample retained for analysis during the field investigation, collected on May 14, 2002.

3. Affix a non-removable (when wet) label to each sample container. The following information will be written on the label with black or blue ink that will not smudge when wet:

   - Project number
   - Sample ID (see Step 1 above)
   - Date of sample collection
   - Time of sample collection (military time only)
   - Specify "grab" or "composite" sample with an "X"
   - Sampler initials
   - Preservative(s) (if applicable)
   - Analytes for analysis (if practicable)

4. Record all sample label information in the Project Field Book and on a Sample Summary Collection Log (see attached samples), keyed to the sample identification number. In addition, add information regarding the matrix, sample location, depth, etc. to provide a complete description of the sample.

SAMPLE STORAGE PROCEDURE

1. Immediately after collection, placement in the proper container, and labeling, place samples to be retained for chemical analysis into resealable plastic bags.

2. Place bagged samples into an ice chest filled approximately half-full of double bagged ice. Blue ice is not an acceptable substitute for ice.

3. Maintain samples in an ice chest or in an alternative location (e.g. sample refrigerator) as approved by the Benchmark Field Team Leader until time of shipment. Periodically drain melt-water off coolers and replenish ice as necessary.

4. Ship samples on a daily basis, unless otherwise directed by the Benchmark Field Team Leader.

5. Maintain appropriate custody procedures on coolers and other sample storage containers at all times. These procedures are discussed in detail in the Project Quality Assurance Project Plan, Monitoring Plan or Work Plan.

6. Samples shall be kept in a secure location locked and controlled (i.e., locked building or fenced area) so that only the Project Field Team Leader has access to the location or under the constant visual surveillance of the same.

SAMPLE SHIPPING PROCEDURE

1. Fill out the chain-of-custody form completely (see attached sample) with all relevant information. The white original goes with the samples and should be placed in a resealable plastic bag and taped inside the sample cooler lid; the sampler should retain the copy.

2. Place a layer of inert cushioning material such as bubble pack in the bottom of cooler.

3. Place each bottle in a bubble wrap sleeve or other protective wrap. To the extent practicable, then place each bottle in a resealable plastic bag.

4. Open a garbage bag (or similar) into a cooler and place sample bottles into the garbage bag (or similar) with volatile organic analysis (VOA) vials near the center of the cooler.

5. Pack bottles with ice in plastic bags. At packing completion, cooler should be at least 50 percent ice, by volume. Coolers should be completely filled, so that samples do not move excessively during shipping.

6. Duct tape (or similar) cooler drain closed and wrap cooler completely in two or more locations to secure lid, specifically covering the hinges of the cooler.

7. Place laboratory label address identifying cooler number (i.e., 1 of 4, 2 of 4 etc.) and overnight delivery waybill sleeves on cooler lid or handle sleeve (Federal Express).

8. Sign the custody seal tape with an indelible soft-tip marker and place over the duct tape across the front and back seam between the lid and cooler body.

9. Cover the signed custody seal tape with an additional wrap of transparent strapping tape.

10. Place "Fragile" and "This Side Up" labels on all four sides of the cooler. "This Side Up" labels are yellow labels with a black arrow with the arrowhead pointing toward the cooler lid.

11. For coolers shipped by overnight delivery, retain a copy of the shipping waybill, and attach to the chain-of-custody documentation.

ATTACHMENTS

Soil/Sediment Sample Summary Collection Log (sample)
Groundwater/Surface Water Sample Summary Collection Log (sample)
Wipe Sample Summary Collection Log (sample)
Air Sample Summary Collection Log (sample)
Chain-Of-Custody Form (sample)

REFERENCES

None

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

AIR SAMPLE COLLECTION SUMMARY LOG

Field ID	Location	QC Type	Analytical Parameters	Containers	Date	Time	Sampler Initials	Comments (e.g. problems encountered, ref. to variance, location changes, important observations or descriptions, etc.)

Notes:

1. See QAPP for sampling frequency and actual number of QC samples.
2. SC - Summa Canister.
3. TB - Tedlar Bag (quantity).
4. No Matrix Spike, Matrix Spike Duplicate, Matrix Spike Blanks, Field Duplicates, Field Blanks or Rinsates collected for air samples.

SAMPLE

SAMPLE LABELING, STORAGE & SHIPMENT PROCEDURES

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

CHAIN OF CUSTODY RECORD

Project No.	Project Name					Number of Containers	VOCs	SVOCs	Metals					REMARKS
Samplers (Signature)														
No.	Date	Time	comp	grab	Sample Identification									

Possible Hazard Identification:
☐ Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison ☐ Unknown

Sample Disposal:
Return to Client ☐ Disposal by Lab ☐ Archive _____(mos.)

Turnaround Time Required:
Normal ☐ Rush ☐

QC Level: I. ☐ II. ☐ III. ☐ Project Specific (specify):_____

Relinquished by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	REMARKS:
Relinquished by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	

SAMPLE

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

WIPE SAMPLE COLLECTION SUMMARY LOG

Field ID	Location	QC Type	Analytical Parameters	Containers	Date	Time	Sampler Initials	Comments (e.g. problems encountered, ref. to variance, location changes, important observations or descriptions, etc.)

Notes:

1. See QAPP for sampling frequency and actual number of QC samples.
2. CWM - clear, wide-mouth glass jar with Teflon-lined cap.
3. FD - Field Duplicate.
4. FB - Field Blank.
5. RS - Rinsate.
6. No Matrix Spike, Matrix Spike Duplicate or Matrix Spike Blanks for wipe samples.
7. Rinsates should be taken at a rate of 1 per day during wipe sampling. Only take when reusable equipment is used.
8. Wipe sample FB collected by wiping unused glove and any other sampling equipment coming into contact with sampled surface) with prepared gauze pad and place in sample jar. Take at a rate of 1 FB per 20 samples.
9. Wipe sample FDs taken adjacent to original sample at a rate of 1 FD per 20 samples.
10. **EH :** Extract and Hold

SAMPLE

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

AIR SAMPLE COLLECTION SUMMARY LOG

Field ID	Location	QC Type	Analytical Parameters	Containers	Date	Time	Sampler Initials	Comments (e.g. problems encountered, ref. to variance, location changes, important observations or descriptions, etc.)

SAMPLE

Notes:

1. See QAPP for sampling frequency and actual number of QC samples.
2. SC - Summa Canister.
3. TB - Tedlar Bag (quantity).
4. No Matrix Spike, Matrix Spike Duplicate, Matrix Spike Blanks, Field Duplicates, Field Blanks or Rinsates collected for air samples.

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

CHAIN OF CUSTODY RECORD

Project No.	Project Name					Number of Containers	VOCs	SVOCs	Metals					REMARKS
Samplers (Signature)														
No.	Date	Time	comp	grab	Sample Identification									

Possible Hazard Identification:
☐ Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal:
Return to Client ☐ Disposal by Lab ☐ Archive _____(mos.)

Turnaround Time Required:
Normal ☐ Rush ☐

QC Level:
I. ☐ II. ☐ III. ☐ Project Specific (specify):_____

Relinquished by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	REMARKS:
Relinquished by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	

SAMPLE

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FIELD OPERATING PROCEDURES

Surface Water Sampling Procedures

FOP 064.0

SURFACE WATER SAMPLING PROCEDURES

PURPOSE

This procedure describes a method for collecting surface water samples. Sediment samples typically are collected in conjunction with surface water samples as dictated by the site-specific work plan. It should be noted, however, sediment sample collection procedures are not presented herein and Benchmark's sediment sampling FOPs 049 and 050 should be reviewed prior to sediment sample collection. This surface water sampling method incorporates the use of the laboratory provided sample bottle for collecting the sample, which eliminates the need for other equipment and hence, reduces the risk of introducing other variables into a sampling event.

PROCEDURE

1. Locate the surface water sample location.

2. Calibrate all field meters (i.e., pH/Eh, turbidity, specific conductance, dissolved oxygen, PID etc.) in accordance with the Benchmark Field Operating Procedure for Calibration and Maintenance of the specific field meter.

3. Wearing appropriate protective gear (i.e., latex gloves, safety glasses), as required in the Project Health and Safety Plan, prepare sample bottles for use.

4. If samples are to be collected from a stream, creek or other running water body, collect downstream samples first to minimize impacts on sample quality.

5. Surface water samples should be collected during a dry (non-precipitation) event to avoid any dilution effect from precipitation.

6. Pre-label all sample bottles in the field using a waterproof permanent marker in accordance with the Benchmark Sample Labeling, Storage and Shipment

FOP. The following information, at a minimum, should be included on the label:

- Project Number;
- Sample identification code (as per project specifications);
- Date of sample collection (mm, dd, yy);
- Time of sample collection (military time only) (hh:mm);
- Specify "grab" or "composite" sample type;
- Sampler initials;
- Preservative(s) (if applicable); and
- Analytes for analysis (if practicable).

7. Collect the surface water sample from the designated location by slowly submerging each sample bottle with minimal surface disturbance. If the sample location cannot be sampled in this manner due to shallow water conditions, a small depression can be created with a standard shovel to deepen the location to facilitate sample collection by direct grab. It should be noted, prior to disturbing sediment at any location for this purpose, all required sediment samples should be collected. All sediment cuttings will be removed from the area and the surface water allowed to flow through the depression for several minutes prior to collecting samples until clear (i.e., no visible sediment).

8. Collect samples from near shore. If water body is over three feet deep, check for stratification. Check each stratum for contamination using field measured water quality parameters. Collect samples from each stratum showing evidence of impact. If no stratum shows signs of impact, collect a composite sample having equal parts of water from each stratum.

9. Collect samples into pre-cleaned bottles provided by the analytical laboratory with the appropriate preservative(s) added based on the volatilization sensitivity or suite of analytical parameters required, as designated below:

    - Volatile Organic Compounds (VOCs)
    - Total Organic Halogens (TOX)

- Total Organic Carbon (TOC)
- Extractable Organic Compounds (i.e., BNAs, SVOCs, etc.)
- Total metals (Dissolved Metals)
- Total Phenolic Compounds
- Cyanide
- Sulfate and Chloride
- Turbidity
- Nitrate and Ammonia
- Radionuclides

10. For pre-preserved bottles, avoid completely submerging the bottle and overfilling to prevent preservative loss. Pre-preserved VOC vials should be filled from a second, unpreserved, pre-cleaned glass container. Never transfer samples from dissimilar bottle types (i.e., plastic to glass or glass to plastic).

11. Collect a separate sample of approximately 200 ml into an appropriate container prior to collecting the first and following the last surface water sample collected to measure the following field parameters:

Parameter	Units
Dissolved Oxygen	parts per million (ppm)
Specific Conductance	μmhos/cm or μS or mS
pH	pH units
Temperature	^{o}C or ^{o}F
Turbidity	NTU
Eh (*optional*)	mV
PID VOCs (*optional*)	ppm

Record all field measurements on a Surface Water Quality Field Collection Log form (sample attached).

12. Record available information for the pond, stream or other body of water that was sampled, such as its size, location and depth in the Project Field Book and

on the Surface Water Quality Field Collection Log form (sample attached). Approximate sampling points should be identified on a sketch of the water body.

13. Label, store and ship all samples in accordance with the Benchmark Field Operating Procedure for Sample Labeling, Storage and Shipment Procedures.

ATTACHMENTS

Surface Water Quality Field Collection Log (sample)

REFERENCES

Benchmark FOPs:

007 *Calibration and Maintenance of Portable Dissolved Oxygen Meter*
008 *Calibration and Maintenance of Portable Field pH/Eh Meter*
009 *Calibration and Maintenance of Portable Field Turbidity Meter*
012 *Calibration and Maintenance of Portable Specific Conductance Meter*
046 *Sample Labeling, Storage and Shipment Procedures*

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

SURFACE WATER QUALITY FIELD COLLECTION LOG

PROJECT INFORMATION

Project Name:

Project No.:

Client:

SAMPLE DESCRIPTION

I.D.:

Matrix:

Location:

SAMPLE INFORMATION

Date Collected:

Time Collected:

Date Shipped to Lab:

Collected By:

Sample Collection Method:

LABORATORY ANALYSIS

SAMPLING INFORMATION

Weather:

Air Temperature:

Depth of Sample:

LOCATION

(not to scale, dimensions are approximate)

Parameter	First	Last	Units
pH			unit
Temp.			
Cond.			mS
Turbidity			
Eh			
D.O.			
Odor			olfactory
Appearance			visual

EXACT LOCATION (if applicable)

Northing (ft)	Easting (ft)	Surface Elevation (fmsl)

SAMPLE

ADDITIONAL LABORATORY ANALYSIS:

ADDITIONAL REMARKS:

PREPARED BY: **DATE:**

APPENDIX C

CORRECTIVE MEASURES REPORT

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

DAILY LOG	DATE		
	REPORT NO.		
	PAGE	OF	

CORRECTIVE MEASURES REPORT

Date:

Project:

Job No:

Location:

CQA Monitor(s):

Client:

Contractor:

Contractor's Supervisor:

WEATHER CONDITIONS:

Ambient Air Temp. - A.M.:

Ambient Air Temp. - P.M.:

Wind Direction:

Wind Speed:

Precipitation:

Corrective Measures Undertaken (reference Problem Identification Report No.)

Retesting Location:

Suggested Method of Minimizing Re-Occurrence:

Approvals (initial):

CQA Engineer:

Project Manager:

Signed:

CQA Representative

APPENDIX B

POST-CLOSURE FIELD INSPECTION REPORT

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

Field Inspection Report
Post-Remedial Operation, Maintenance & Monitoring Plan

Property Name:		Project No.:	
Client:			
Property Address:		City, State:	Zip Code:
Property ID: (Tax Assessment Map)	Section:	Block:	Lot(s):
Preparer's Name:		Date/Time:	

CERTIFICATION

The results of this inspection were discussed with the Site Manager. Any corrective actions required have been identified and noted in this report, and a supplemental Corrective Action Form has been completed. Proper implementation of these corrective actions have been discussed with the Site Manager, agreed upon, and scheduled.

Preparer / Inspector: **Date:**

Signature:

Next Scheduled Inspection Date:

Property Access

1. Is the access road in need of repair?	☐ yes	☐ no	☐ N/A
2. Sufficient signage posted (No Trespassing)?	☐ yes	☐ no	☐ N/A
3. Has there been any noted or reported trespassing?	☐ yes	☐ no	☐ N/A

Please note any irregularities/ changes in site access and security:

Final Surface Cover / Vegetation

The integrity of the vegetative soil cover or other surface coverage (e.g., asphalt, concrete) over the entire Site must be maintained. The following documents the condition of the above.

1. Final Cover is in Place and in good condition?	☐ yes	☐ no	☐ N/A
Cover consists of (mainly):			
2. Evidence of erosion?	☐ yes	☐ no	☐ N/A
3. Cracks visible in pavement?	☐ yes	☐ no	☐ N/A
4. Evidence of distressed vegetation/turf?	☐ yes	☐ no	☐ N/A
5. Evidence of unintended traffic and/or rutting?	☐ yes	☐ no	☐ N/A
6. Evidence of uneven settlement and/or ponding?	☐ yes	☐ no	☐ N/A

Field Inspection Report
Post-Remedial Operation, Maintenance & Monitoring Plan

☐ ☐ ☐

Final Surface Cover / Vegetation

7. Damage to any surface coverage? ☐ yes ☐ no ☐ N/A

If yes to any question above, please provide more information below.

_____

_____

_____

Gas Vent System Monitoring and Maintenance

Are there signs of stressed vegetation around gas vents? ☐ yes ☐ no ☐ N/A

Are the gas vents currently intact and operational? ☐ yes ☐ no ☐ N/A

Has regular maintenance and monitoring been documented and enclosed or referenced?
☐ yes ☐ no ☐ N/A

Groundwater Monitoring

Is there a plan in place and currently being followed? ☐ yes ☐ no ☐ N/A

Are the wells currently intact and operational? ☐ yes ☐ no ☐ N/A

When was the most recent sampling event report and submittal? Date: _____

When is the next projected sampling event? Date: _____

Property Use Changes / Site Development

Has the property usage changed, or site been redeveloped since the last inspection?
☐ yes ☐ no ☐ N/A

If yes, please list with date: _____

_____

_____

_____

_____

Field Inspection Report
Post-Remedial Operation, Maintenance & Monitoring Plan

New Information

Has any new information been brought to the owner/engineer's attention regarding any and/or all engineering and institutional controls and their operation and effectiveness?

☐ yes ☐ no ☐ N/A

Comments: _____

This space for Notes and Comments

Please include the following Attachments:

1. Site Sketch
2. Photographs

BENCHMARK
ENVIRONMENTAL
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Corrective Action Certification
Post-Remedial Operation, Maintenance & Monitoring Plan

Property Name:		Project No.:	
Client:			
Property Address:		City, State:	Zip Code:
Property ID: (Tax Assessment Map)	Section:	Block:	Lot(s):
Preparer's Name:		Date/Time:	

Issue Addressed

The Environmental Inspection of the above property determined the need for corrective action. This form has been completed to document the required corrective action and it's implementation.

Description of Site Issue identified during Environmental Inspection (include sketch & photographs):

Corrective Action Taken

Date Completed:

Describe Action Taken (include sketch & photographs):

Certification of Implementation

The signatory hereby certifies that the corrective action as described in this form has been completed in accordance with all relevant requirements of the Soil/Fill Management Plan and other applicable documents.

Preparer / Inspector: **Date:**

Signature:

Please verify inclusion of the following Attachments:

1. Site Sketch
2. Photographs

APPENDIX C

KEY CONSTRUCTION SPECIFICATIONS

SECTION 02250 – FINAL CONSTRUCTION COVER
SECTION 02270 - GEOSYNTHETICS
SECTION 02901 – TOPSOIL
SECTION 02902 – TURF

APPENDIX C-1

SECTION 02250, FINAL CONSTRUCTION COVER

SECTION 02250
FINAL CONSTRUCTION COVER

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. Subcontractor shall furnish all labor, materials, equipment, accessories and services necessary to excavate, screen, transport, place and compact soil and materials specified for the final cover as shown on the Drawings and herein specified.

B. Related Work Specified Elsewhere:

1. Section 02110, Clearing and Grubbing
2. Section 02901, Topsoil
3. Section 02902, Turf

1.2 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

A. Barrier Layer Material Tests:

1. Benchmark will perform in-place soil density testing to determine the degree of compaction of the recompacted barrier layer soil. A minimum of nine moisture-density tests using a nuclear densitometer shall be performed per acre per lift of completed barrier layer. Benchmark will determine the exact location of the moisture-density tests. The location of all nuclear densitometer tests will be referenced to the existing horizontal grid system. The Subcontractor shall be responsible for providing grade control at all times during barrier layer placement to facilitate test identification and coordination by Benchmark.
2. The soil shall be compacted to wet of the optimum moisture content and not less than the minimum density as described in the CQA Plan and item 3.4 of this Section. If the specified moisture and density is not obtained, the Subcontractor shall perform all work required to provide the specified amounts. This work shall include recompaction and/or complete removal and replacement of unacceptable barrier material until the specified moisture and density is achieved. All additional excavation and compaction work shall be performed by the Subcontractor at no additional cost to Benchmark until the specified degree of compaction is obtained.
3. Benchmark will perform one moisture content test per acre of the previous lift before placement of additional lifts. No additional lifts of final cover material will be permitted unless the moisture content of the soil is greater than the optimum. The Subcontractor shall obtain the approval of Benchmark before proceeding with placement of additional lifts.

4. Constant-head undisturbed laboratory permeability tests (Shelby tube) will be performed on the completed lifts of barrier material by Benchmark. The Subcontractor shall assist Benchmark in collecting the Shelby tube samples required for the performance of the permeability tests. The location of all permeability shall be referred to the existing horizontal grid system. The Subcontractor shall achieve maximum in-place soil permeability for the barrier layer material of 1.0×10^{-6} cm/sec.
5. Soils testing of material shall be performed in accordance with the following references:
   a. ASTM D 421, Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
   b. ASTM D 422, Particle-Size Analysis of Soils.
   c. ASTM D 689, Moisture-Density Relations of Soils.
   d. ASTM D 2922, Standard Test Methods for Soil and Soil Aggregates In-Place by Nuclear Methods (for shallow depths).
   e. ASTM D 1557, Moisture-Density Relations of Soils, Using 10 lb. Rammer and 18-inch Drop.
   f. ASTM D 2216, Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures.
   g. ASTM D 5084, Recompacted Constant-Head Permeability of Soils.
   h. ASTM D 4318, Liquid Limit Plastic Unit, and Plasticity Index of Soils.
6. The Subcontractor shall be thoroughly familiar with the requirements of the Benchmark's Construction Quality Assurance (CQA) Plan. The quality assurance testing specified in the CQA Plan will be performed by Benchmark; however, the Subcontractor shall assist Benchmark in implementation of the CQA Plan. This includes performing site layout surveying, providing equipment and personnel to assist Benchmark in collection of soil samples, and implementation of corrective measures as described in the CQA Plan at no additional cost to Benchmark.

B. Benchmark shall perform all quality assurance testing on the topsoil as required under Section 02901, Topsoil.

C. Coordination:
   1. The Subcontractor shall coordinate soil placement activities with the Benchmark's CQA Inspector to keep him fully informed regarding amounts of soil material needed, and when it will be placed.

PART 2 – MATERIALS

2.1 SOIL MATERIALS

A. General:

1. The Subcontractor shall be responsible for obtaining all the necessary State and Local permits required for the excavation of borrow source material.
2. All soil material shall be natural soil, free from excessive moisture or frost.
3. The Subcontractor shall remove all stumps, roots, muck, marl and stones exceeding 3-inches in greatest dimension prior to placement.
4. Stones smaller than 3-inches in diameter shall be kept apart and not permitted to accumulate in-groups.
5. Use no frozen material.
6. Benchmark shall collect the soil samples for analysis. The Subcontractor shall provide personnel and heavy equipment to assist Benchmark in the collection of the samples.

B. Barrier Layer Material:

1. In addition to Paragraph 2.1.A requirements, material shall contain no sod or vegetative matter.
2. Benchmark will perform CQA testing on the barrier layer material prior to placement. The Subcontractor will either stockpile the proposed material in 1000 cubic yard piles for testing by Benchmark or else dig representative test holes at the borrow area for testing. Specific requirements are described in the CQA Plan. The Subcontractor will not be permitted to use the soil for the barrier layer construction until after CQA testing has been completed and Benchmark approves the material.
3. Barrier layer material will conform to the following requirements:
   a. Recompacted Permeability: less than or equal to 1.0×10^{-6} cm/sec.
   b. Approximate Gradation:

Seize Size Designation	Percent Minimum Passing by Weight
3 – inch	100
No. 4	85
No. 200	50

C. Topsoil:

1. Soil material capable of supporting adequate vegetative growth meeting the requirements of Section 02901, Topsoil.

2.2 SEED

A. Refer to Section 02902, Turf.

PART 3 – EXECUTION

3.1 EXCAVATION

A. All miscellaneous excavation and grading shall be to the required lines, grades, depths and dimensions necessary as shown on the Contract Drawings.

B. In any case where the excavation or grading extends deeper than the required elevations, the over-excavated areas shall, at the discretion of Benchmark, be filled with acceptable material at no additional cost to Benchmark.

3.2 BARRIER LAYER PREPARATION

A. The Subcontractor shall be responsible for scarifying the top inch of the existing barrier layer as directed by Benchmark, prior to placement of additional barrier layer material.

3.3 GAS VENT INSTALLATION

A. Waste material excavated during gas vent installation shall be disposed of on-site within the waste fill area, the same day it is excavated, at a location specified by Benchmark.

3.4 BARRIER LAYER CONSTRUCTION

A. The Subcontractor shall utilize all soil material representative of one composite sample (approximately 5,000 cubic yards) before beginning to utilize other material representative of the next composite.

B. The barrier layer material shall be placed in loose lifts, approximately nine inches thick and shall be compacted to maximum lift thickness of six inches.

C. Each layer of barrier material shall be thoroughly tamped or rolled to the required degree of compaction and moisture. Successive layers shall not be placed until the layer under construction has been thoroughly compacted, tested, and approved by Benchmark.

D. The top inch of each completed and approved lift shall also be scarified or rolled with a pad-foot roller, unless otherwise directed by Benchmark, prior to placement of successive layers.

E. Material shall be mixed and spread in a manner to assure uniform lift thickness after placement.

F. Barrier layer material containing lumps, pockets or concentrations of rubble and stones, debris, wood or other organic matter shall not be placed. Fill containing unacceptable material shall be removed and disposed.

G. The Subcontractor shall remove existing vegetation prior to barrier layer placement.

H. All excavation, transportation and placement operations shall be such as will produce satisfactory gradation of materials after they have been spread and compacted. Dumping, spreading, sprinkling and compacting operations shall be carried out systematically so as not to interfere with each other.

I. Intermediate lifts will be seal rolled when subsequent lifts will not be placed within 48 hours of completion.

J. Damage to compacted lifts (viz., rutting by equipment or erosion) will be repaired prior to placing any overlying materials at no additional cost.

K. Any perforations in the barrier layer material resulting from grade stake removal or other causes shall be backfilled with acceptable barrier layer soil material or a dry soil-bentonite (50/50) mixture by the Subcontractor before material may be placed on the next lift.

L. Moisture Control:

1. The barrier layer material moisture content shall be maintained greater than optimum moisture content during placement.
2. Barrier layer material shall not be placed unless the moisture content of the previous lift is also greater than optimum.
3. When necessary, moisture will be added using approved sprinkling equipment. The Subcontractor shall, at his own expense, add sufficient water during rolling and tamping to assure complete compaction of material.
4. Place no more barrier material than can be compacted and tested the same day.
5. If, in the opinion of Benchmark, the material is too wet for satisfactory compaction, or compaction efforts may damage preceding layers of final cover, the Subcontractor shall temporarily stop work and the material will be allowed to dry. There shall be no additional cost to Benchmark for time and materials required to spread, dry and rework the material.
6. The placement or compaction of material will not be permitted during or immediately following rainfall. Construction of the barrier layer shall be conducted in such manner that a minimum of rainwater will be retained thereon. Compacted material that is damaged by washing shall be replaced by the Subcontractor in an acceptable manner at no additional cost.
7. No compaction of material will be permitted with free water on any portion of the layer to be compacted.
8. Place topsoil on each completed segment of cap immediately after CQA tests are approved by Benchmark to control moisture and prevent desiccation cracking.

M. Compaction:

1. Each lift of the barrier layer shall be compacted to not less than 90 percent of the modified proctor maximum density, in pounds per cubic foot, as determined by the Modified Proctor Compaction Test, ASTM-D-1557 and as specified in the CQA Plan.
2. Benchmark will perform the compaction and moisture content tests in accordance with the CQA Plan.
3. The Subcontractor shall select equipment, which is capable of providing the minimum densities required by these specifications, and shall submit a description of the type of equipment he proposes to use to Benchmark for approval. Compaction equipment will be a tamping foot or sheepsfoot roller. A smooth roller shall not be used for compaction.
4. Lift thicknesses, water content (of the material), compactor weight and the number of passes of the compacting equipment will be adjusted as required to obtain the minimum specified density.
5. If the field and laboratory tests indicate unsatisfactory results, the Subcontractor shall provide the additional work effort necessary to achieve the desired degree of in-place moisture, density and permeability to the satisfaction of Benchmark. All additional compaction work or removing and replacing of soil material shall be performed by the Subcontractor at no additional cost to Benchmark.

3.5 TOPSOIL AND VEGETATIVE COVER

A. Following the completion of the barrier layer construction, six inches of topsoil will be placed to support vegetative growth. Refer to Sections 02901 and 02902 for specifications regarding topsoil and vegetative cover.

3.6 MINIMUM COVER SYSTEM THICKNESS

A. The Subcontractor shall obtain the approval of Benchmark for the minimum layer thickness of each layer before beginning the placement of subsequent layers.
B. The barrier layer shall have a minimum overall thickness of 18-inches after final compaction.
C. The topsoil layer shall have a minimum thickness of 6-inches after final rolling.

3.7 INSPECTION

A. Benchmark shall examine the areas and conditions under which the compaction work is to be performed and notify the Subcontractor of conditions detrimental to the proper and timely completion of the Work. Subcontractor shall not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

END OF SECTION

APPENDIX C-2

SECTION 02270, GEOSYNTHETICS

SECTION 02270
GEOSYNTHETICS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies the material and construction requirements for:
1. Geocomposite (Geotextile Encapsulated Geonet)
2. Black Surfaced Coextruded Textured LLDPE Geomembrane
3. Silt Fence

B. Related work specified elsewhere:
1. Excavation, Backfill, and Grading: Section 02220

1.2 DEFINITIONS:

A. Geocomposite is the geotextile encapsulated geonet material to be installed above and below the geomembrane as part of the final cover system on the creek bank as shown.

B. Geomembrane is the linear low-density polyethylene liner to be installed as the primary barrier of the cover system.

C. Silt fence is a geosynthetic fabric fence system keyed into the existing ground to help retain potential eroded soil and sediment from migrating off-site or from restored areas.

1.3 JOB CONDITIONS:

A. The OWNER will retain the services of Geosynthetics Supplier(s) to supply:
- Geomembrane; and
- Geocomposite

Chanago Contracting, Inc. (Geosynthetics Installer) will also be retained to perform the installation of the geosynthetics associated with the landfill cover system, including:
- Geocomposite drainage layer;
- 40-mil Black Surfaced Coextruded Textured LLDPE geomembrane liner
- Geocomposite cushion/drainage layer

The SUBCONTRACTOR shall be responsible for notifying OWNER of the geosynthetic quantities necessary for completing the project, preparing and providing

suitable subgrades, coordinating and scheduling the material delivery, providing for the unloading and staging of material at the site and providing for the transfer of material from the staging area to the work location. The SUBCONTRACTOR shall keep the OWNER and BENCHMARK informed of all issues pertaining to the coordination and execution of the work to be performed by Geosynthetics Installer.

B. The SUBCONTRACTOR will be responsible for supplying and installing all other geosynthetic materials and providing appropriate manufacturing data, as specified herein, which are required for the project unless otherwise directed and arranged by the OWNER.

C. The SUBCONTRACTOR shall be responsible for all record surveying and drawings required for the geosynthetics installation work. Survey coordination will be required between SUBCONTRACTOR and Geosynthetics Installer to not delay any work.

1.4 SUBMITTALS:

A. Geosynthetics Supplier or the SUBCONTRACTOR, as appropriate, shall submit to BENCHMARK, prior to product shipping, the following:
   1. Geocomposite (Geosynthetics Supplier)
      a. Manufacturers product specifications.
      b. Manufacturers recommendations for storage, installation and anchoring.
   2. Geomembrane (Geosynthetics Supplier)
      a. Manufacturers product specifications.
      b. Manufacturers recommendations for storage, installation and anchoring.
   3. Silt Fence (SUBCONTRACTOR)
      a. Supplier/manufacturer
      b. Manufacturers product specifications
      c. Manufacturers recommendations for storage, installation and anchoring

B. Geosynthetics Supplier/Installer or the SUBCONTRACTOR, as appropriate, shall submit to BENCHMARK, prior to or upon product delivery to the site and prior to installation the following:
   1. Manufacturer's test data, as specified herein.
   2. Proposed geomembrane and geocomposite panel layout.

C. Geosynthetics Supplier or the SUBCONTRACTOR, as appropriate, shall submit to the OWNER and BENCHMARK, following geosynthetic installation, the following:
   1. Manufacturer's Warranty for all geosynthetic products delivered to the project site.
   2. "Testing Report" as required under Section 5.4.2.5 of the Construction Quality

Assurance Project Plan.

The above geomembrane submittals shall be made and the data accepted by BENCHMARK prior to placement of any overlying materials over the geomembrane.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Geomembrane (GSE UltraFlex Textured): Geomembrane shall be GSE UltraFlex Textured Geomembrane as manufactured by GSE Lining Technology, Inc. and shall be linear low density polyethylene, shall be a nominal 40 mil continuous thickness, shall have textured surfaces both sides, shall have smooth edges on both sides, and shall meet or exceed the minimum requirements specified in Table 02270-1.

B. Geocomposite (280 mil GSE FabriNet HF): Geocomposite shall be non-woven, needle punched, polyester, continuous filament geotextile thermally (heat) bonded to both sides of a high density polyethylene geonet meeting or exceeding the minimum requirements specified in Table 02270-1.

C. Silt Fence:

1. Fabric

Silt fence fabric shall be woven and consist of monofilaments of polypropylene treated with ultraviolet light stabilizers. The fabric shall have sleeves through which either steel or square wood posts can be inserted. Silt fence fabric shall be inert to chemicals commonly found in soils and to hydrocarbons, resistant to mildew, rot, insects, and rodent attack, and shall conform to the following test criteria:

Property	Unit	Test Method	Min. Average Roll Value
Grab Strength	lbs	ASTM D4632	90
Elongation at Failure	%	ASTM D4632	50
Mullen Burst Strength	psi	ASTM D3786	190
Trapezoidal Tear Strength	lbs	ASTM D4533	50
Puncture Strength	lbs	ASTM D751	40
AOS	U.S. Sieve No.	ASTM	40-80

	Equivalent	D4751	
Ultraviolet Stability	%	ASTM D4355	70
Water Flow Rate	gal/min/sq. ft	ASTM D4491	20
Permittivity	sec^{-1}	ASTM D4491	0.2

2. Silt Fence Posts
   b. Wood shall be composed of sound quality hardwood with a minimum cross sectional area of 3.0 square inches.
   c. Wood posts shall be a minimum of 36 inches in length.
   d. Steel posts shall be standard T&V section weighing not less than 1.00 pound/linear foot.

PART 3 - EXECUTION

3.1 GEOCOMPOSITE

A. Manufacturer's Testing
Geosynthetics Supplier shall provide manufacturer's test data to confirm the geocomposite supplied for the project meets the material requirements specified herein.

B. Installation:
The following provisions shall apply, except where in conflict with the manufacturer's recommendations.

1. Upon delivery and deployment, the geocomposite material shall be observed for damage and defects. Any damaged or defective geocomposite material, including geocomposite with holes, and tears, or covered with mud or other deleterious materials, shall be rejected and shall be removed from the project site.
2. Geocomposite shall be deployed only on subgrade surfaces that have been properly prepared, and are acceptable to BENCHMARK.
3. The upper geocomposite drainage layer shall be deployed in a manner that does not stress or "pull-on" the underlying textured geomembrane.
4. No vehicles of any type shall be allowed on the geocomposite material.
5. Fueling of equipment on geocomposite material shall not be permitted. No fuel containers shall be permitted on the geocomposite material.
6. The Geosynthetic Installer shall limit daily deployment of the lower drainage geocomposite to the area that can be covered with placement of the overlying geomembrane by the end of the workday. The Geosynthetic Installer shall limit daily deployment of the upper geocomposite (i.e. drainage/cushion layer) to the area that can be covered with placement of bedding stone by the end of the workday.

7. Deployment of geocomposite on slopes shall be from the top of the slope with the long dimension perpendicular to the toe of the slope.
8. The geocomposite shall be placed in a manner as to continually keep the geocomposite slightly tensioned and generally free of wrinkles or folds. The geocomposite shall be secured using sand bags until anchored and/or covered with the overlying material.
9. Where cross seams occur midslope, adjoining geocomposite rolls shall be shingled down in the direction of the slope, a minimum of 12 inches across the roll width. The geocomposite overlap shall be joined by applying suitable plastic zip ties at 6-inch intervals along the width of the roll. The completed geocomposite cross seams shall be covered with a minimum 3-foot wide non-woven geotextile cap, heat bonded to the geotextile portion of the shingled geocomposite. No horizontal cross seams shall be installed within 5 feet of the top or toe of a slope. The number of cross seams occurring on a slope shall be minimized.
10. The geonet seam overlap shall be a minimum of 4-inches and joined by applying suitable plastic zip ties at 2-foot intervals along the length of the roll.
11. All geonet overlaps shall be secured with suitable plastic zip ties. Metallic, wire, or string ties shall not be permitted. Plastic zip ties shall be white or another bright color for easy observation.
12. The vertical overlap seams of the upper geocomposite geotextile layer shall be sewn using a single row, two-thread chain stitch technique.
13. Any rips, tears, or damaged areas on the deployed geocomposite shall be removed and patched using the same geocomposite, originating from a new roll. The patch shall be a minimum of 18 inches larger in all directions than the area to be repaired. The patch shall be tied in place using a minimum of 8 plastic ties spaced at a maximum interval of one every 6 inches. The exposed ends of the geonet on the repair piece of geocomposite shall be covered with non-woven (Type I) with a minimum overlap of 18 inches in each direction. The geotextile layers shall be heat-bonded with a hot air gun.

3.2 GEOMEMBRANE MATERIAL

A. Manufacturer's Conformance Testing

1. The manufacturer shall provide certification that the geomembrane was continuously inspected for uniformity, damage, holes, cracks, thin spots, foreign materials, and any other imperfections that will compromise the performance of the geomembrane. Any imperfections shall be immediately repaired and reinspected.
2. The manufacturer shall provide data that indicates chemical and physical resistance of the LLDPE to sanitary landfill solid waste leachate.
3. The manufacturer shall provide information on the origin and identification of the raw materials used to manufacture the geomembrane.

4. Geomembrane manufacturer shall submit the test data to BENCHMARK for review and acceptance prior to shipment of the geomembrane liner.
5. Geomembrane shall be shipped in rolls which are properly identified with the following:
    - Manufacturer's Name, Plant and Location
    - Product Name and Model/Type No.
    - Lot Number or Designation identifying the date of manufacture and production run
    - Roll Number

B. Geosynthetics Installer Qualifications and Requirements

1. The liner shall be installed in accordance with the manufacturer's recommendations, the NYSDEC NYCRR Part 360-2.13(k) requirements and these specifications. Geosynthetics Installer shall submit qualifications that Field Crew superintendent and the Master Seamer shall have a documented minimum qualification which demonstrates successful installation experience of at least 50 acres of previous landfill or comparable geosynthetic systems on a minimum of five different projects. This documentation must be submitted to BENCHMARK before the field crew foreman will be approved. Resume's shall also be submitted for all Geosynthetics Installer's personnel, who will be doing field seaming and field testing, demonstrating their that they are qualified to do the work specified.
2. The Geosynthetics Installer shall prepare and submit a quality control plan acceptable to the OWNER and BENCHMARK addressing the installation, seaming and testing requirements specified herein. The Geosynthetics Installer shall adhere to its approved quality control plan, and the requirements specified herein.
3. The Geosynthetics Installer will be required to submit a liner deployment plan for review at least seven (7) days before beginning deployment. The plan will be reviewed for the proposed orientation of seams with respect to slopes. The deployment plan shall also include the procedures for deploying and protecting underlying geosynthetic materials. BENCHMARK must approve the liner deployment plan prior to LLDPE liner construction.

C. Sequence of Construction

1. The geomembrane shall be constructed to the limits shown on the Contract Drawings and in accordance with these Specifications. Any deviations from the Drawings or Specifications require the prior approval of BENCHMARK and must be documented by "record" revisions to the Drawings.
2. The geomembrane and underlying geosynthetics shall be placed and seamed as soon as practical after completion of the underlying subgrade and approval by BENCHMARK or portion thereof. Sections of geomembrane and underlying geocomposite deployed on the landfill slopes shall be properly secured and or anchored in anchor trenches and continuously welded to

adjacent sections.

3. During all phases of liner installation, construction will be tested, inspected, and evaluated prior to approval.

D. Geomembrane Installation

The following provisions shall apply, except where in conflict with the manufacturer's recommendations.

1. Upon delivery and deployment, the geomembrane material shall be observed for damage and defects. Any damaged or defective geomembrane material, including geomembrane with holes, and tears, or covered with mud or other deleterious materials, shall be rejected and shall be removed from the project site.
2. No vehicles of any type shall be allowed on the geomembrane material.
3. Personnel working on the geomembrane must not wear shoes that can damage the geomembrane or engage in activities that could result in damage to the geomembrane.
4. Fueling of equipment on geomembrane material shall not be permitted. No fuel containers shall be permitted on the geomembrane material.
5. No equipment shall be permitted on the geomembrane material. All lightweight equipment, including seaming equipment, shall be placed on rub sheets.
6. The textured geomembrane shall be employed in a manner that does not stress or "pulls on" the underlying drainage geocomposite.
7. Installation of the geomembrane shall be as follows:
   a. Unroll only those sections that are to be seamed together or anchored in one day. Panels shall be positioned with the overlap recommended by the manufacturer, but not less than 4 inches. The edge of the upslope sheet shall be positioned above the edge of the downslope sheet. The geomembrane liner, where appropriate, will be placed in an anchor trench which is then backfilled by the SUBCONTRACTOR with compacted soil as shown on the Contract Drawings. Compaction shall be to a minimum of 95 percent of the maximum dry density as determined by ASTM D-987, standard Proctor test.
   b. After panels are initially in place, remove as many wrinkles as possible. Unroll panels and allow the liner to "relax" before beginning field seaming. The purpose of this is to make the edges that are to be bonded as smooth and free of wrinkles as possible.
   c. Once panels are in place and smooth, commence field seaming operations.
8. Field seaming is affected by ambient weather conditions. This effect varies depending on the method of field seaming. The Geosynthetics Installer shall establish control parameters prior to the start of field seaming. It shall submit

these parameters as well as the method and procedure for seaming to BENCHMARK for approval.

9. Field seaming shall be as follows:
   a. All foreign matter (dirt, water, oil etc.) shall be removed from the edges to be bonded.
   b. For extrusion-type welds, the bonding surfaces must be thoroughly cleaned by mechanical abrasion or alternative methods approved by BENCHMARK to remove surface impurities and prepare the surface for bonding. All abrasive buffing shall be performed using No. 80 grit or finer sandpaper. Grinding marks shall be perpendicular to the seam direction. The depth of the grinding marks must be less than 10% of the sheet thickness. Grinding marks shall not appear beyond 0.25 inches from the extrudate after it is placed. No solvents shall be used to clean the geomembrane liner.
   c. As much as practical, field seaming shall start from the top of the slope down. This will keep any wrinkles that may occur due to having people working on the side slopes behind the area being seamed. Tack welds (if used) shall use heat only; no double-sided tape, glue or other method will be permitted. The geomembrane should be seamed completely to the ends of all panels to minimize the potential of tear propagation along the seam.
   d. The completed liner shall not exhibit any "trampolining" during any daylight hours.
   e. At the end of each day or installation segment all unseamed edges shall be anchored by rope, sand bags, or other approved device. Sand bags securing the geomembrane on the side slopes should be connected by rope fastened at the top of the slope section by a temporary anchor as necessary. Staples, U-shaped rods or other penetrating anchors shall not be used to secure the geomembrane. Any damage to the liner due to wind, rain, hail, or other weather shall be the sole responsibility of the SUBCONTRACTOR.

10. Field seaming may be extrusion or fusion welding or a combination of these methods. Solvent welding is not acceptable. BENCHMARK reserves the right to reject any proposed seaming method believed to be unacceptable. Additional concepts and requirements of proper field seaming include the following:
    a. Panels shall be positioned with the overlap recommended by the manufacturer, but not less than 3 inches for extrusion welds and not less than 4 inches for fusion welds.
    b. The seams shall be oriented parallel to the line of maximum slope. In corners and odd-shaped geometric locations, the number of field seams should be minimized.
    c. No horizontal seams shall be allowed within 5 feet of the toe or the top of the slope.

d. Field seaming is prohibited when either the ambient air or sheet temperature is below 32 degrees F, when the sheet temperature exceeds 158 degrees F, when the ambient air temperature is above 120 degrees F, during periods of precipitation, or when wind velocity exceeds 20 miles per hour. The ambient air temperature shall be measured 18 inches above the liner surface. The membrane installation contractor shall supply instrumentation for measurement of ambient temperature.
e. If the Geosynthetics installer plans on seaming during periods when the air or sheet temperature is below 32 degrees F, the installer shall submit a cold weather seaming plan to BENCHMARK for approval, in consultation with the NYSDEC. No cold weather seaming shall be permitted until the cold weather seaming plan has been approved.
f. If the Geosynthetics installer plans on seaming during wet weather, the installer shall submit a wet weather seaming plan to BENCHMARK for approval, in consultation with the NYSDEC. No wet weather seaming shall be permitted until the wet weather seaming plan has been approved.
g. A moveable protective layer of plastic may be required, as recommended by BENCHMARK, to be placed directly below each overlap of geomembrane that is to be seamed. This is to prevent any moisture build-up between the sheets to be welded.
h. Seaming will extend to the outside edge of panels to be placed in anchor trenches.
i. If required, a firm working surface should be provided by using a flat board, conveyor belt, or similar hard surface directly under the seam overlap to achieve proper support.
j. No excessive grinding prior to welding shall be permitted. Overground or improperly ground areas shall be replaced at the SUBCONTRACTOR's expense. Grinding is not required for fusion welds.
k. Seams at panel corners of 3 or 4 sheets shall be completed with a patch having a minimum dimension of 24 inches, extrusion welded to the parent sheet.
l. The Geosynthetics Installer shall maintain at least one spare operable fusion and one spare operable extrusion seaming apparatus on site.
m. Prior to beginning a seam, the extruder shall be purged until all heat-degraded extrudate has been removed from the barrel. Whenever the extruder is stopped, the barrel shall be purged of all heat-degraded extrudate.

E. Testing During Construction

1. The Geosynthetics Installer shall observe the surface of the subgrade soils to check for stones, clumps or other detrimental materials, and wet areas before

deploying the roll of geosynthetics and will submit a certificate to BENCHMARK stating that the subgrade surface was checked and that its condition is satisfactory for covering with the underlying geosynthetics and liner. A satisfactory subgrade shall be relatively smooth and even, and free of roots, voids, etc.

2. BENCHMARK will also observe the subgrade surface and will inform the Geosynthetics Installer of areas that, in BENCHMARK's opinion, are unsatisfactory for covering. The geosynthetics contractor also will be advised so that the areas can be repaired before deploying the geosynthetics.
3. The Geosynthetics Installer will check the condition of each roll for defects and imperfections as it is deployed. BENCHMARK will observe the condition of each sheet as it is being deployed. Observed defects will be marked on the sheet and will be noted in field reports. Each defect will be patched and the patch seam will be non-destructively tested, as described below. The date of the successful non-destructive test will be marked on the liner and will be noted in field reports.
4. The Geosynthetics Installer shall maintain and use equipment and personnel at the site to perform testing of test seams. Seaming equipment will be checked daily before beginning seaming by destructive testing a seam specimen with a tensiometer. Test seams must be completed for each seamer/machine combination daily prior to beginning seaming, after extended breaks, at least every four hours, after significant changes in weather conditions, etc. Requirements for test seams follow:
   a. The test seam sample will be at least 0.9 m (3 ft) long by 0.3 m (1 ft) wide with the seam centered lengthwise. Six adjoining specimens 25 mm (1 in) wide each will be die cut from the test seam sample. These specimens will be tested in the field with a tensiometer for both shear (3 specimens) and peel (3 specimen). Test seams will be tested by the Geosynthetics Installer. The specimens should not fail in the weld. The Geosynthetics Installer will supply all necessary knowledgeable personnel and testing equipment. No strain measurements need to be obtained in the field.

      A passing machine or hand welded test seam will be achieved when the criteria in Table 02270-2 are satisfied with the exclusion of any strain requirements. If a test seam fails, the entire operation will be repeated. If the additional test seam fails, the seaming apparatus or seamer will not be used for seaming until the deficiencies are corrected and two consecutive successful full test seams are achieved. Test seam failure is defined as failure of any one of the specimens tested in shear or peel.
   b. BENCHMARK will observe all test seam procedures and log the date, hour, ambient temperature, number of seaming unit, name of seamer, welding machine temperature and pass or fail description.

5. If the Geosynthetics Installer proposes to seam using a Leister unit and extrusion welding, BENCHMARK will observe the condition of the test seam after leistering but before extrusion welding. The seam will be checked for zones of overheated materials (wrinkles, fishmouths, etc.). A seam having these features will be considered unsatisfactory. A sample of an apparent satisfactorily Leistered seam will be collected and will be peeled by hand to check the ease of the peeling and the adhesive of the two sheets. The Leistered seam will be considered acceptable if the sheets can be readily peeled and if the sheets do not tear during peeling.
6. Non-destructive tests will be done on all field seams to measure the integrity of the seam. Seams made by extrusion welding will be tested with a vacuum box (ASTM D4437) and seams made with a double hot wedge will be pressure tested as follows (pressure gauges and equipment will have been calibrated within 180 days of the project initiation and a current calibration certificate shall be provided):
    a. Single Weld Seams (extrusion weld) - The Geosynthetics Installer shall maintain and use equipment and personnel at the site to perform continuous vacuum box testing on all single weld production seams. The system shall be capable of applying a vacuum of at least 5 psi. The vacuum shall be held for a minimum of 10 seconds for each section of seam.
    b. Double Weld Seams (hot wedge) - The Geosynthetics Installer shall maintain and use equipment and personnel to perform air pressure testing of all double weld seams. The system shall be capable of applying a minimum pressure of at least 20 psi for not less than 5 minutes. The Geosynthetics Installer shall perform all pressure and vacuum testing under the supervision of BENCHMARK. Pressure loss tests shall be conducted in accordance with the procedures outlined in "Pressurized Air Channel Test for Dual Seamed Geomembranes", Geosynthetic Research Institute Test Method GM-6. As outlined by the test method, following a 2-minute pressurized stabilization period, pressure losses over a measurement period of 5 minutes shall not exceed 4 psi. At end of test, release pressure from end of test seam opposite the pressure source. If air is not released through this point, check seam to identify any clogging, then repair and retest.
    c. The results of each non destructive test shall be recorded by the Geosynthetics Installer and BENCHMARK in daily field reports and the results (with the date) will be marked on the liner next to the seam to allow inspection of the liner upon completion.
7. The Geosynthetics Installer will record the location of each sheet as each is deployed and its respective seam.

8. During installation of the geomembrane, no vehicular traffic or construction equipment will be allowed on the liner or geocomposite.
10. All field seaming equipment shall be placed on rub sheets.
11. Membrane areas that become torn or damaged shall be replaced or patched by construction of a cap strip. No repairs shall be made to seams by application of an extrusion bead to a seam edge previously welded by fusion or extrusion methods unless approved by BENCHMARK. Repaired areas will be non-destructively tested for seam integrity.
12. BENCHMARK shall make field observations, visual examinations, and monitor material measurements and the type of installation equipment used to determine if the methods used are in compliance with the specifications for the project. Field tests shall be performed as soon as possible after materials receipt or after completion of a portion of the constructed work in order to provide prompt field test results.
13. The Geosynthetics Installer shall provide an installation certificate that states the liner was supplied and installed in accordance with design specifications and manufacturer's requirements. The installation certificate shall state that all QA testing was done as required by these specifications. In addition, the Geosynthetics Installer will be required to submit a record drawing of the installed liners.
14. The repair locations shall be located on the panel layout sheet.
15. Damaged materials are the property of the Geosynthetics Installer and will be removed from the site at the Geosynthetics Installer's expense. The Geosynthetics Installer will retain all ownership and responsibility for the geomembrane until final acceptance of the project by OWNER.

F. Other Requirements

1. LLDPE geomembrane shall be transported and stored in accordance with the manufacturer's recommendations. The geomembrane shall be completely covered to protect the geomembrane from exposure to sunlight, precipitation, dirt, sharp objects or other deleterious materials during transportation and storage and shall be stored off the ground.
2. All seams shall be subject to the approval of BENCHMARK. The LLDPE liner shall not be seamed when either the air or sheet temperatures are below 32°F, when the sheet temperature exceeds 158° F, or when the air temperature is above 120°F. All seaming shall be done during daylight hours. The relative humidity during seaming shall not exceed 90 percent. Seaming shall not be done in winds equal to or exceeding 20 miles per hour or during precipitation. Construction of enclosures to provide protection from wind and rain is permitted provided the Geosynthetics Installer can demonstrate that conditions within the enclosure measured within 18 inches above or at the geomembrane (as appropriate) meet project specifications.
3. LLDPE liner that becomes torn or damaged shall be replaced or patched. The patch shall extend 1.5 feet beyond the perimeter of the tear or damage.

4. Potentially Damaging Activities
   No support equipment used by the Geosynthetics Installer shall be allowed on the geomembrane. Personnel working on the geomembrane shall not smoke, wear damaging shoes, or engage in any activity that damages the geomembrane.
5. Upon completion of each section of the geomembrane, BENCHMARK will observe its condition (both sheets and seams) for defects. Any observed defects (nicks, gouges, etc.) shall be repaired by the geosynthetics contractor before covering.
6. Anchor Trench Backfilling
   The anchor trench will be backfilled and compacted by the SUBCONTRACTOR to a dry density not less than 95 percent of the maximum dry density determined by the standard Proctor (ASTM D-698). Care should be taken when backfilling the trench to prevent any damage to the geomembrane. Anchor trench spoil shall be used as backfill material, wherever possible.
7. Protection of Leading Edges
   Between construction of partial sections of the membrane liner, leading edges of the membrane may be exposed or buried for extended periods of time prior to their joining to adjacent, subsequent membrane sections. The combined action of abrasive soil and equipment impact stresses may "etch" unprotected membrane surfaces sufficiently to affect seam strengths. Therefore, it is necessary to protect leading edges in high activity areas with sacrificial layers of geotextile and LLDPE sheet until they are ready for final seaming. As a minimum, each leading edge to be seamed that must be buried or which must be exposed for periods of one month or longer shall be continuously covered by a layer of geotextile overlain by a layer of LLDPE sheet. The geotextile shall be non-woven and have a minimum weight of 6 ounces per square yard. The sacrificial LLDPE sheet shall have a minimum thickness equal to that of the membrane liner to be protected. Both protective layers shall have a minimum width of 2 feet. The protective cover sheets shall be either covered with soil or weighted with sand bags to prevent displacement by wind. The edge of the sheet to be protected shall be approximately centered beneath the overlying protective layers prior to burial or weighing with sandbags. Leading edges located in areas expected to receive direct traffic from construction equipment shall be buried under a minimum thickness of one foot of buffer soil.

G. Progress
   a. Geomembrane installation shall be done to complete the project in a timely manner. Installation and protection of the geomembrane may occur in areas simultaneous to construction of other underlying/overlying components of the landfill final cover system.

3.3 SILT FENCE

A. Silt Fence shall be installed in accordance with the manufacturer's recommendations and as shown on the drawings.

B. Silt Fence shall be protected at all times during construction from damage resulting from construction traffic, improper installation procedures, or any other condition which can result in damage to the material. Silt Fence found to be damaged as a result of improper construction procedures, inadequate protection, or improper installation, shall be replaced by the SUBCONTRACTOR at his expense.

C. Silt fence shall be inspected daily by the SUBCONTRACTOR and BENCHMARK. All damaged silt fence shall be repaired within 48 hours or sooner if directed by BENCHMARK.

Table 02270-1 SPECIFICATIONS FOR GEOSYNTHETIC MATERIALS		
Property	**Test Method**	**Value**
1. Geomembrane		
Thickness (min. avg.) (mils)	ASTM D5994	40
Thickness (Minimum) (mils)	ASTM D5994	36
Asperity Height (min.) (mils) See Note 1	GRI GM 12	10
Tensile Properties (min.)	ASTM D6693	
• Yield Strength (lbs/in) • Break Strength (lbs/in) • Yield Elongation, % • Break Elongation, %	 (1.3" gauge length) (2.0" gauge length)	84 100 13 500
Tear Resistance (lbs) (min.)	ASTM D1004	22
Puncture Resistance (lbs)	ASTM D4833	48
Carbon Black Content (%)	ASTM D1603	2.0 to 3.0
Carbon Black Dispersion	ASTM D5596	Note 2
Density (g/cm^3)	ASTM D1505	0.92 to 0.939
2. Geocomposite		
Transmissivity (m^2/sec) See Note 3 (min.)	ASTM D4716	3×10^{-5}
Ply Adhesion (lb/in) (min.)	ASTM D413	0.5
Geotextile:		
Unit Weight (oz/yd^2) (min.)	ASTM D5261	6.0
Grab Tensile Strength (lbs) (min.)	ASTM D4632	160
Grab Elongation (%) (min.)	ASTM D4632	50
Apparent Opening Size (U.S. Sieve Number Equivalent)	ASTM D4751	70
Permittivity, sec^{-1} (min.)	ASTM D4491	1.0
Geonet:		
Density (g/cm^3)	ASTM D1505	0.94
Carbon Black Content (%)	ASTM D1603	2.0 to 3.0
Thickness (mils) (min.)	ASTM D5199	280

Notes:
1. Of 10 readings, 8 out of 10 must be ≥ 7 mils, and the lowest individual reading must be ≥ 5 mils.
2. 9 of 10 views in Categories 1 and 2 and 1 of 10 views in Category 3.
3. Transmissivity shall be tested under the following conditions:
   - Fluid Media = Water
   - Confining Pressure = 1,000 psf
   - Hydraulic Gradient = 0.1
   - Transmissivity Box (from Top to Bottom): Steel Plate, Synthetic Soil, Geocomposite Sample, 40-mil Textured LLDPE Geomembrane, Steel Plate
   - Normal Load Time = 15 minutes

Table 02270-2– Minimum Weld Values for LLDPE Geomembranes

Property	Test Method	40 (1.0)
Peel Strength (extrusion), ppi (kN/m)	ASTM D 6392	48 (8.4)
Peel Strength (fusion), ppi (kN/m)	ASTM D 6392	50 (8.8)
Shear Strength (fusion & ext.), ppi (kN/m)	ASTM D 6392	60 (10.5)

END OF SECTION

APPENDIX C-3

SECTION 02901, TOPSOIL

SECTION 02901
TOPSOIL

PART 1- GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Subcontractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install topsoil Work.
   2. The types of topsoil Work required include the following:
      a. Spreading topsoil.
      b. Maintenance Work.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with the topsoil.

C. Related Work Specified Elsewhere:
   1. Section 02101, Clearing and Grubbing.
   2. Section 02902, Turf.

1.2 QUALITY ASSURANCE

A. Benchmark will perform QA testing on the topsoil material prior to placement. The Subcontractor will either stockpile the material in 5000 cubic yard piles for testing by Benchmark or will dig representative test holes at the borrow area for testing. Specific requirements are described in the Construction Quality Assurance Plan and Paragraph 2.1. The Subcontractor will not be permitted to place topsoil until after QA testing has been completed and Benchmark approves the material.

B. Source Quality Control:
   1. Off-Site Topsoil: Obtain topsoil only from naturally well-drained sites where topsoil occurs in depth of not less than 4-inches; do not obtain from bogs or marshes.

C. Reference Standards: Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified:
   1. ASTM C 602, Agricultural Liming Materials.
   2. ASTM D 421-85, Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
   3. ASTM D 422-63, Particle-Size Analysis of Soils.
   4. ASTM D 2487-93, Classifications of Soils for Engineering Purposes (USCS).
   5. ASTM D 2974-87, Moisture, Ash, and Organic Matter of Peat and Other

Organic Soils.
6. ASTM D 4972-95 a, pH of Soils.
7. Association of Official Analytical Chemists, Official Methods of Analysis.

1.3 JOB CONDITIONS

A. Environmental Requirements: Do not spread topsoil if condition is unsuitable due to frost, excessive moisture or other conditions. Cease Work until the topsoil is in a suitable condition as determined by Benchmark.

PART 2- PRODUCTS

2.1 MATERIALS

A. General:
1. The Subcontractor shall be responsible for obtaining all the necessary State and Local permits required for the excavation of borrow source material.

B. Topsoil:
1. Fertile, friable, natural loam, surface soil, capable of sustaining vigorous plant growth, free of any admixture of subsoil, clods of hard earth, plants or roots, sticks or other extraneous material harmful to plant growth. Topsoil will meet the following criteria:

a.

Sieve Size Designation	Percent Passing By Weight
3-inch	100
1-inch	80-100
1/4-inch	65-100
No. 200	20-80

b. Clay content of material passing No. 200 sieve not greater than 20 percent, as determined by hydrometer tests.
c. pH 5.0 to pH 7.6. pH may be amended to meet these limits
d. Organic content at least 2.5 percent, as determined by ignition loss (may be amended to meet this requirement). Organic content less than 2.5 percent may not be adequate to establish vegetative growth.
e. Free of pests and pest larvae.
f. Soluble salt content not greater than 500 ppm.

PART 3- EXECUTION

3.1 INSPECTION

A. Benchmark will examine the subgrade, observe the conditions under which the

Work is to be performed, and notify Subcontractor of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to Benchmark.

3.2 INSTALLATION

A. Place and spread topsoil, over the areas shown, to a minimum depth of 6-inches after natural settlement and light rolling, in a manner that the completed work conforms to the lines and grades shown.

B. Do not spread topsoil while in a frozen condition or when moisture content is so great that excessive compaction will occur nor when so dry that dust will form in the air or that clods will not break readily.

C. Do not compact topsoil.

D. Alter the topsoil is spread, remove all large, stiff clods, rocks, roots or other foreign matter over 2-inches.

F. Manipulate topsoil to attain a properly drained surface.

G. Grade topsoil areas to smooth, even surface with loose, uniform, fine texture.

H. Roll and rake and remove ridges and fill all depressions, ruts, low spots or unsuitable areas which result after settlement.

I. Topsoil placed and graded on slopes steeper than *5* percent shall be promptly fertilized, seeded, mulched and stabilized by "tracking" with suitable equipment.

3.3 MAINTENANCE

A. Maintain topsoiled areas by filling in erosion channels and correcting drainage as required.

B. Maintain the topsoil in a loose, friable condition until seeding operations begin.

3.4 INSPECTION AND ACCEPTANCE

A. When the topsoiling Work is completed, including maintenance, Benchmark will make an inspection to determine acceptability.

B. Where inspected topsoil Work does not comply with the requirements, regrade rejected Work and maintain until reinspected by Benchmark and found to be acceptable.

END OF SECTION

APPENDIX C-4

SECTION 02902, TURF

SECTION 02902
TURF

PART 1- GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Subcontractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install turf Work.
   2. The extent of the turf Work shall include:
      a. All areas where Subcontractor places cover soils.
      b. All areas within the limits of clearing where existing vegetation is deemed insufficient as determined by Benchmark.
      c. All areas where Subcontractor's performance of Work damages existing vegetation as determined by Benchmark.
   3. The types of turf Work required include the following.
      a. Seeded areas.
      b. Soil amendments.
      c. Mulch.
      d. Replant unsatisfactory or damaged turf.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installations of items that must be installed with the turf.

C. Related Work Specified Elsewhere:
   1. Section 02101, Clearing and Grubbing.
   4. Section 02901, Topsoil.

1.2 QUALITY ASSURANCE

A. Source Quality Control:
   1. General: Ship turf materials with certificates of inspection as required by governmental authorities. Comply with governing regulations applicable to turf materials.
   2. Analysis and Standards: Package standard products with manufacturer's certified analysis.

C. Reference Standards: Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified:
   1. Association of Official Analytical Chemists, Official Methods of Analysis.
   2. American Joint Committee on Horticultural Nomenclature, Standardized Plant Names.
   3. ASTM C 602, Agricultural Liming Materials.

4. ASTM D 2487-93, Classification of Soils for Engineering Purposes (USCS).
5. FSO-F-241D, Fertilizer, Mixed, Commercial.
6. FSO-P-166E, Peat Moss; Peat, Humus; and Peat, Reed-sedge.
7. Official Seed Analysts of North America, Standards of Quality.

1.4 PRODUCT DELIVERY. STORAGE AND HANDLING

A. Delivery of Materials:
   1. Do not deliver seed until site conditions are ready for planting.
   2. Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery.
   3. Furnish seed in sealed, standard containers.
   4. Notify Benchmark of delivery schedule in advance so turf material may be inspected upon arrival at job site.
   5. Remove unacceptable material immediately from job site.

B. Storage of Materials:
   1. Store and cover materials to prevent deterioration. Remove packaged materials that have become wet or show deterioration or water marks from the project site.
   2. Seed that is wet or moldy or that has been otherwise damaged in transit or storage is not acceptable. Replace at no further cost to Benchmark or Respondents.

1.5 JOB CONDITIONS

A. Environmental Requirements:
   1. Proceed with and complete the turf Work as rapidly as portions of the site become available, working within the seasonal limitations for each type of turf required.
   2. Do not spread seed when wind velocity exceeds 5 miles per hour.
   3. Do not plant turf when drought, or excessive moisture, or other unsatisfactory conditions prevail.

B. Scheduling:
   1. Plant or install materials only during normal planting seasons. Correlate planting with specified maintenance periods and provide maintenance as specified herein.

1.6 ALTERNATIVES

A. If specified turf material is not obtainable, submit to Benchmark proof of non-availability and proposal for use of equivalent material.

PART 2- PRODUCTS

2.1 MATERIALS

A. Grass Materials:

1. Grass Seed Mixture: Provide fresh, clean, new-crop seed complying with the tolerance for purity and germination established by the Official Seed Analysts of North America. Provide seed of the grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified.
2. **Soil Cap:** The soil cap areas requiring seeding shall be seeded with 196 lbs/acre of seed conforming to the following:

Name of Grass	Application Rate Per Acre	% of Mix	Variety
Tall Fescue	70.6 pounds	36%	KY-31
Orchard Grass	29.4 pounds	15%	PENNLATE
Creeping Red Fescue	39.2 pounds	20%	ENSYLVA
Perrenial Ryegrass	49 pounds	25%	POLLY
Birds-Foot Trefoil	7.8 pounds	4%	VIKING

   a. Germination and purity percentages should equal or exceed the minimum seed standard listed. If it is necessary to use seed as the germination percentage less than the minimum recommended above, increase the seeding rate accordingly to compensate for the lower germinations.
   b. Birds-Foot Trefoil is a legume that requires inoculation before sowing. The inoculants should be delivered with the seed mix and added before application.
   c. Weed seed content not over 0.25 percent and free of noxious weeds.
   d. All seed shall be rejected if the label lists any of the following grasses:
      1) Timothy.
      2) Sheep Fescue.
      3) Meadow Fescue.
      4) Canada Blue.
      5) Alta Fescue.
      6) Kentucky 31 Fescue.
      7) Bent Grass.

3. **Off Soil Cap:** Areas requiring seeding outside of the cap shall be seeded with 100 lbs/acre of perennial ryegrass seed.

B. Soil Amendments:

1. Lime: Natural limestone containing not less than 85 percent of total carbonates, ground so that not less than 90 percent passes a 10-mesh sieve and not less than 50 percent passes a 100-mesh sieve.

C. Fertilizers:

1. Commercial Fertilizer: Complete fertilizer of neutral character, with a minimum of 75 percent nitrogen derived from natural organic sources or urea form; 40-50

percent of the nitrogen shall be water-soluble. Available phosphoric acid derived from superphosphate, bone, or tankage. Potash derived from muriate of potash, containing 60 percent potash. Uniform in composition, free flowing and suitable for application with approved equipment. Provide fertilizer with the following percentages of available plant nutrients:

a. Provide fertilizer with not less than 4 percent phosphoric acid and not less than 2 percent potassium, and the percentage of nitrogen required to provide not less than 1.5 pounds of actual nitrogen per 1000 square feet of seeded area. Provide nitrogen in a form that will be available to the grasses during the initial period of growth.

2. Superphosphate: Soluble mixture of treated minerals; 20 percent available phosphoric acid.

D. Mulch:

1. Anti-Erosion Mulch: Provide clean, seed-free salt hay or threshed straw of wheat, rye, oats or barley, free from noxious weeds. Materials that are low grade and unfit for farm use such as "U.S. Sample Grade" are acceptable.
2. Wood Cellulose Fiber Pulp (Hydromulch):
   a. Provide specially prepared wood cellulose fiber, processed to contain no growth or germination inhibiting factors, and dyed an appropriate color to facilitate visual metering of application of the materials.
   b. Supply in packages having a gross weight not in excess of 60 pounds.
   c. Moisture content not to exceed 10 percent air dry weight, manufactured so that after addition and agitation in slurry tank the fibers become uniformly suspended to form a homogeneous slurry that when hydraulically sprayed on the ground the material will form a blotter like ground cover impregnated uniformly with seed and which after application allows the absorption of moisture, either rainfall or mechanical watering, to percolate to the underlying soil.
   d. Product and Manufacturer: Provide one of the following:
      1) Conwed Virgin Wood Fiber Mulch by Conwed Incorporated.
      2) Silva Fiber by Weyerhaeuser Company.
      3) Or equal.
3. Hydromulch Adhesive:
   a. On areas and slopes graded between 1:3 and 1:5 provide 8.25 pounds of adhesive per 1000 square yards of seedbed incorporated into the hydroseed slurry.
   b. Provide the following:
      1) A non-ionic galatomannan polysaccharide that forms a colloidal dispersion. Once adhesive film is formed and has been allowed to dry or cure, its resistance to solubility increases. Adhesive film shall be biodegradable, so that it eventually is broken down by water and/or by microbial action.
      2) pH: 6 to 7.

E. Water: Potable.

F. Ball Stock Plantings
   a. Hybrid Poplar: Provide 4-5 foot tall ball stock plantings in good health and condition at time of planting.

PART 3- EXECUTION

3.1 INSPECTION

A. Subcontractor shall examine the topsoil, verify the elevations, and depth of topsoil, observe the conditions under which Work is to be performed, and notify Benchmark of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to Benchmark.

3.2 SOIL PREPARATION

A. Apply ground limestone, by machine, over all areas to receive turf, as required, to bring the soil to a neutral pH. Work lightly into the top 3 inches of topsoil at least five days before applying the commercial fertilizers.

B. Apply commercial fertilizers in the following quantities:
   1. For grass apply only at a rate sufficient to supply 1.5 pounds of nitrogen per 1000 square feet.

C. Apply commercial fertilizers within 10 days of planting.

D. Apply commercial fertilizers in 2 operations. First application shall be 3/4 of total amount.

E. Thoroughly and evenly incorporate commercial fertilizers with the soil to depth of 3 inches by discing, or other approved method.
   1. In areas inaccessible to power equipment, use hand tools.
   2. Adjacent to existing trees, adjust depth to avoid disturbing roots.

F. Apply superphosphate for turf areas at the rate of 20 pounds per 1000 square feet and incorporate into the top 3 inches of topsoil.

G. Grade planting areas to smooth, even surface with loose, uniformly fine texture. Remove all stones and extraneous foreign material in excess of 2-inch diameter. Roll and rake and remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading.

H. Apply a second dressing of fertilizer. Use 1/4 of the total required amount.

I. Moisten prepared planting areas before seeding, if soil is dry. Water thoroughly and allow surface moisture to dry before planting. Do not create a muddy soil condition.

J. Restore planting areas to specified condition if eroded or otherwise disturbed after fine grading and prior to seeding.

3.3 INSTALLATION

A. General: Maintain grade stakes until removal is mutually agreed upon by all parties concerned.

B. Seeding:
   1. Sow seed using a spreader or seeding machine.
   2. Distribute seed evenly over entire area by sowing equal quantity in 2 directions at right angles to each other.
   3. Sow not less than the quantity of seed specified.
   4. Cultipacker, or approved similar equipment, may be used to cover the seed and to firm the seedbed in one operation. In areas inaccessible to cultipacker:
      a. Rake the seed lightly into top 1/8 inch of soil, roll in two directions with a water ballast roller, weighing not less than 100 pounds per linear foot.
      b. Take care during raking that seed is not raked from one spot to another.
   5. Protect seeded areas against erosion by spreading specified mulch after completion of seeding operations.
      a. Protect seeded areas against hot, dry weather or drying winds by applying peat moss mulch not more than 24 hours after completion of seeding operations. Presoak and scatter evenly to a depth of from 1/8-inch to 3/16-inches thick and roll to a smooth surface. Do not mound.
      b. Spread anti-erosion mulch to form a continuous blanket not less than 1-1/2-inch loose measurement over seeded areas. Provide mulch with a partial coating of emulsified liquid tackifier. Place mulch using either of the following methods:
         1) Anchor mulch by spraying with liquid tackifier at the rate of 10 to 13 gallons per 1000 square feet.
         2) Place mulch with equipment that will blow or eject, by means of a constant air stream, controlled quantities of the mulch and tackifier in a uniform pattern over the specified area. If the mulch is excessively cut or broken take measures to reduce the cutting or breakage to a limit approved by Benchmark. Introduce the tackifier into the air stream by means of a spray arranged so that it will partially coat the mulch with a spotty tack prior to the depositing of the mulch covering. Rate of application not less than 75 gallons per ton of mulch.

6. Do not leave seeded areas unmulched for longer than 3 days. Reseed areas which remain without mulch for longer than 3 days.
7. Prevent damage or staining of construction or other plantings adjacent to mulched areas.
8. Prevent foot or vehicular traffic, or the movement of equipment, over the mulched area. Reseed areas damaged as a result of such activity.
9. Water seeded areas thoroughly with a fine spray.

3.4 MAINTENANCE

A. Begin maintenance immediately after planting.

B. Maintain turf for not less than the period stated below, and longer as required to establish an acceptable stand, as determined by Benchmark.
   1. Seeded areas, not less than 60 days.
   2. If planted in fall and not given full 60 days of maintenance, or if not considered acceptable at that time, continue maintenance the following spring until acceptable turf is established.

C. Maintain seeded areas by watering, fertilizing, weeding, and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas. After grass has started, re-seed repeatedly all areas greater than 8 inches square which fail to show a uniform stand of grass for any reason whatsoever until all areas are covered with a satisfactory stand of grass is achieved, as determined by Benchmark.

D. Cutting: to be performed after nesting birds have nested (no earlier than first week of August). Hand cutting to remove woody growth will be allowed in lieu of mechanical vegetative cover mowing with USEPA approval.

E. Watering: Provide and maintain temporary watering equipment as required to convey water from water sources and to keep lawn areas uniformly moist as required for proper growth.

F. For seeded areas lay out temporary watering system and arrange watering schedule to avoid walking over muddy and newly seeded areas. Use equipment and water to prevent puddling and water erosion and displacement of seed or mulch (if any).

3.5 CLEANUP AND PROTECTION

A. Keep work area in an orderly condition.

B. Protect turf Work and materials from damage. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged turf Work as directed.

C. Remove all rubbish, equipment and rejected materials from the project site.

D. Protection includes all temporary fences, barriers and signs and other work incidental to proper maintenance.

END OF SECTION

APPENDIX D

SEEP/GROUNDWATER COLLECTION AND PRETREATMENT SYSTEM PROCESS LOG

PETER COOPER SUPERFUND SITE
GOWANDA, NEW YORK
SEEP/GROUNDWATER COLLECTION AND PRETREATMENT SYSTEM PROCESS LOG

DATE	TIME	OPERATOR INITIALS	OXIDANT AGENT VOLUME REMAINING (GALS)	VOLUME OF OXIDANT AGENT USED DURING PERIOD (GALS)	DISCHARGE PUMP FLOW RATE (GPM)	TOTAL VOLUME TREATED TO DATE (GALS)	VOLUME WATER TREATED DURING PERIOD (GALS)

APPENDIX E

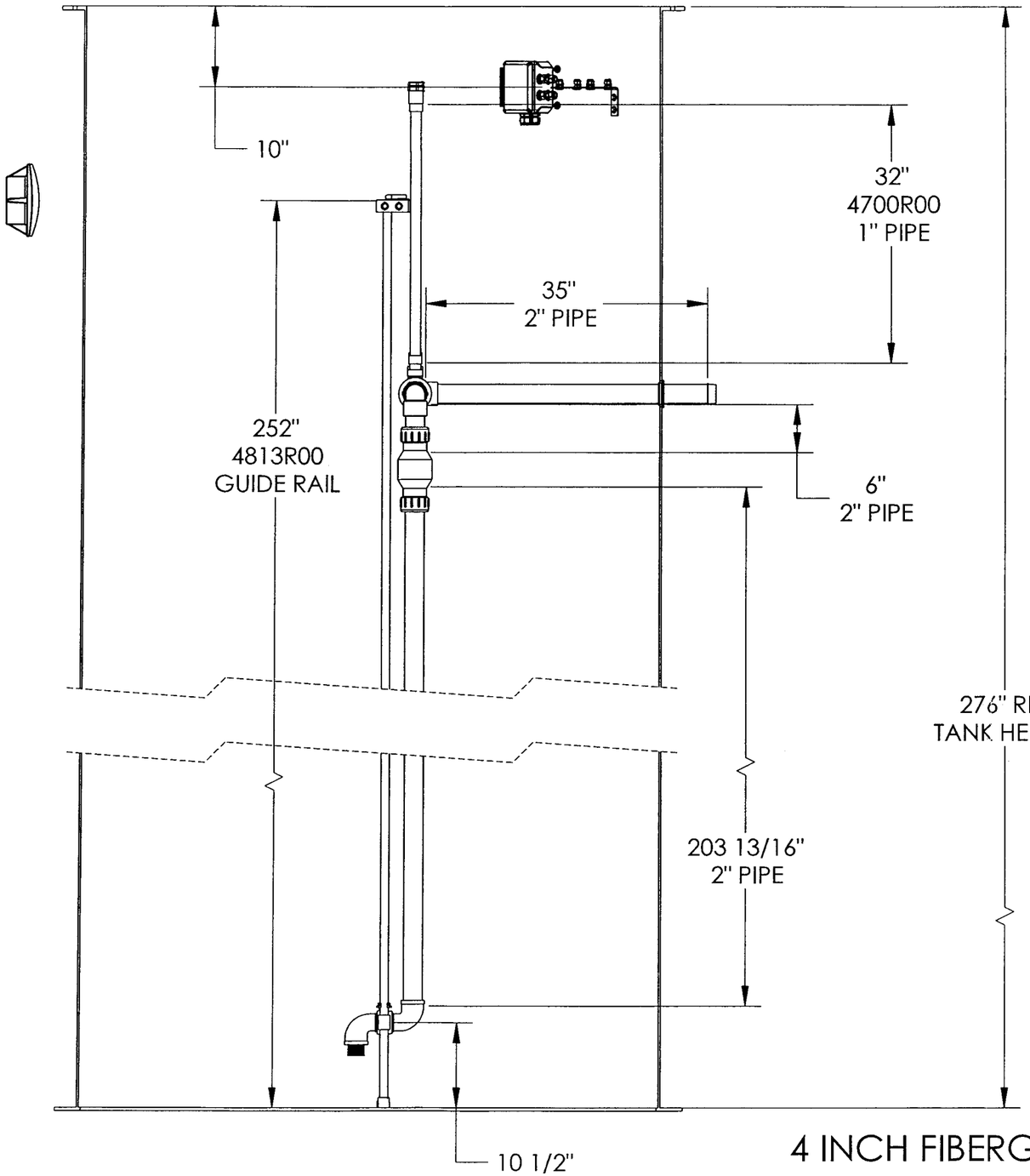
MANUFACTURER'S EQUIPMENT LITERATURE

MANUFACTURING PACKET

EPS40848

7000 APPLE TREE AVENUE
BERGEN, N.Y. 14416
(585) 494-1817

drn by			
date 9/15/2009			
scale			
title			
part no.			
drawing no. EPS40848		sheet number of	sheet size B



4 INCH FIBERGLASS HUB

GALVANIZED GUIDE RAIL

MOUNT 4789000 FLOAT BRACKET.

SYSTEM HAS NO CONTROL PANEL BUT SHOULD BE READY TO ACCEPT 4 FLOATS ON THE JOB SITE.

INCLUDE (4) 6048000 FLOAT WEIGHTS.

Liberty Pumps
7000 APPLE TREE AVENUE
BERGEN, N.Y. 14416
(585) 494-1817

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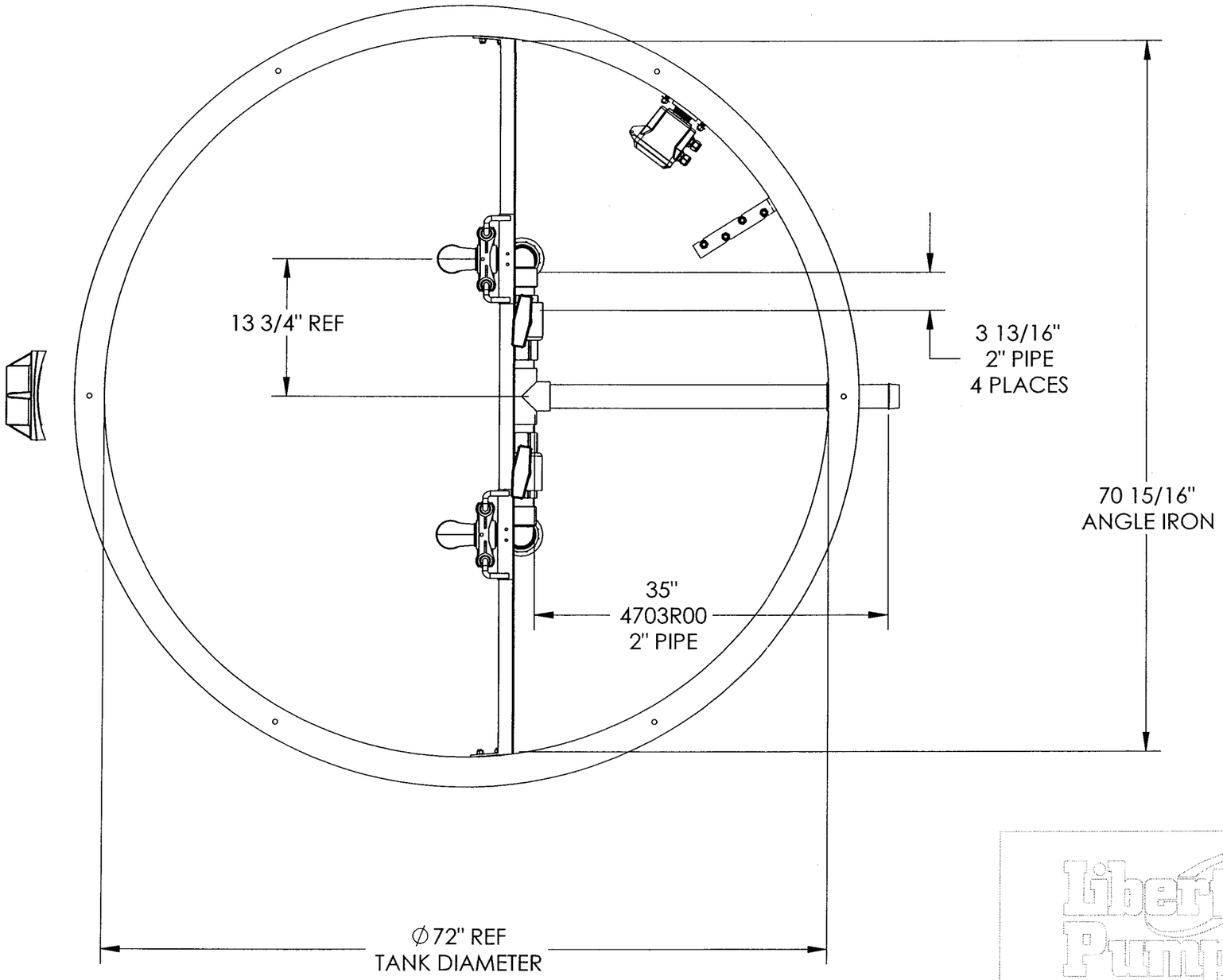
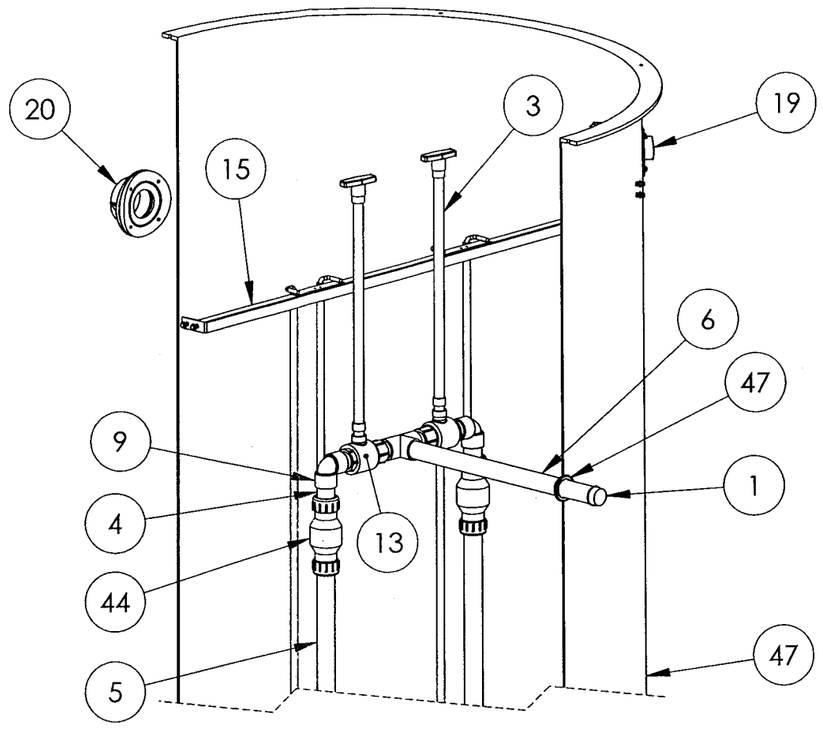
date 9/15/2009	
scale	
title	
part no.	
drawing no. EPS40848	sheet number of / sheet size B

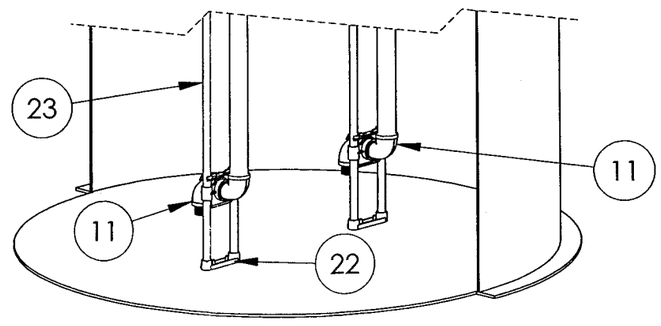


Liberty Pumps
7000 APPLE TREE AVENUE
BERGEN, N.Y. 14416
(585) 494-1817

drn by	
date 9/15/2009	
scale	
title	
part no.	
drawing no. EPS40848	sheet number of / sheet size B

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	LENGTH
1	4020000	CAP PROTECTIVE 2" NPT MALE	1	
2	4587000	NAMEPLATE	1	
3	4700R00	1" PIPE PVC SCH 80.	2	32
4	4703R00	6 IN LG 2 IN SCH 80 PVC	2	6
5	4703R00	203.84 IN LG 2 IN SCH 80 PVC	2	203.84
6	4703R00	35 IN LG 2 IN SCH 80 PVC	1	35
7	4703R00	3.82 IN LG 2 IN SCH 80 PVC	2	3.82
8	4703R00	3.82 IN LG 2 IN SCH 80 PVC	2	3.82
9	4708000	ELBOW 90 PVC 2" SCH 80	2	
10	4725000	2" TEE PVC SCH 80 SxS	1	
11	47430B0	ELBOW STREET 2' GALV	4	
12	4744000	2" CLOSE NIPPLE GALV.	3	
13	47450B0	2" BALL VALVE PVC SXS SCH. 80	2	
14	47490B0	2" EXTENSION KIT	2	
15	4752R00	ANGLE SS 1-1/2" X 1-1/2"	1	78.9
16	4754R00	CHAIN, 3/8 IN SS 252 INCHES	4	252
17	4755000	QUICK LINK	6	
18	4768000	GROMMET, 2" JACKEL	1	
19	4776000	ELECTRICAL COUPLING, FIBERGLASS 2"	1	
20	4784000	4X24-60 FIBERGLASS INLET HUB	1	
21	4789000	FLOAT BRACKET SS X4	1	
22	4809000	2" GUIDE RAIL BRASS	2	
23	4813R00	3/4 INCH GALV PIPE, 252 INCHES	4	252
24	6048000	FLOAT WEIGHT	4	
25	6112000	4" FERNCO SEALING DONUT	1	
26	6143000	CORD SEAL FITS DIA .450-.700	2	
27	6155000	CORD SEAL FITS DIA .300-.450	4	
28	6648000	JUNCTION BOX PVC NEMA 4X	1	
29	7077000	BAR CODE LABEL 4X8	4	
30	7140000	8X8X8 KRAFT CARTON	1	
31	7358E00	FLOAT HANGING INSTRUCTIONS	1	
32	7382000	ENGINEERED PRODUCT LABEL	1	
33	7485000	CARTON, BLANK EPS SEWAGE	2	
34	8050000	CABLE TIE LG CAP ATTACH	6	
35	8099000	METAL TACK FOR NAMEPLATE / STEEL COVERS	4	
36	8106000	BOLT, 3/8-16X1 316 SS HEX HEAD	4	
37	8107000	WASHER, FLAT 3/8 316 SS	36	
38	8108000	NUT, 3/8-16 316 SS	18	
39	8110000	BOLT, 3/8-16x1 1/2" 316 SS	10	
40	81250A0	LOCKNUT, CONDUIT, 2 IN	2	
41	8139000	EYE BOLT, 3/8-16	2	
42	8540000	24 INCH BEAD CHAIN	2	24
43	8541000	SPLICING LINK, BEAD CHAIN	2	
44	CV200C	2" PVC CHECK VALVE SLIP, 6175000	2	
45	LE103M2-2B25	SEWAGE PUMP 1HP 230V 3PH 25'	2	
46	XC72H2133	72 IN STEEL HATCH COVER	1	
47	XT72X276D1495	72 x 276 FIBERGLASS TANK W/STUDS	1	



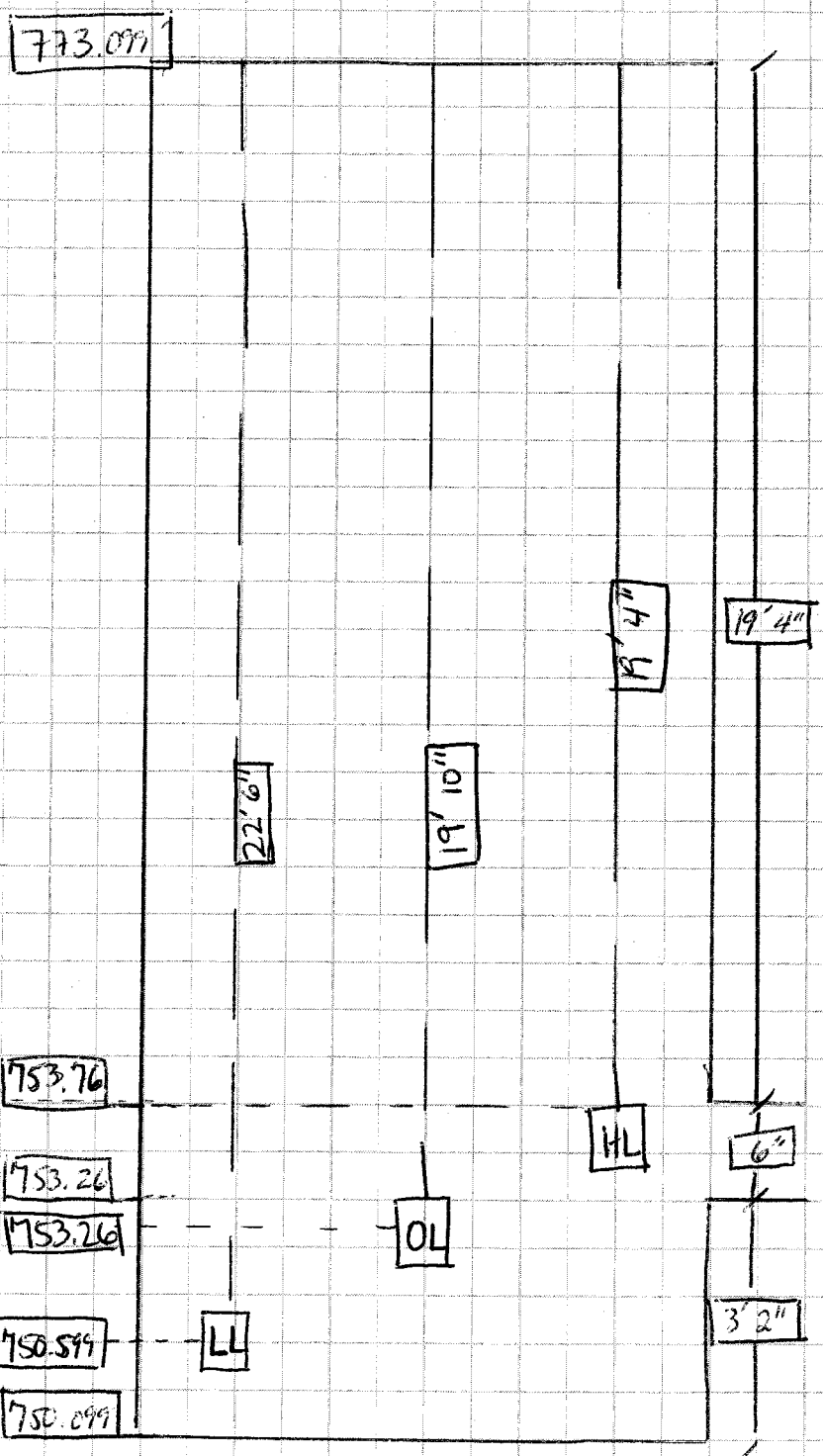


Liberty Pumps
7000 APPLE TREE AVENUE
BERGEN, N.Y. 14416
(585) 494-1817

drn by	
date 9/15/2009	
scale	
title	
part no.	
drawing no. EPS40848	sheet number of / sheet size B

BENCHMARK
ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

Sheet _____ of _____
Project No. GOWANDA PUMP STATION ELS
By WJM Date 1/7/2010
Checked _____ Date _____
Subject _____



LL = LOW LEVEL (OFF)

OL = ON LEVEL

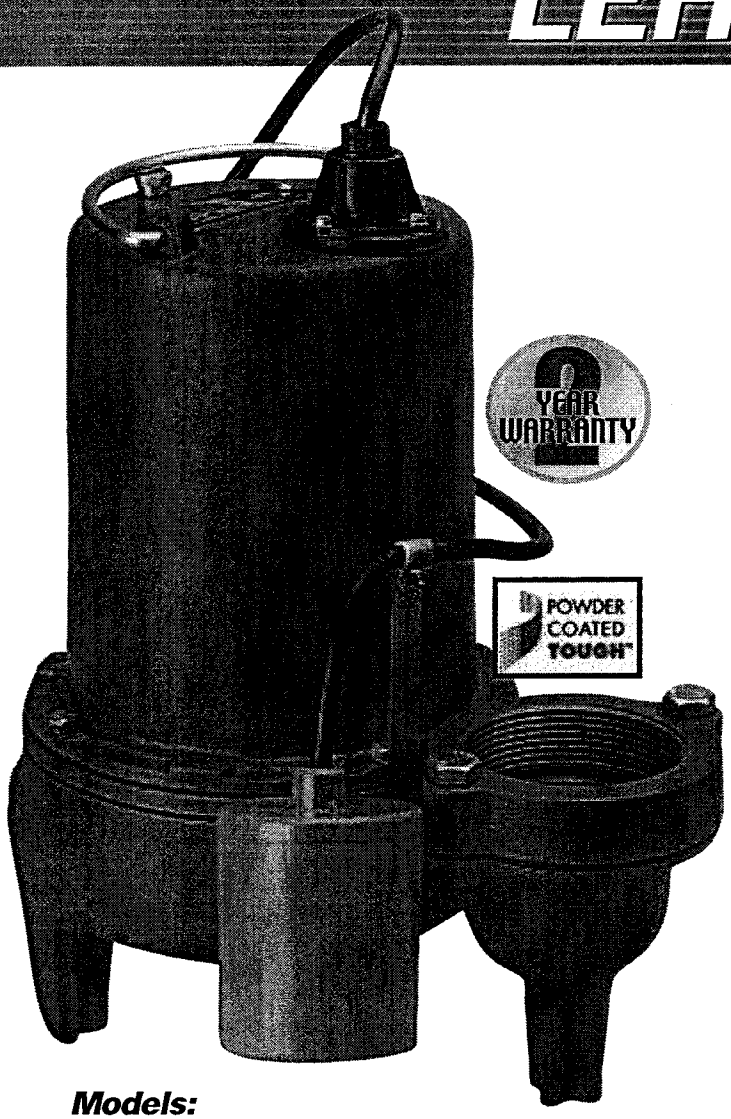
HL = HIGH LEVEL

Liberty Pumps®

LEH100-Series

High Head Sewage Pumps

1 hp
2" Solids-Handling
2" or 3" Flanged Discharge
53' Maximum TDH



Features:

- Rugged 2 vane, semi-open cast iron impellers
- Cast iron housings and volute with all stainless and brass fasteners
- 416 stainless steel rotor shaft
- Oil-filled, hermetically sealed motors
- Built-in thermal protection on single phase models
- 2" or 3" flanged discharge
- Permanently lubricated upper and lower ball bearings
- Unitized shaft seals
- Single float mechanical level control with series plug for manual bypass operation–standard on single-phase automatic models
- Adjustable pumping range
- Quick-disconnect 10' standard power cord allows replacement of cord in seconds without breaking seals to motor. (25' length optional)

Models:

SINGLE PHASE

LEH102M	**208-230V, 12a, manual**
LEH102A	**208-230V, 12a, automatic**

3-PHASE

LEH103M	**208-230V, 9a, manual***
LEH104M	**440-480V, 4.5a, manual***

*Note: 3-phase models require control panel for automatic operation. See sewage accessories literature for complete information on all Simplex and Duplex controls.

innovate. evolve.

LEH100-SERIES TECHNICAL SPECIFICATIONS

PUMP

The pump(s) shall be model _____ as manufactured by Liberty Pumps, Bergen, N.Y. or equal. The pump(s) shall have a capacity of _____ GPM at a total dynamic head of _____ feet. Motor size shall be 1 horsepower, _____ phase, 60 hz. and _____ volt operation.

MOTOR

The pump motor shall be of the submersible type, oil filled, and hermetically sealed. Single phase motors shall have thermal overload protection embedded in the windings, and shall automatically reset when motor cools. Three-phase motors shall have heat breakers incorporated into the control panel, properly sized for the horsepower and amperage of the pump(s).

The rotor shaft shall be made of 416 stainless steel and shall be supported by upper and lower ball bearings.

The power cord shall be of the quick-disconnect design.

IMPELLER

The pump impeller shall be cast iron, 2 vane, semi-open, and shall be capable of passing a 2" spherical solid.

SEAL

The shaft seal shall be of the carbon/ceramic unitized design, with BUNA N elastomers and stainless housings.

EXTERNAL CONSTRUCTION

The pump volute, legs and motor housing shall be heavy gray iron castings, class 25 or better. All castings shall be powder coated before assembly.

All fasteners shall be of 300-series stainless steel.

LEVEL CONTROL

The pump shall be controlled by an adjustable mechanical switch sealed in a PVC float, and shall have a series plug for manual bypass operation.

EBS LE 103M2-2 72X276

ALL MODELS: 1 HP, 3450 RPM

	MODELS	VOLTS	PHASE	AMPS	DISCHARGE	AUTOMATIC
SINGLE PHASE	LEH102M2	208-230	1	12	2" FLANGED	NO
	LEH102A2	208-230	1	12	2" FLANGED	YES
	LEH102M3	208-230	1	12	3" FLANGED	NO
	LEH102A3	208-230	1	12	3" FLANGED	YES
3-PHASE	LEH103M2-2	208-230	3	9	2" FLANGED	NO
	LEH104M2-2	440-480	3	4.5	2" FLANGED	NO
	LEH103M3-2	208-230	3	9	3" FLANGED	NO
	LEH104M3-2	440-480	3	4.5	3" FLANGED	NO

LE 103M2-2

10' cord standard on above models. For 25' cord options, add a "-2" suffix to model number.
Example: LEH102A2-2 for Model LEH102A2 with 25' cord.

NOTE: 3-Phase models require panel for automatic operation. See sewage accessories literature for complete information on all simplex and duplex controls.

DIMENSIONAL DATA:

Weight: LEH102M: 62 LBS.

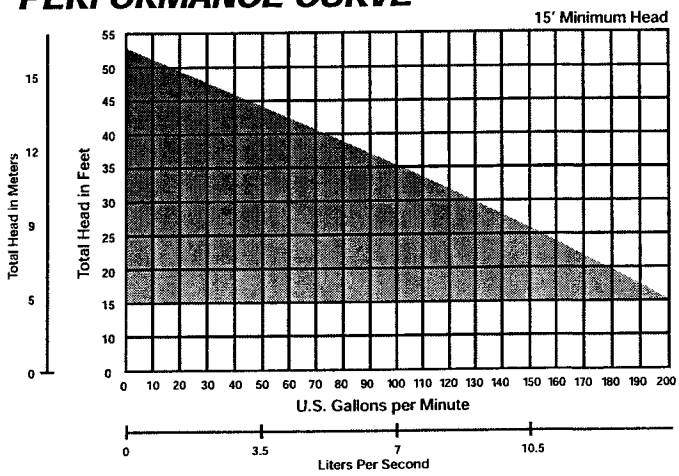
Height: 14.1"

Major Width: 12.5"

Maximum fluid temperature: 140 degrees F.

NOTE: LEH-Series high-head pumps require a minimum application of 15' head.

PERFORMANCE CURVE



SSPMA Certified MEMBER

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Specifications subject to change without notice.

Liberty Pumps • 7000 Apple Tree Avenue • Bergen, New York 14416 • Phone 800-543-2550 Fax (585) 494-1839
www.libertypumps.com

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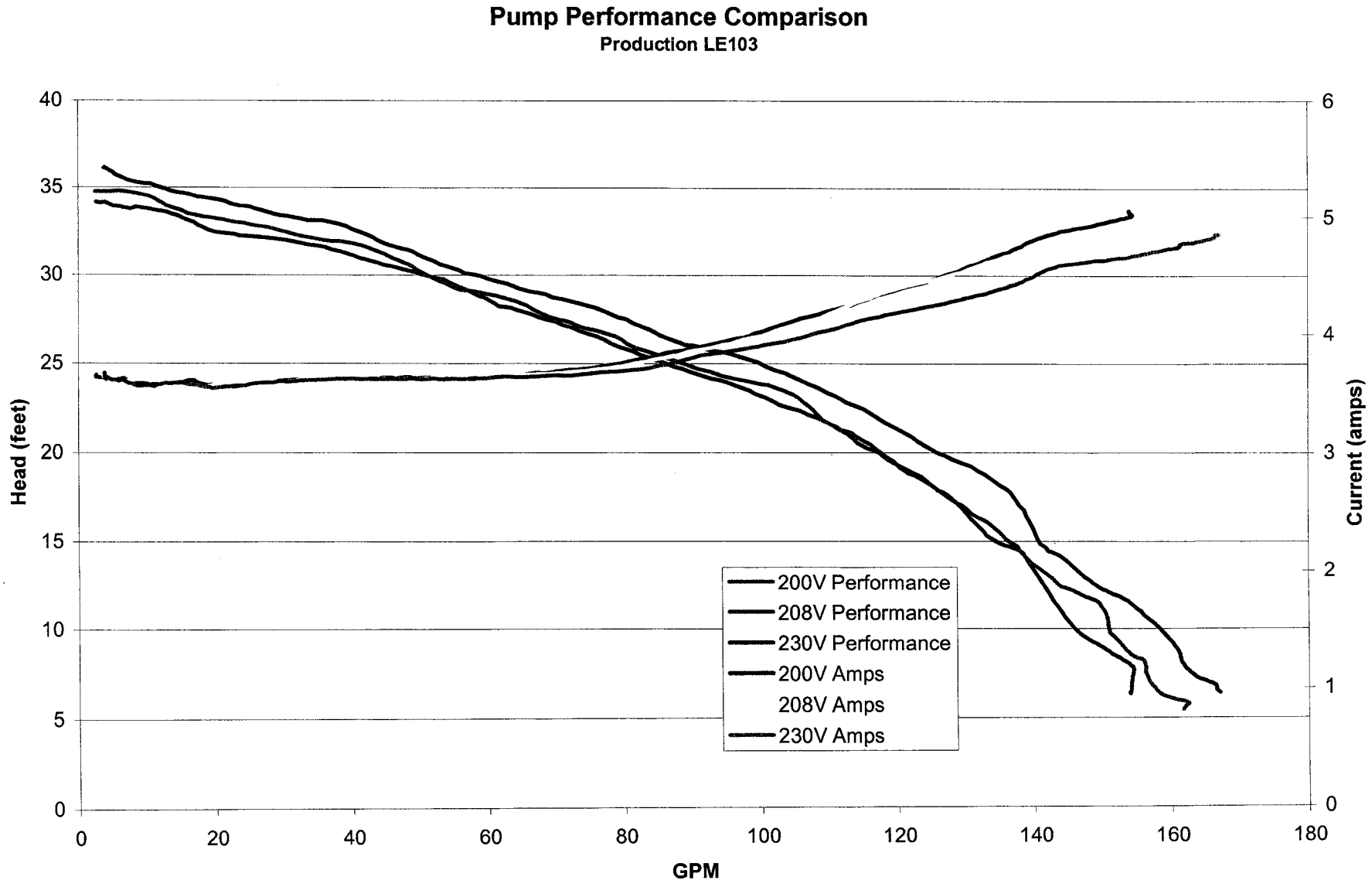
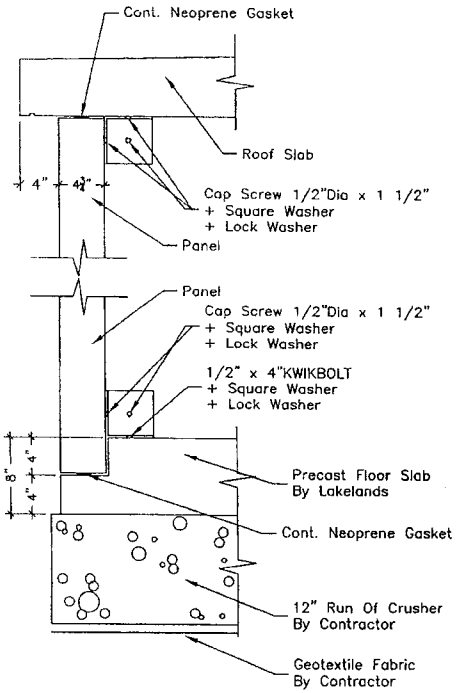
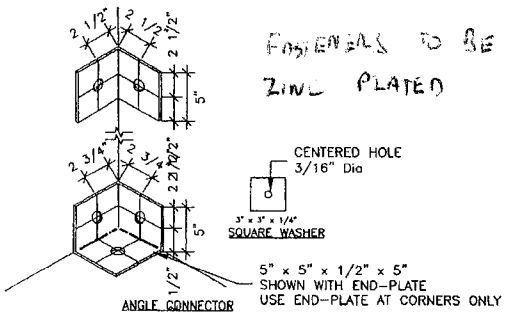

Pump Performance Comparison
Production LE103
Head (feet)
Current (amps)
GPM
0
5
10
15
20
25
30
35
40
0
1
2
3
4
5
6
0
20
40
60
80
100
120
140
160
180
200V Performance
208V Performance
230V Performance
200V Amps
208V Amps
230V Amps

CAULK TO BE INSIDE + OUTSIDE
AND SHALL BE BASF SONOLASTIC NP1
COLOR SHALL BE LIMESTONE

1/2" Star Washers	32	5x5x5 – 3 Sided Clips	8	ZP–1: 8'–0"x8'–3 1/2" – 2584	ZF–1: 8'–0"x8'–0" – 5768	Exterior Caulk: Vertical Joints Only	
Wall Joint Plates 3"x10"	–	5x5 – 2 Sided Clips	4	NP–2: 8'–0"x8'–3 1/2" – 3939	ZR–1: 8'–8"x8'–8" – 4929		
Roof Joint Plates 8"x12"	–	3x3x1/4" Washers	32	ZP–3: 7'–2"x8'–3 1/2" – 3528	Threshhold With Shipment NO	Interior Caulk: NONE	
Backer Rod 3/8"&1/2"		1/2"x2" Bolts	8	ZP–3: 7'–2"x8'–3 1/2" – 3528			
Caulk 3x3 Shim Pads		1/2"x1 1/2" Bolts	24				

DATE:
MIX:
WEIGHT: lbs
FINISH: Exp Aggregate
Interior Broomed





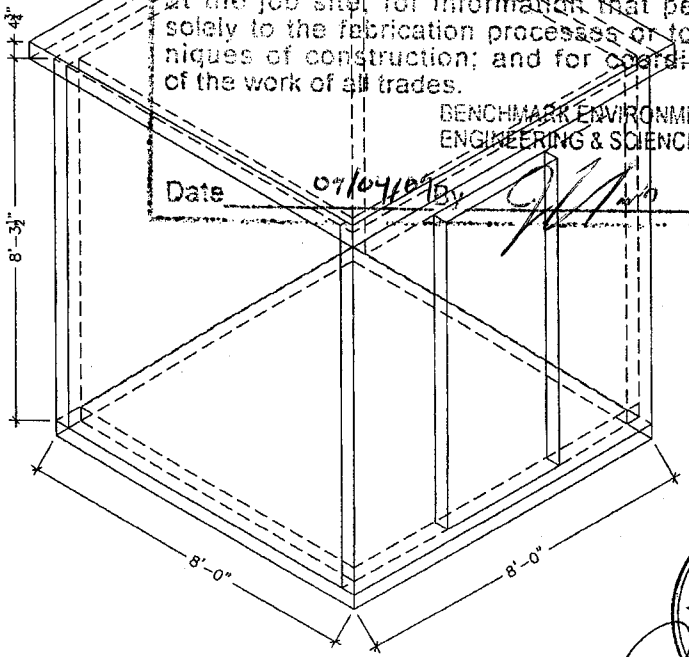
FASTENERS TO BE ZINC PLATED

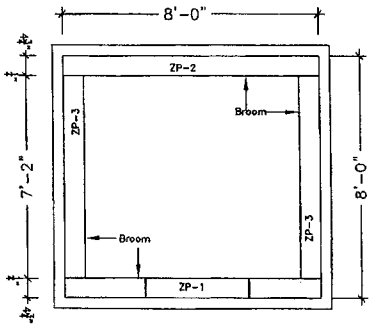
☐ APPROVED
☒ APPROVED AS CORRECTED
☐ REVISE AND RESUBMIT
☐ NOT APPROVED

Checking is only for conformance with the design concept of the Project and compliance with the information given in the Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

Date 07/07/09 By





Meets:
1. ACI 318, Building Code Requirements For Reinforced Concrete.
2. Concrete Reinforcing Institute Manual Of Standard Practice.
NY State "Uniform Bldg" Code
Gnd Snow: 60psf
Wind Load: 27psf
Reinforcing Steel: ASTM A615–60
Structural Steel Fastners: ASTM C260, Stone
At f'c=5000 psi.min. (5000 psi., Roof)
All PC/PC Joints 1/4" U.O.N.

~~CONCRETE TO BE 6,000 PSI~~ DEVIATION APPROVED

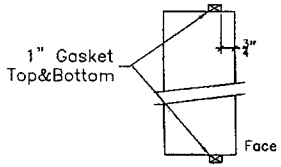
STATE OF NEW YORK
RONALD A. SAMSEL
049374
LICENSED PROFESSIONAL ENGINEER

Lakelands concrete products, inc.
PRECAST CONCRETE PRODUCTS
7520 East Main Street
Lima NY 14485, (585)624–1990

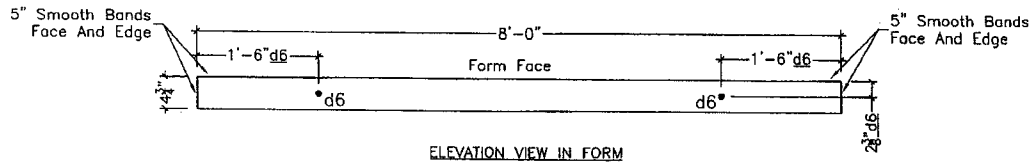
Zoladz Construction
Gowanda Landfill

Date: 8/25/09

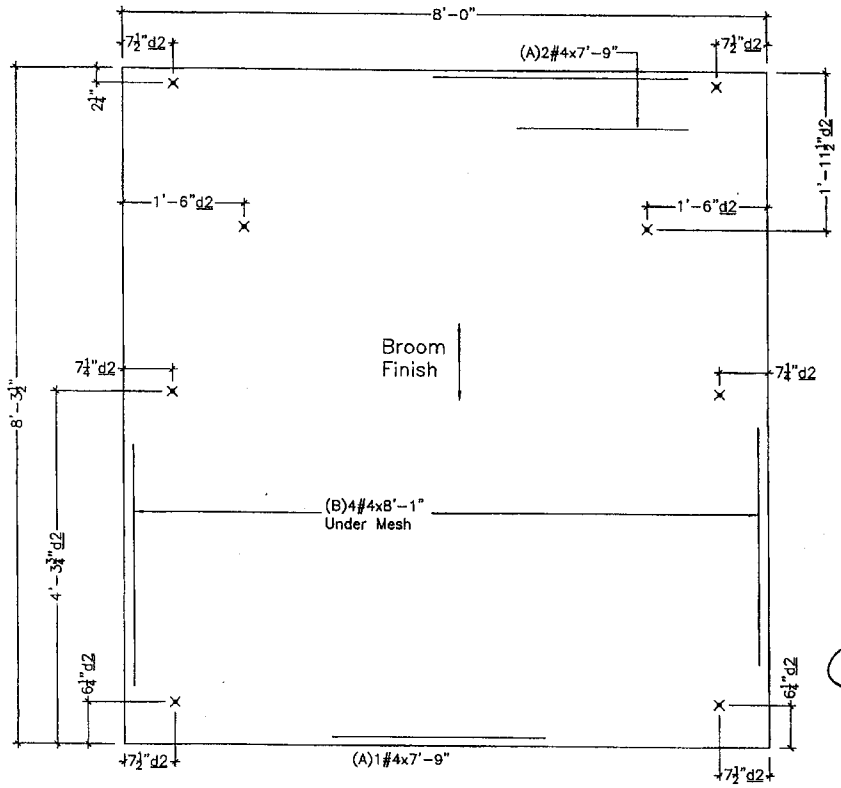
ZE–1



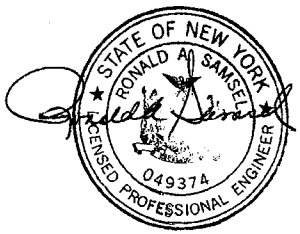
DATE:
MIX:
WEIGHT: 3939 lbs
FINISH: Exp. Agg.
Broom Back



ELEVATION VIEW IN FORM

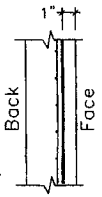


PLAN VIEW IN FORM



REINFORCING

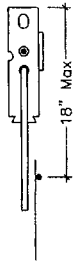
MARK	SIZE	SHAPE	LENGTH	WT.	QTY
A	#4	Plain	7'-9"		3
B	#4	Plain	8'-1"		4
	#4	Tension	1'-6"		2



4x4-4/4WWF(1 Layer)
7'-9" x 8'-1"

EMBEDDED ITEMS

PART NO.	DESCRIPTION	QTY
d6	2 Ton Dayton Erection With Tension Bar	2
d2	F-42 1/2"ø Insert (Back)	8



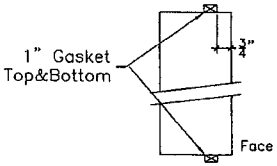
f'c: 5 ksi fy: 60 ksi

Lakelands
PRECAST CONCRETE PRODUCTS
7520 East Main Street
Lima NY 14485, (585)624-1990

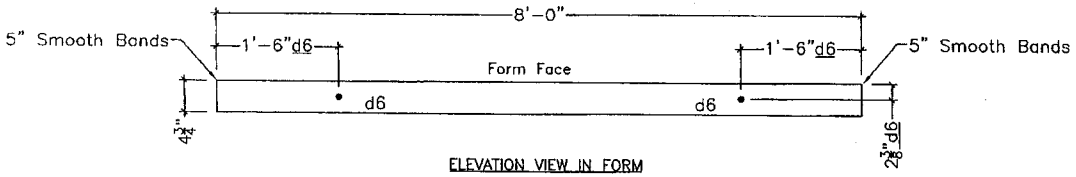
Zoladz Construction
Gowanada Landfill

No. Req'd: 1
Date: 8/25/09

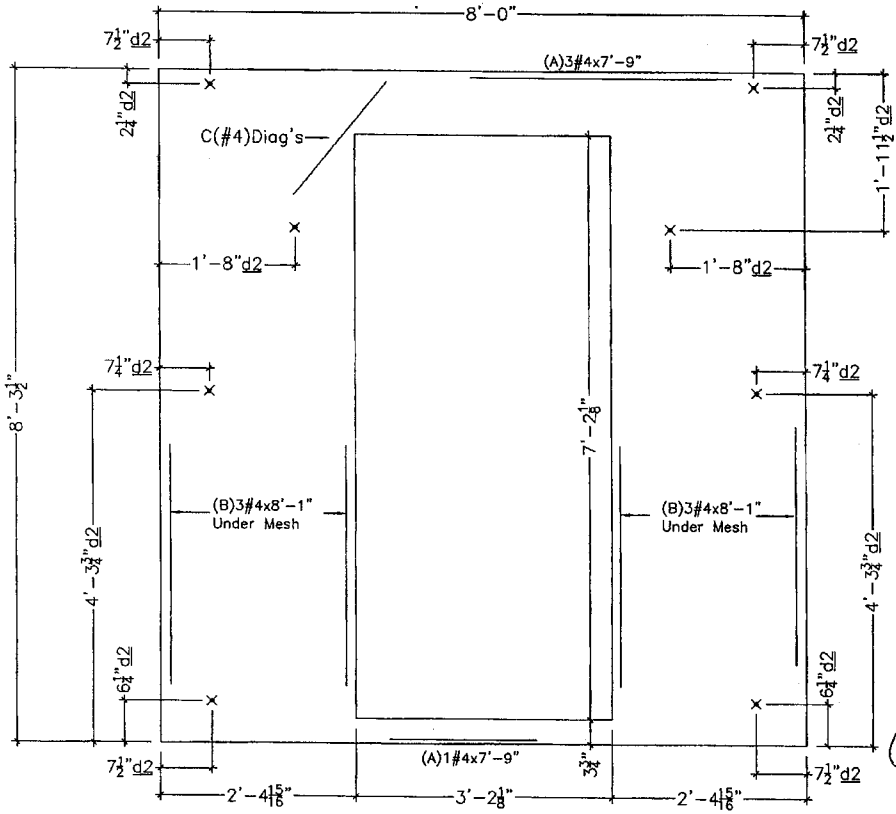
ZP-2



DATE:
MIX:
WEIGHT: 2584 lbs
FINISH: Exp. Agg.
Broom Back

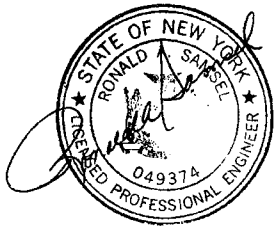


ELEVATION VIEW IN FORM



PLAN VIEW IN FORM

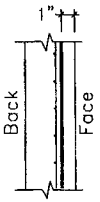
Broom Finish



REINFORCING

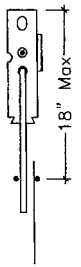
MARK	SIZE	SHAPE	LENGTH	WT.	QTY
A	#4	Plain	7'-9"		4
B	#4	Plain	8'-1"		6
C	#4	Plain	2'-0"		4
	#4	Tension	1'-6"		2

4x4-4/4WWF(1 Layer)
7'-9" x 8'-1"



EMBEDDED ITEMS

PART NO.	DESCRIPTION	QTY
d6	2 Ton Erection Lifters With Tension Bar	2
d2	F-42 1/2"ø Insert (Back)	8



f'c: 5 ksi fy: 60 ksi

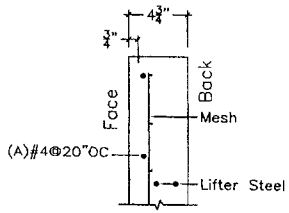
Lakelands
PRECAST CONCRETE PRODUCTS
7520 East Main Street
Lima NY 14485, (585)624-1990

Zoladz Construction
Gowanda Construction

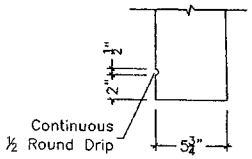
No. Req'd: 1
Date: 8/25/09

ZP-1

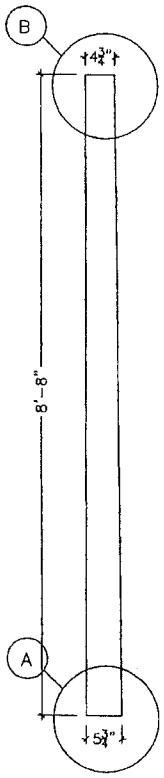
DATE:
MIX:
WEIGHT: 4929 lbs
FINISH:



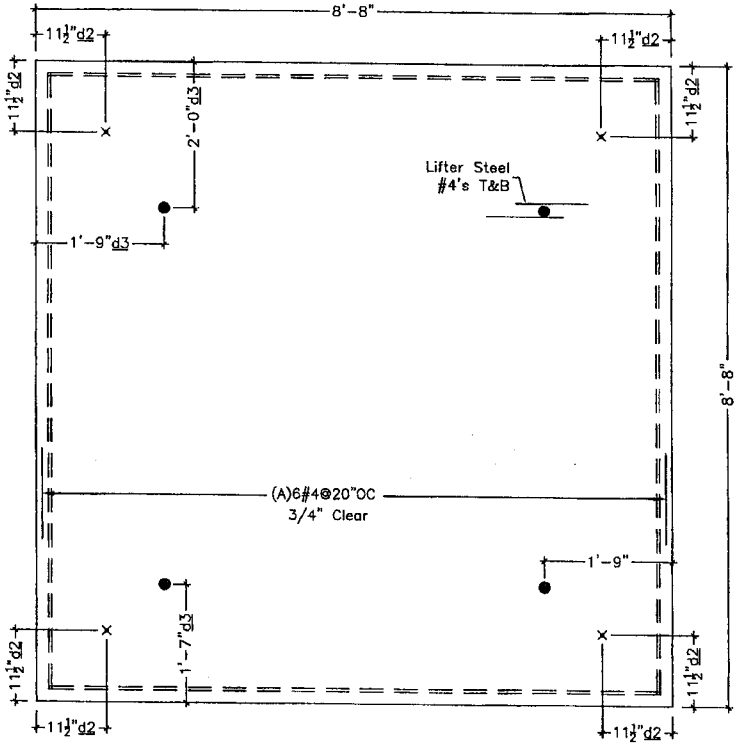
DETAIL 'B'



DETAIL 'A'



EDGE VIEW



PLAN VIEW IN FORM

REINFORCING

MARK	SIZE	SHAPE	LENGTH	WT.	QTY
4x4–4/4WWF 3/4"clr 8'–5" x 8'–5" Add#4 Peri Bars					1
A	#4	Plain	8'–5"		6
Back Lifter Steel #4 Bar (Straight) 8'–5"					8

EMBEDDED ITEMS

PART NO.	DESCRIPTION	QTY
d2	F–42 1/2"ø Insert (Face)	4
d3	2T.Swiftlift x 3–3/8" (4 In Back)	4

f'c: 5 ksi fy: 60 ksi

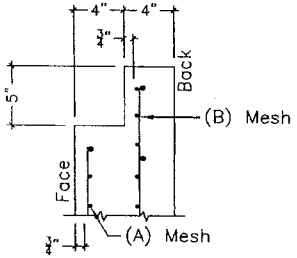
akelands
PRECAST CONCRETE PRODUCTS
7520 East Main Street
Lima NY 14485, (585)624–1990

Zoladz Construction
Gowanda Landfill

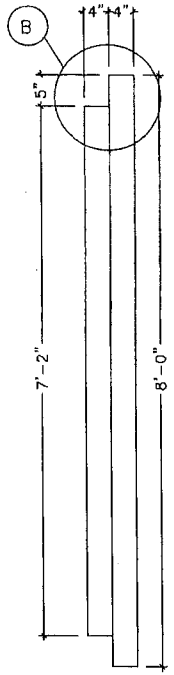
No. Req'd: 1
Date: 8/25/09

ZR–1

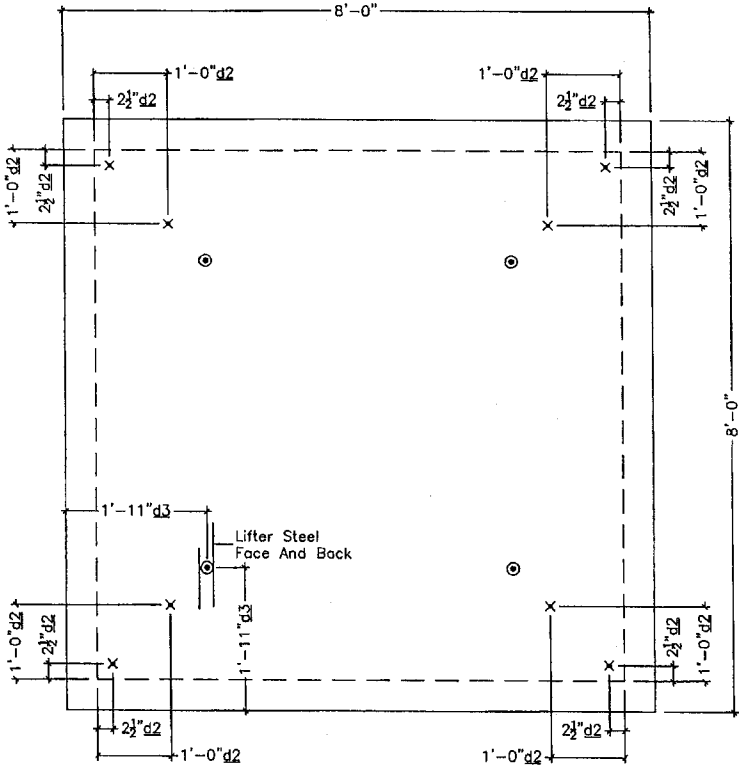
DATE:
MIX:
WEIGHT: 5768 lbs
FINISH:



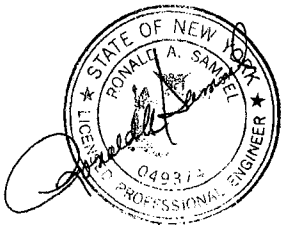
DETAIL 'B'



EDGE VIEW



PLAN VIEW IN FORM



REINFORCING

MARK	SIZE	SHAPE	LENGTH	WT.	QTY
A	4x4–4/4WWF 1"clr 6'–11" x 6'–11"				1
B	4x4–4/4WWF 4 3/4"clr 7'–9" x 7'–9"				1
	Perimeter Brs				
	#4	Plain	7'–9"		4
	#4	Plain	6'–11"		4
	Lifter Steel				
	#4	Plain	7'–9"		4
	#4	Plain	6'–11"		4

EMBEDDED ITEMS

PART NO.	DESCRIPTION	QTY
d2	F–42 1/2"ø Insert (Face)	8
d3	2T.Swiftlift x 3–3/8" (4 In Face) (4 In Back)	8

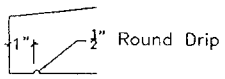
f'c: 5 ksi fy: 60 ksi

Lakelands
PRECAST CONCRETE PRODUCTS
7520 East Main Street
Lima NY 14485, (585)624–1990

Zoladz Construction
Gowanda Landfill

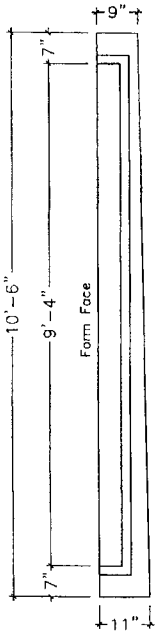
No. Req'd: 1
Date: 8/25/09

ZF–1

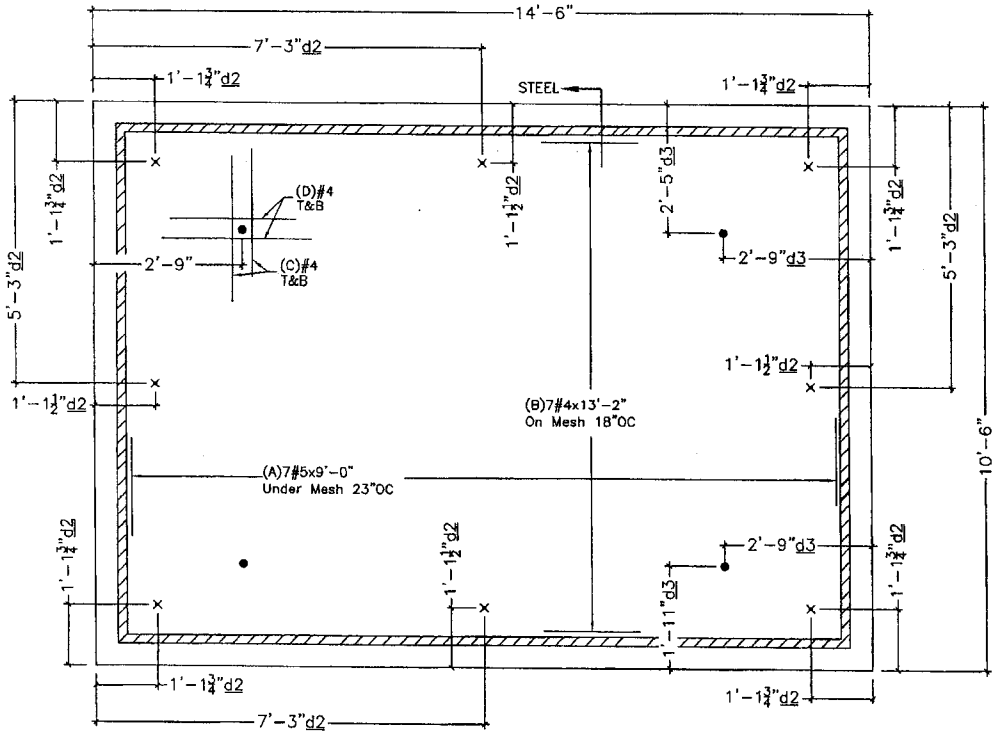


Drip Edge

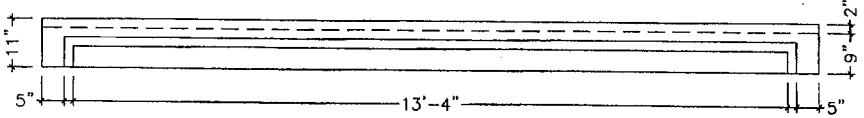
DATE:
MIX:
WEIGHT: 2" Back 5709 lbs
5" Face 9037 lbs
FINISH:Smooth Form/Trowel



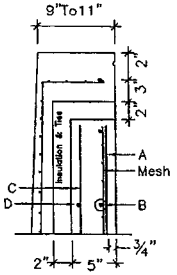
EDGE VIEW



PLAN VIEW IN FORM



ELEVATION VIEW IN FORM



REINFORCING

MARK	SIZE	SHAPE	LENGTH	WT.	QTY
A	#5	Plain	9'-0"		7
B	#4	Plain	13'-2"		7
		Lifter Steel			
C	#4	Plain	9'-0"		8
D	#4	Plain	13'-0"		8
4x4 – 4/4 WWF 9'-0" x 13'-0" FACE					1
4x4 – 4/4 WWF 10'-2" x 14'-2" BACK					1

EMBEDDED ITEMS

PART NO.	DESCRIPTION	QTY
d2	F-42 1/2"ø Insert (Face)	8
d3	4 Ton Swift Lifters (7¼") (Back)	4

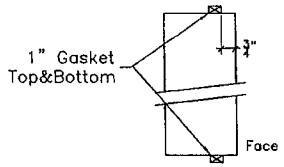
f'c: 5 ksi fy: 60 ksi

Lakelands
PRECAST CONCRETE PRODUCTS
7520 East Main Street
Lima NY 14485, (585)624-1990

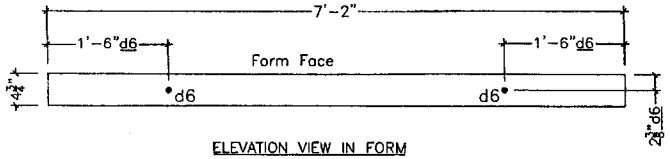
Dakksco Pipeline
Methane Removal Project
Campbell

Date: 8/25/09 No. Req'd: 1

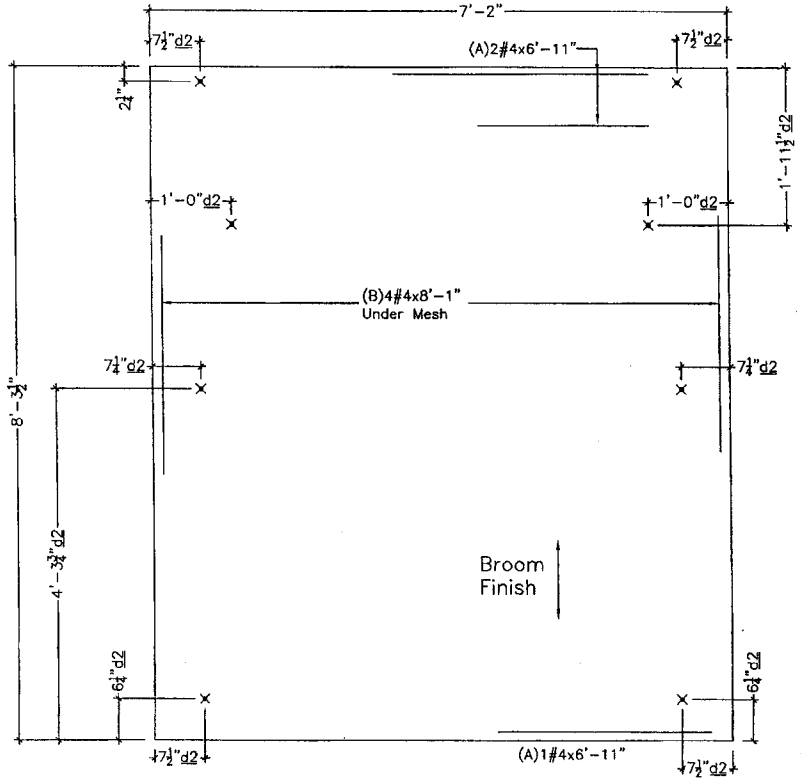
DR-1



DATE:
MIX:
WEIGHT: 3528 lbs
FINISH: Exp. Agg.
Broom Back



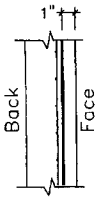
ELEVATION VIEW IN FORM



PLAN VIEW IN FORM

REINFORCING

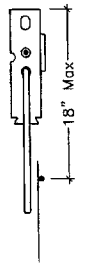
MARK	SIZE	SHAPE	LENGTH	WT.	QTY
A	#4	Plain	6'-11"		4
B	#4	Plain	8'-1"		3
	#4	Tension	1'-6"		2



4x4-4/4WWF(1 Layer)
6'-11" x 8'-1"

EMBEDDED ITEMS

PART NO.	DESCRIPTION	QTY
d6	2 Ton Dayton Erection With Tension Bar	2
d2	F-42 1/2"ø Insert (Back)	8



f'c: 5 ksi fy: 60 ksi

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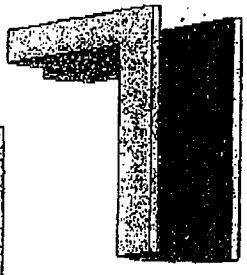
PRECAST CONCRETE PRODUCTS
7520 East Main Street
Lima NY 14485, (585)624-1990

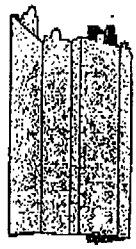
Zoladz Construction
Gowanda Landfill

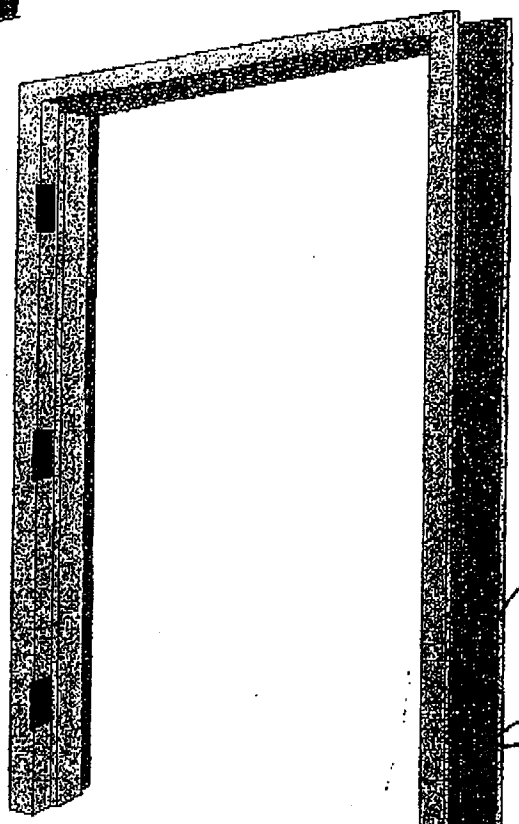
No. Req'd: 2
Date:

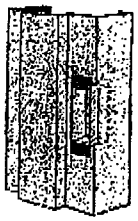
ZP-3

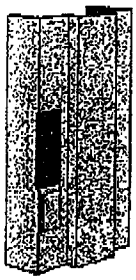
MASONRY FRAMES



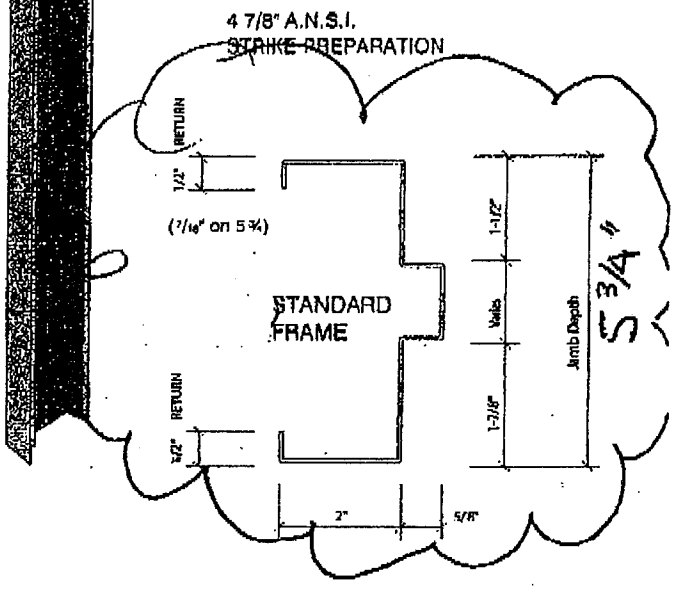


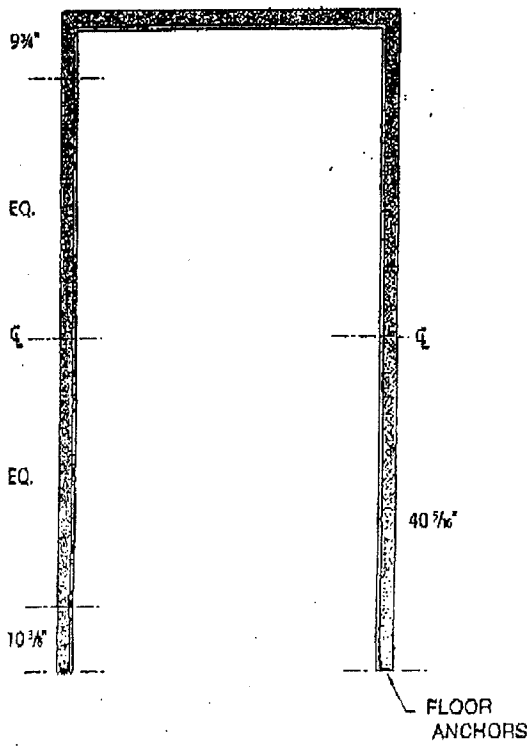






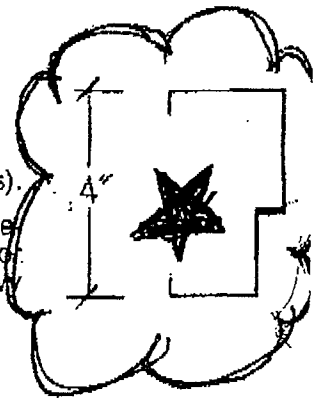
HINGES: 10-GAUGE HIGH FREQUENCY REINFORCEMENT, DRILLED AND TAPPED FOR 4½" TEMPLATED HINGES. (C/W HEAVYWEIGHT CONVERSION FEATURE)





SPECIFICATIONS

- 16 gauge A40 galvanneal steel.
- Knocked down or face welded.
- Double rabbeted (1¾" thick doors).
- Hinges: 10-gauge high frequency reinforcement, drilled and tapped for 4½" templated hinges. (c/w heavy weight conversion feature)
- 4 7/8" ANSI strike reinforcements c/w integrated mortar box.
- Silencer holes.
- Minimum jamb depth 4½".
- ½" returns except 7/16" on 5¾".



National Guard Products, Inc.
The products you count on. The people you trust.
Phone: 800-647-7874
Fax: 800-255-7874
www.ngp.com

Saddle Thresholds

BHMA All thresholds this page

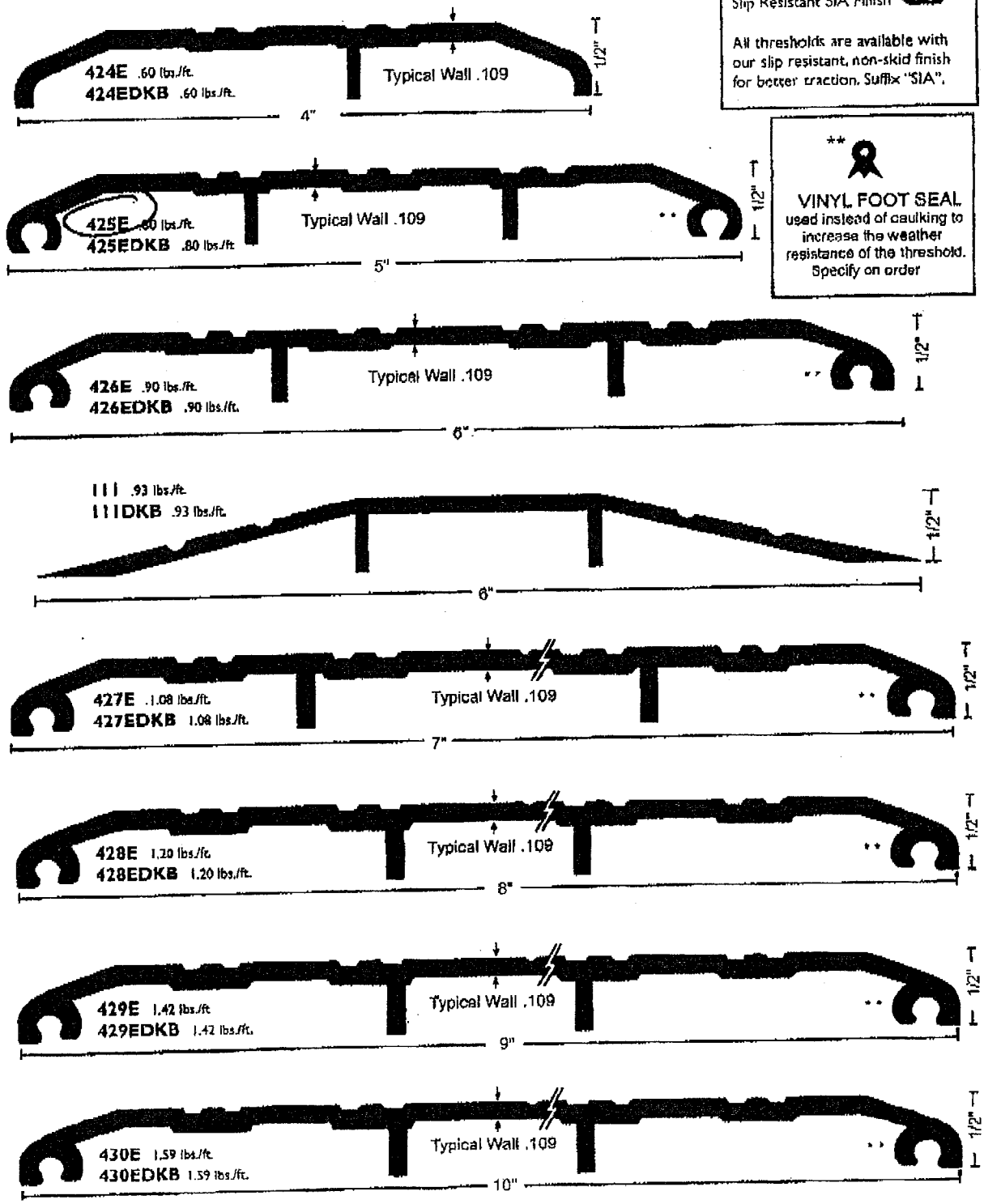
MATERIALS & FINISHES

- Aluminum mill finish
- DKB - Aluminum dark bronze finish

Slip Resistant SIA Finish

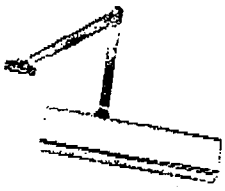
All thresholds are available with our slip resistant, non-skid finish for better traction. Suffix "SIA".

** VINYL FOOT SEAL used instead of caulking to increase the weather resistance of the threshold. Specify on order



Door Closers

5200 Series



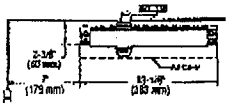
Grade 1
Heavy Duty Surface Door Closer
Ideal for schools, hospitals and other high-use environments

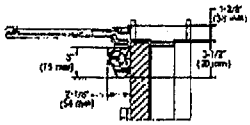
5200 Series

- **Lifetime warranty**
- **Tri-pack mount - Standard**
- **Sex nuts and bolts - Standard**

Certifications:	• BHMA Certified ANSI A156.4, adjustable sizes 2 to 5 - Standard • ADA Compliant ANSI A117.1 Accessibility Code only for adjustable sizes 1 to 4 - Optional • UL/cUL Listed for up to 3 hours • UL10C Positive Pressure Rated • UL10B Neutral Pressure Rated
Material:	• Aluminum alloy
Cover:	• Full Plastic Cover - Standard • Slim Line Plastic Cover - Optional • Full Size Plated Metal Cover - Optional
Springs:	• Double heat treated steel, tempered springs
Valves:	• Adjustable latching and sweep speed valves • Adjustable backcheck valve • Delayed action valve - Optional • Staked valves - Standard
Handing:	• Non-handed
Arms & Brackets:	• Tri-Pack: Regular, Top Jamb and Parallel Arm Mount - Standard • 15% power adjustment in arm
Door Thickness:	• 1¾" (44 mm) • 1⅜" - 2¼" (36 mm - 57 mm) - Optional
Fasteners:	• Self-reaming, self-tapping wood and machine screws • Sex nuts and bolts
Finishes:	• ALM, BRZ, DBZ, GOL, US3, US26, US26D
Notes:	• Full rack and pinion operation • Precision machined, heat treated steel piston • Triple heat treated steel spindle

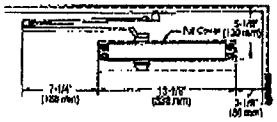
Arm Mounts

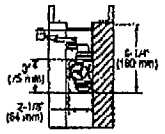




Regular Arm Mount

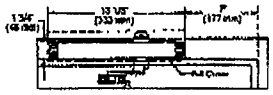
Opening:	• Templating allows up to 180°
Hold-open:	• Hold-open points 90° up to 180° with hold-open arm
Frame face:	• 1⅜" (35 mm)
Ceiling clearance:	• 1¾" (45 mm) minimum • 1⅝" (41 mm) minimum for hold-open arm
Top rail:	• 2½" (64 mm) minimum without drop plate • 1⅝" (38 mm) minimum with plate, 5918
Top Rail Clearance:	• 3½" (89 mm) minimum

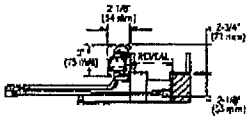




Parallel Arm Mount

Opening:	• Templating allows up to 180°
Hold-open:	• Hold-open points 90° up to 180° with hold-open
Top rail:	• Standard hollow metal ⅝" frame stop • 5⅜" (137 mm) minimum
Top rail clearance:	• 6¼" (159 mm) minimum





Top Jamb Mount

Opening:	• Templating allows up to 180°
Hold-open:	• Hold-open points 90° up to 180° with hold-open
Frame face:	• 1⅞" (48 mm) minimum • 1⅛" (29 mm) minimum with plate, 5918
Ceiling clearance:	• 2¾" (70 mm) minimum • 1⅝" (41 mm) minimum with plate, 5918
Top rail:	• 2" (51 mm) minimum
Top rail clearance:	• 2¼" (57 mm) minimum • 2½" (64 mm) minimum for hold-open • 3⅜" (86 mm) minimum with plate, 5918 • 3⅝" (92 mm) minimum for hold-open with plate

Notes: Right Hand Door - RH
Left Hand Reverse - LHR
Left Hand Door - LH
Right Hand Reverse - RHR

Door Closers

General Information

Meeting ADA Requirements

Doors and doorways that are part of an accessible route shall comply with Section 404 of the ANSI 117.1 standard.

Doorways shall have a clear opening of 32" minimum. Clear opening of doorways with swinging doors shall be measured from the face of door and stop with the door open 90°.

Door closers shall be adjusted so that from the open position of 90°, the time required to move the door to an open position of 12° shall be 5 seconds minimum.

The maximum force for pushing open or pulling open doors other than fire doors shall be as follows:

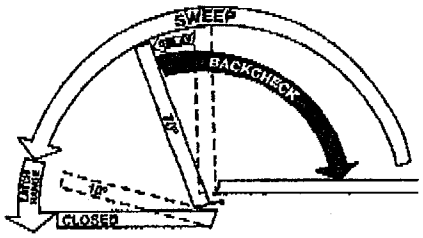
1. Interior hinged door: 5 lbs.
2. Exterior hinged door: 8.5 lbs.

Fire Doors

Fire doors shall have the minimum opening force allowable by the appropriate administrative authority.

Closer Adjustment

All Hager Companies' door closers are equipped with key control valves that allow for easy adjustments while decreasing the chances for tampering.



Sweep and Latching Speeds

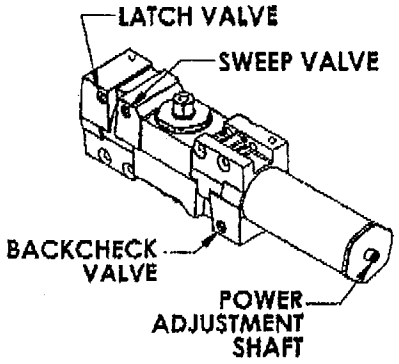
Two separate valves control the closing speed of the door. The sweep speed controls the speed of the door from full opening to within approximately 10° to 2° of the closed position. The latching speed valve controls the speed of the door from approximately 10° to 2° to full closing.

Backcheck

Backcheck starts at approximately 70° door opening and slows the door as it opens. This feature is not to be used as a positive stop. An auxiliary stop must be used.

Delayed Action

The delayed action feature is available for all applications. The closing time between 90° and 70° shall be a minimum of 20 seconds, but is adjustable to be even slower.



Adjustable Spring Feature

The 5100, 5200 and 5300 series closers offer an adjustable spring feature for sizing. Spring power of the closer can be increased by turning the power adjustment shaft clockwise.

Use of Door Stops

It is important to use an auxiliary door stop in order to protect the wall, trim, door and closer. A stop should be used even when a holder arm or closer with backcheck is used.

How to Select the Proper Closer

1. **Size and Weight of Door**
   5100, 5200 and 5300 Closers are non-sized so that closing force can be adjusted in the field to accommodate various door sizes, weights and applications. Specify size when ordering 5400.
2. **Interior Application**
   Where possible the standard Regular Arm application should be used as it is the most efficient in terms of power and control.
3. **Exterior Application**
   Exterior doors require greater closing forces because of draft and wind conditions.
4. **Degree of Opening**
   The closer should permit the door to open far enough to allow for easy traffic flow. The selection of the proper arm and position on the door are very important.
5. **Function**
   Closers can be equipped with special arms that can serve many functions such as hold-open, positive stop or hold-open stop when necessary.
6. **Abusive Environment**
   Closers can be equipped with Extra Heavy Duty arms that can withstand vandalism and extreme use.

Door Closers

General Information

Hager Companies offers a variety of surface door closers to meet a wide range of applications and uses. Heavy Duty, Grade 1 door closers are ideal for schools, hospitals, and other high-use environments while the Standard Duty, Grade 2 closer is ideal for less abusive commercial applications.

Surface door closers are easy to install, with only a few holes for the body and the arm, requiring a minimum amount of preparation of the door and frame. Not only are surface mounted door closers easier to install, they offer advantages with regard to adjustments that may need to be made because of variations in usage or environmental conditions.

There are a number of factors to consider when choosing how to mount your closer. These factors can be influenced by aesthetics, environment or application. The main things to consider when defining how to mount a surface door closer are:

- Appearance
- Accessibility to the closer arm
- Space limitations of the frame above the door
- Space limitations on the top rail of the door
- Closer position

There are three basic methods of mounting surface door closers to the door and frame and they are regular arm, parallel arm and top jamb mounts. All Hager Companies' door closers are supplied standard with a tri-pack for mounting any of the three types of applications.

Regular Arm

The regular arm application would be used when there is ample room on the top rail of the door and you are not concerned about the arm extending out away from the door. The closer body is mounted on the hinge side of the top rail of the door. The forearm is then mounted to the frame face by a mounting shoe.

The arm projects at approximately a 90° angle away from the door. The regular arm mount will make the closer more power-efficient than the parallel arm or top jamb mount.

Parallel Arm

The depth of the top rail is an important consideration when using this application. The closer body is mounted on the top rail of the door opposite the hinge side of the door. The forearm is mounted by a parallel arm bracket to the underside of the frame. The arm is parallel to the door, which makes it less likely to be damaged and aids in the overall aesthetics. This mounting application will, however, reduce the power-efficiency of the closer.

Top Jamb

This is the preferred method of mounting a closer if you are faced with a narrow rail on a door. The closer body is mounted to the frame face above the door, opposite the door hinge side. The forearm is then mounted to the top rail of the door. The top jamb mount is more power-efficient than the parallel arm application.

Door Handing

Hager Companies' surface door closers are all non-handed, meaning they can be placed on a door so that they will operate a left-opening or a right-opening door. Some of the accessories that can be ordered with these closers are handed and the hand of the door should be specified when ordering a closer with these components.

Closer Sizing

The American National Standards Institute (A.N.S.I.) has set the standard for sizing and ensured that each manufacturer's closers are tested on the same basis.

The accompanying chart shows the closer size required to fit your door size and application.

Exterior (and Vestibule) Door Width

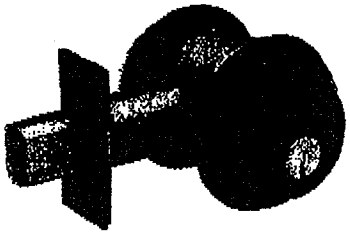
	Minimum Door Width (24")				
	24" (610 mm)	30" (762 mm)	36" (914 mm)	42" (1067 mm)	48" (1219 mm)
Regular Arm & Top Jamb	Size 3 (0)	Size 4 (4cw)	Size 5 (8cw)	Size 6 (12cw)	
Parallel Arm	Size 3 (4cw)	Size 4 (8cw)	Size 5 (12cw)	–	

Interior Door Width

	Minimum Door Width (24")					
	24" (610 mm)	30" (762 mm)	34" (865 mm)	38" (965 mm)	48" (1219 mm)	54" (1372 mm)	60" (1524 mm)
Regular Arm & Top Jamb	Size 1 (8ccw)	Size 2 (4ccw)	Size 3 (0)	Size 4 (4cw)	Size 5 (8cw)	Size 6 (12cw)	
Parallel Arm	Size 1 (4ccw)	Size 2 (0)	Size 3 (4cw)	Size 4 (8cw)	Size 5 (12cw)	–	

Note: CW - Clockwise
CCW - Counter clockwise

B600/700/800-Series Finishes & Functions



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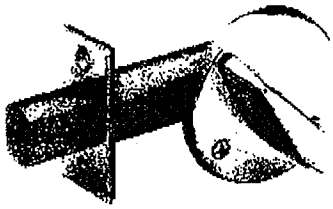

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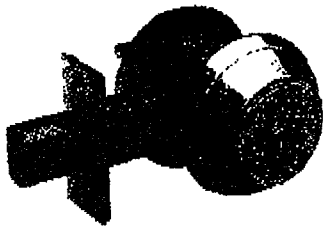

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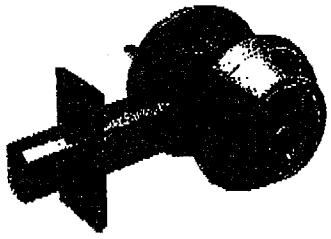


626

B600-SERIES

Schlage's toughest heavy duty Grade 1 commercial deadlock. Furnished with conventional cylinder standard.
Also available with full size interchangeable core cylinder or small format interchangeable core (SFIC) cylinder.

Requires 2⅛" (55mm) prep. UL10B listing standard for *auxiliary* lock on A Label fire doors.

B700-SERIES

Same lock as B600-Series but furnished with Primus Controlled Access cylinder for patented key control, geographical exclusivity and resistance to picking and impressioning. Also available with Primus interchangeable core cylinder.

B800-SERIES

Same lock as B700-Series but Primus high security cylinder is UL437 Listed to resist drilling and other forms of physical attack. Not available in interchangeable core.

Finishes

605 Bright Brass
606 Satin Brass
609 Antique Brass
612 Satin Bronze
613 Oil Rubbed Bronze
619 Satin Nickel
625 Bright Chromium Plated
626 Satin Chromium Plated

Functions

ANSI A156.5 BORED DEADBOLT LOCKS

	Single Cylinder Deadlock	Double Cylinder Deadlock	Cylinder x Plate Deadlock	Classroom Deadlock	Cylinder Only Deadlock	Thumbturn Only Deadlock
Schlage	B660P B760P B860P	B662P* B762P* B862P*	B661P B761P B861P	B663P B763P B863P	B664P B764P B864P	B680
ANSI	E2151 Deadbolt thrown or retracted by key outside or thumbturn inside.	E2141 Deadbolt thrown or retracted by key either side.	E2161 Deadbolt thrown or retracted by key outside. Blank plate with exposed screws inside.	E2171 Deadbolt thrown only by key outside; retracted by key outside or thumbturn inside.	E2101 Deadbolt thrown or retracted by key one side. No trim on other side.	E2191 Deadbolt thrown or retracted by thumbturn inside. No outside trim.

B660, B661, B662, B663 available with full size or small format IC cylinders.

B760, B761, B762, B763 available with Primus full size IC cylinders.

**Caution: Double cylinder locks on doors that are used for exits are a safety hazard in times of emergency. Schlage does not recommend double cylinder locks in these situations. Installation should comply with local life safety codes.*

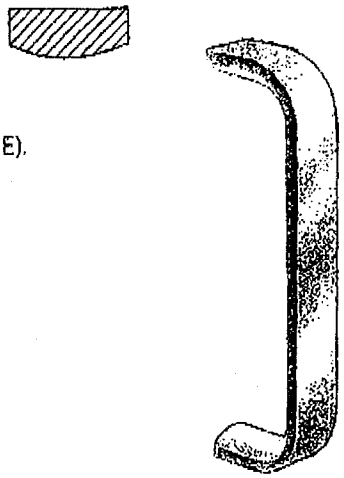
Hager Pulls

Modified Half Round Wrought Door Pull

Meets ANSI A156.6 for J401 Pulls

1
1/2" x 1" (13 mm x 25 mm) Base
2" (51 mm) Projection
1 1/2" (38 mm) Clearance

Material: Aluminum, Brass, Bronze, or Stainless Steel
Finishes: All standard, see page F3.
Handicap: 2 1/2" (63 mm) clearance available on special order. Prefix "H" to number (i.e., H1E).
Available with standard base centers (CTC).
This pull unit may be combined with a plate to make a pull plate.
(See page F5 and 19Y for pull plate specifications.)



Item No.	Length CTC*		Fasteners (with finish washers)	Quantity	
	Inches	mm		Box	Case
1E	6	152	1/4 x 20 thru bolts	1 each	12 each
1G	8	203	1/4 x 20 thru bolts	1 each	12 each
1J	10	254	1/4 x 20 thru bolts	1 each	12 each
1L	12	305	1/4 x 20 thru bolts	1 each	12 each

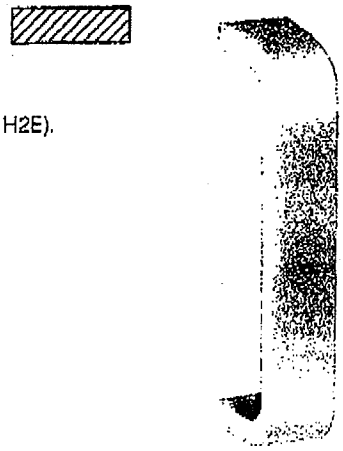
* Other centers on special order.

Rectangular Wrought Door Pull

Meets ANSI A156.6 for J401 Pulls

2
3/8" x 1 1/4" (10 mm x 32 mm) Base
2" (51 mm) Projection
1 5/8" (41 mm) Clearance

Material: Aluminum, Brass, Bronze, or Stainless Steel
Finishes: All standard, see page F3.
Handicap: 2 1/2" (63 mm) clearance available on special order. Prefix "H" to number (i.e., H2E).
Available with standard base centers (CTC).
This pull unit may be combined with a plate to make a pull plate.
(See page F5 and 19Y for pull plate specifications.)



Item No.	Length CTC*		Fasteners (with finish washers)	Quantity	
	Inches	mm		Box	Case
2E	6	152	1/4 x 20 thru bolts	1 each	12 each
2G	8	203	1/4 x 20 thru bolts	1 each	12 each
2J	10	254	1/4 x 20 thru bolts	1 each	12 each
2L	12	305	1/4 x 20 thru bolts	1 each	12 each

* Other centers on special order.

Hager Pulls

Pull Plate Series

Pull plate series 30, 40, and 50 meet ANSI A156.6 for J405 Pull Plate
Pull plate series 80, 90, and 100 meet ANSI A156.6 for J407 Pull Plate
Pull plate 33E meets ANSI A156.6 for Standard Pull Plate

Standard Sizes: 3" x 12" (76 mm x 305 mm), 3 1/2" x 15" (89 mm x 381 mm), 4" x 16" (102 mm x 406 mm), 6" x 16"* (152 mm x 406 mm), 8" x 16"* (203 mm x 406 mm)
(size not available for 30 and A50 series)

Material: Aluminum, Brass, Bronze, or Stainless Steel
Finishes: All standard, see page F3.
Handicap: 2 1/2" (63 mm) clearance available on special orders for pull plates except with 5N or 6N pulls. Prefix "H" to pull plate number (i.e., H33E).
Options: Pull plates may be ordered cut for cylinder (CFC) or engraved "PULL" (See page 19Y for standard locations).
Order: Provide pull plate number, plate size, finish,and options, if any (i.e., 31E – 3 1/2 x 15" – US3 – CFC).
Pull plates are ordered by combining a push plate and a door pull using the numbering system below.
Pull plates can be ordered using most of the push plates shown on pages 16Y and 17Y with any of the pulls shown on pages 7Y through 9Y.

Fasteners (with finish washers) Quantity			
Door Pull	Push Plate	Box	Case
#1/4" x 20 thru bolts	#6 x 5/8 OH tapping screws	1 each	10 each

Square Corner

Round Corner

Rounded

.050 Pull Plate Number			.062 Pull Plate Number			1/8" Pull Plate Number			
SQUARE CORNERS	ROUND CORNERS	ROUNDED	SQUARE CORNERS	ROUND CORNERS	ROUNDED	SQUARE CORNERS	ROUND CORNERS	ROUNDED	PULL
31E	41E	51E	A31E	A41E	A51E	81E	91E	101E	1E
31G	41G	51G	A31G	A41G	A51G	81G	91G	101G	1G
31J	41J	51J	A31J	A41J	A51J	81J	91J	101J	1J
31L	41L	51L	A31L	A41L	A51L	81L	91L	101L	1L
32E	42E	52E	A32E	A42E	A52E	82E	92E	102E	2E
32G	42G	52G	A32G	A42G	A52G	82G	92G	102G	2G
32J	42J	52J	A32J	A42J	A52J	82J	92J	102J	2J
32L	42L	52L	A32L	A42L	A52L	82L	92L	102L	2L
33E	43E	53E	A33E	A43E	A53E	83E	93E	103E	3E
33G	43G	53G	A33G	A43G	A53G	83G	93G	103G	3G
33J	43J	53J	A33J	A43J	A53J	83J	93J	103J	3J
33L	43L	53L	A33L	A43L	A53L	83L	93L	103L	3L
34G	44G	54G	A34G	A44G	A54G	84G	94G	104G	4G
34J	44J	54J	A34J	A44J	A54J	84J	94J	104J	4J
34L	44L	54L	A34L	A44L	A54L	84L	94L	104L	4L
35D	45D	55D	A35D	A45D	A55D	85D	95D	105D	5D
35N	45N	55N	A35N	A45N	A55N	85N	95N	105N	5N
36N	46N	56N	A36N	A46N	A56N	86N	96N	106N	6N
39E	49E	59E	A39E	A49E	A59E	89E	99E	109E	9E
39G	49G	59G	A39G	A49G	A59G	89G	99G	109G	9G
39J	49J	59J	A39J	A49J	A59J	89J	99J	109J	9J
39L	49L	59L	A39L	A49L	A59L	89L	99L	109L	9L

NOTE: To order Pull Plates other than those listed above; give complete details (i.e., plate style, size, Pull Number, finish and other specifications.)

Door Trim and Auxiliary

HAGER

Square Corner – Beveled
Meets ANSI A156.6 for J301 or J304 Push Plate

30S/A30S
Standard Sizes:3" x 12" (76 mm x 305 mm), 3 1/2" x 15" (89 mm x 381 mm), 4" x 16" (102 mm x 406 mm), 6" x 16" (152 mm x 406 mm), 8" x 16" (203 mm x 406 mm)
30S Gauge = .050" (1.3 mm)
A30S Gauge = .062" (1.6 mm)
Material: Aluminum, Brass, Bronze, or Stainless Steel
Finishes: All standard, see page F3.
Options: All plates on this page may be ordered cut for cylinder (CFC) or engraved "PUSH" (See page F5 for standard locations).
Order: Provide plate number, size, and finish (i.e., 30S – 3 1/2 x 15" – 32D).

Item No.	Plate Size		Fasteners (tapping screws)	Quantity	
	Inches	mm		Box	Case
30S/A30S	3 x 12	76 x 305	#6 x 5/8 oval undercut head	5 each	50 each
30S/A30S	3-1/2 x 15	89 x 381	#6 x 5/8 oval undercut head	5 each	50 each
30S/A30S	4 x 16	102 x 406	#6 x 5/8 oval undercut head	5 each	50 each
30S/A30S	6 x 16	152 x 406	#6 x 5/8 oval undercut head	——	5 each
30S/A30S	8 x 16	203 x 406	#6 x 5/8 oval undercut head	——	5 each

Radius Corner – Not Beveled
Meets ANSI A156.6 for J301 or J304 Push Plate

40R/A40R
Standard Sizes:3" x 12" (76 mm x 305 mm), 3 1/2" x 15" (89 mm x 381 mm), 4" x 16" (102 mm x 406 mm), 6" x 16" (152 mm x 406 mm), 8" x 16" (203 mm x 406 mm)
40R Gauge = .050" (1.3 mm)
A40R Gauge = .062" (1.6 mm)
Material: Aluminum, Brass, Bronze, or Stainless Steel
Finishes: All standard, see page F3.
Options: All plates on this page may be ordered cut for cylinder (CFC) or engraved "PUSH" (See page F5 for standard locations).
Order: Provide plate number, size, and finish (i.e., 40R – 3 1/2 x 15" – 32D).

Item No.	Plate Size		Fasteners (tapping screws)	Quantity	
	Inches	mm		Box	Case
40R/A40R	3 x 12	76 x 305	#6 x 5/8 oval undercut head	5 each	50 each
40R/A40R	3-1/2 x 15	89 x 381	#6 x 5/8 oval undercut head	5 each	50 each
40R/A40R	4 x 16	102 x 406	#6 x 5/8 oval undercut head	5 each	50 each
40R/A40R	6 x 16	152 x 406	#6 x 5/8 oval undercut head	——	5 each
40R/A40R	8 x 16	203 x 406	#6 x 5/8 oval undercut head	——	5 each

Full Mortise Hinges

HAGER

Plain Bearing • Standard Weight • Template

For use on Medium Weight Doors Requiring Low Frequency Service (Not for use with Door Closer)

For Hospital type prefix "HT" to catalog number

1279
Steel with steel pin ANSI A8133

1191
Brass with stainless steel pin ANSI A2133
Stainless Steel with stainless steel pin ANSI A5133

Five knuckle non-rising removable pin with button tip and plug.
Specify screw requirements.

2 x 2	51 x 51	0.083	4	½ x 6-32	¾ x 8	10 each	200 each	32	35
2½ x 2½	64 x 64	0.089	6	½ x 8-32	¾ x 8	10 each	200 each	34	39
3 x 3	76 x 76	0.097	6	½ x 10-24	1 x 9	2 each	100 each	37	40
3½ x 3½	89 x 89	0.119	6	½ x 10-24	1 x 9	2 each	100 each	66	72
4 x 4	102 x 102	0.129	8	½ x 12-24	1¼ x 12	3 each	48 each	43	47
4½ x 4	114 x 102	0.134	8	½ x 12-24	1¼ x 12	3 each	48 each	49	53
4½ x 4½	114 x 114	0.134	8	½ x 12-24	1¼ x 12	3 each	48 each	55	60
5 x 4	127 x 102	0.145	8	½ x 12-24	1¼ x 12	3 each	24 each	37	40
5 x 4½	127 x 114	0.145	8	½ x 12-24	1¼ x 12	3 each	24 each	37	40
5 x 5	127 x 127	0.145	8	½ x 12-24	1¼ x 12	3 each	24 each	37	40
6 x 4½	152 x 114	0.160	10	½ x ¼-20	1½ x 14	3 each	24 each	61	66
6 x 5	152 x 127	0.160	10	½ x ¼-20	1½ x 14	3 each	24 each	61	66
6 x 6	152 x 152	0.160	10	½ x ¼-20	1½ x 14	3 each	24 each	61	66

Ball Bearing • Standard Weight • Template

For use on Medium Weight Doors or Doors Requiring Medium Frequency Service

BB1279 or BB1191

For Hospital type prefix "HT" to catalog number

BB1279
Steel with steel pin ANSI A8112

BB1191
Brass with stainless steel pin ANSI A2112
Stainless Steel with stainless steel pin ANSI A5112

Five knuckle two ball bearings non-rising removable pin with button tip and plug.
Specify screw requirements.

CB1191
Stainless Steel with stainless steel pin ANSI A5112

Available in Hager's New SecureCoat Lifetime Finish in Bright Brass. ***Specify US3SC when ordering. Contact Hager Engineering for special applications.***

Five knuckle concealed bearings non-rising removable pin with button tip and plug.
Specify screw requirements.

CB1191 SecureCoat Lifetime Finish

NEW PRODUCT!

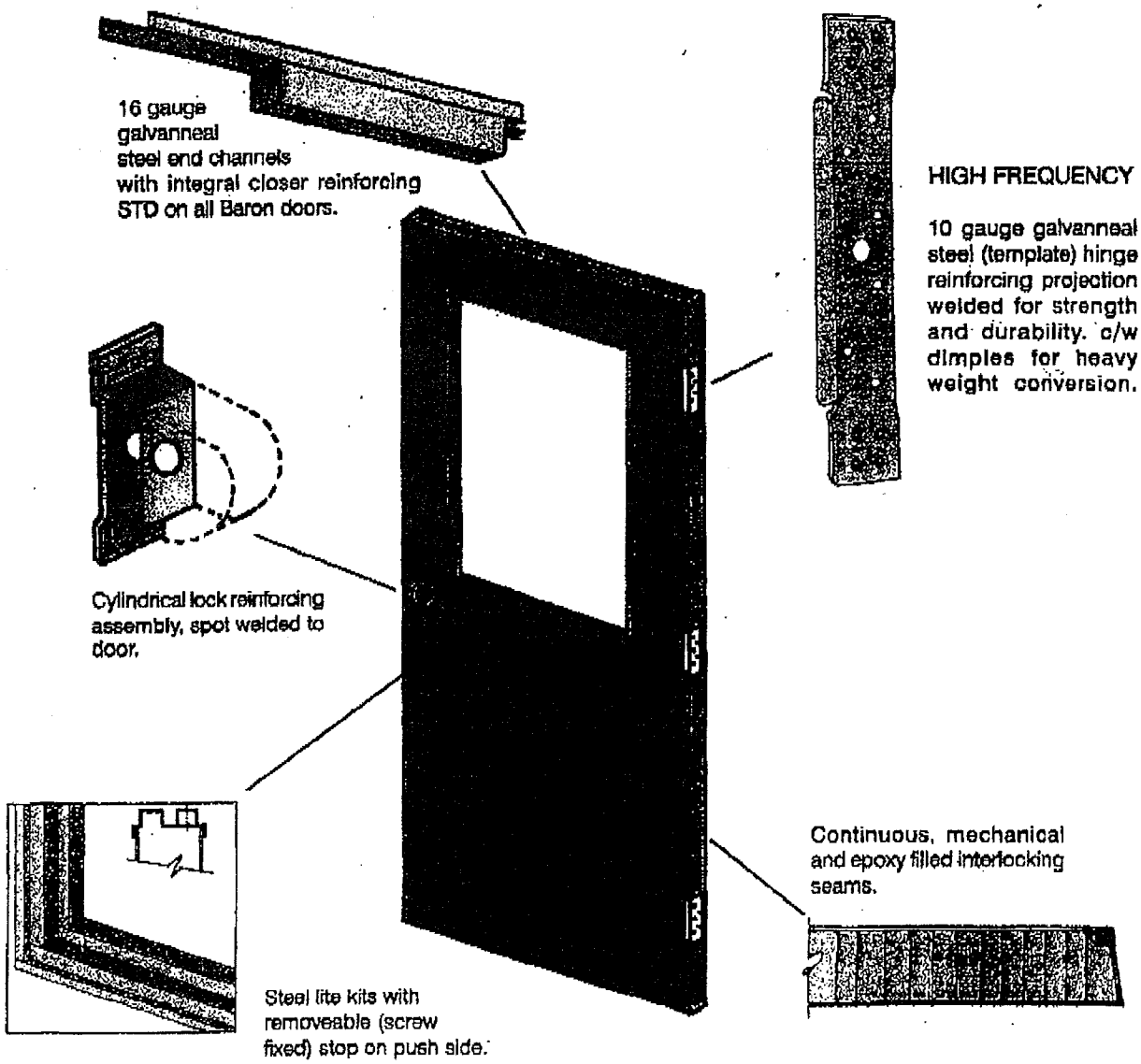
3½ x 3½	89 x 89	0.119	6	½ x 10-24	1 x 9	2 each	100 each	66	72
4 x 4	102 x 102	0.129	8	½ x 12-24	1¼ x 12	3 each	48 each	43	47
4½ x 4	114 x 102	0.134	8	½ x 12-24	1¼ x 12	3 each	48 each	55	60
4½ x 4½	114 x 114	0.134	8	½ x 12-24	1¼ x 12	3 each	48 each	55	60
5 x 4	127 x 102	0.145	8	½ x 12-24	1¼ x 12	3 each	24 each	37	40
5 x 4½	127 x 114	0.145	8	½ x 12-24	1¼ x 12	3 each	24 each	37	40
5 x 5	127 x 127	0.145	8	½ x 12-24	1¼ x 12	3 each	24 each	37	40
6 x 4½	152 x 114	0.160	10	½ x 1/4-20	1½ x 14	3 each	24 each	57	62
6 x 5	152 x 127	0.160	10	½ x 1/4-20	1½ x 14	3 each	24 each	57	62
6 x 6	152 x 152	0.160	10	½ x 1/4-20	1½ x 14	3 each	24 each	57	62

Hinge testing conforms to ANSI A156.1. Furnished with screw hole locations that conform to standards approved by ANSI A156.7.

HOLLOW METAL DOORS

SPECIFICATIONS

- Doors are manufactured with an integral closer reinforcing box and extra deep inverted end channels, (standard at the top of all handed doors, standard at the top and bottom of all non-handed doors [top only on all "SW" Series]).
- Doors are prepared for 1½" pair of 4½" hinges. (c/w conversion feature for heavy weight application)
- Standard lock preparation includes 161-cylindrical with 2 ¾" back-set or rim panic reinforcing only for push/pull applications.
- Door edges include mechanically interlocking seams and are bevelled.
- All doors are available with optional steel or vinyl top caps. (Recommended on all exterior applications).



HOLLOW METAL DOORS

SPECIFICATIONS

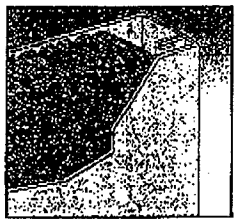
Baron offers doors from standard duty to extra heavy duty. Cores range from standard honeycomb to one of industry's most indestructable welded steel stiffened cores. Use the information shown below to select the door that meets your specifications.

"B" SERIES DOORS

(20, 18 or 16 gauge - Mechanically interlocking seams - Beveled edge - Optional cores)

Honeycomb DESIGNED FOR STANDARD DUTY AND HEAVY DUTY APPLICATIONS

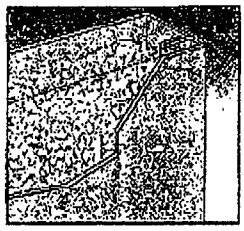
Using a high density honeycomb core which is laminated under pressure ensures strength, durability, flatness and is impact resistant. Positive pressure rated.



HONEYCOMB

Insulated DESIGNED FOR EXTERIOR USE WITH HIGH THERMAL QUALITIES.

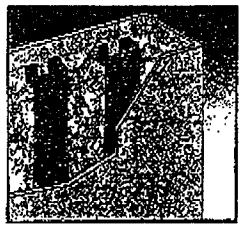
Assembled with solid slabs of polystyrene or polyurethane bonded permanently to the inside of the skin providing a R6 or R12 thermal factor and sound deadening qualities. This type offers security and flexibility in the most adverse conditions. Positive pressure rated.



INSULATED

Steel Stiffened (Laminated) EXTRA HEAVY DUTY DOOR RECOMMENDED FOR HIGH FREQUENCY APPLICATIONS

Constructed with vertical steel stiffeners at 6" centres laminated to both door skins with fibreglass fill in all voids. Positive pressure rated.



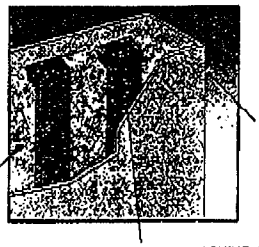
STEEL STIFFENED (laminated)

"SW" SERIES DOORS

(16 or 14 gauge - Seamless - Beveled Edge - Steel Stiffened)

Steel Stiffened (Seamless) DESIGNED FOR SECURITY AND HIGH USAGE APPLICATIONS.

Manufactured with interlocking steel stiffeners, spot welded on both faces at 6" o.c.. All voids filled with fibreglass insulation. Edge seams are continuously welded for maximum strength and ground smooth. Positive pressure rated.



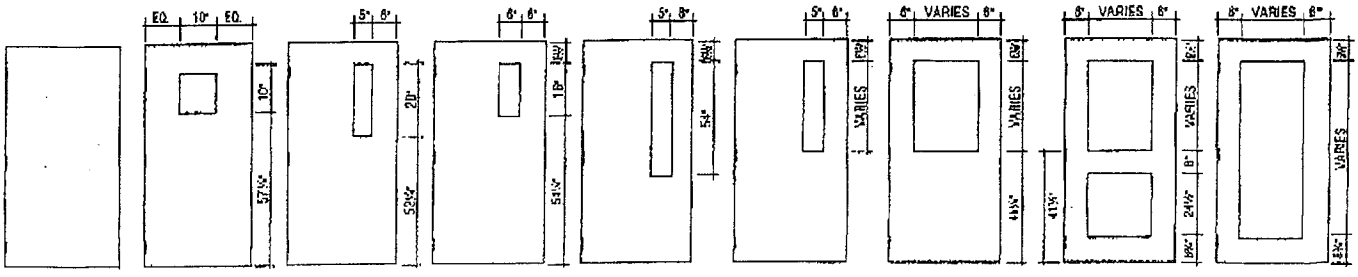
STEEL STIFFENED (welded)

CONTINUOUSLY WELDED EDGE SEAM

ALL VOIDS FILLED WITH FIBREGLASS INSULATION

20 GA. INTERLOCKING STIFFENERS AT 6" O.C. SPOT WELDED TO BOTH DOOR SKINS

STANDARD BARON DOOR ELEVATIONS



Phone: 800-647-7874
Fax: 800-255-7874
www.ngp.com

Vinyl Sweeps

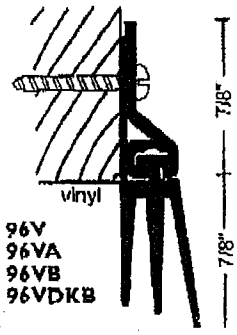
#6 x 3/4" stainless steel SMS furnished.
Screw holes slotted for adjustment.

A - clear
B - gold
DKB - dark bronze
no suffix - mill

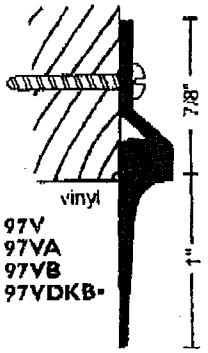
All products this page

vinyl is gray

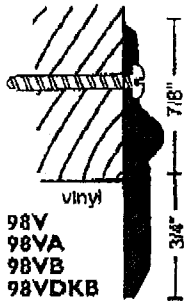
Exceptions:
*vinyl is black
** vinyl is brown



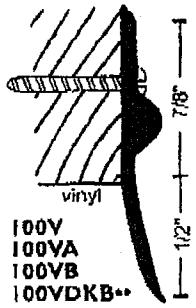
96V
96VA
96VB
96VDKB



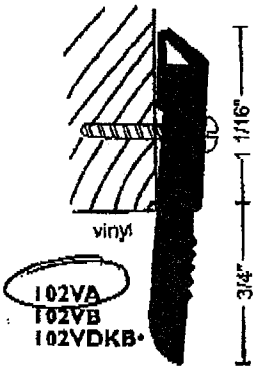
97V
97VA
97VB
97VDKB*



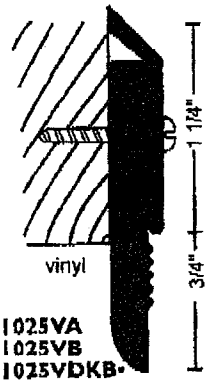
98V
98VA
98VB
98VDKB



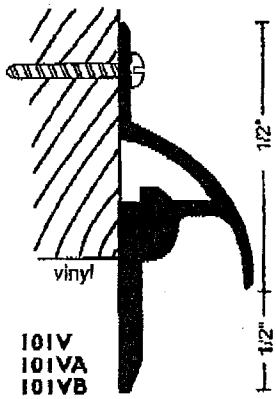
100V
100VA
100VB
100VDKB**



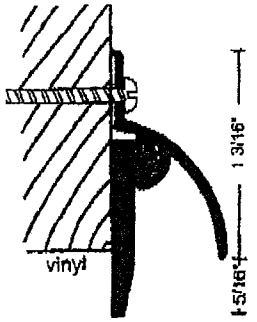
102VA
102VB
102VDKB*



1025VA
1025VB
1025VDKB*



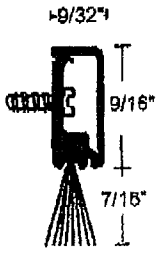
101V
101VA
101VB
101VDKB



1015V
1015VDKB

Concealed Fastener Nylon Brush Sweeps

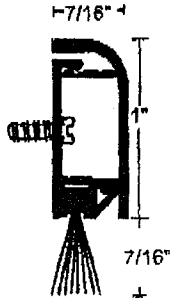
Brush is gray with clear anodized metal; black with gold and DKB metal



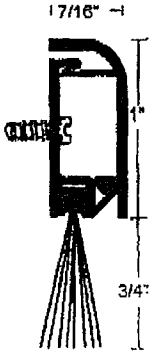
672A
672B
672DKB

673A
673B
673DKB

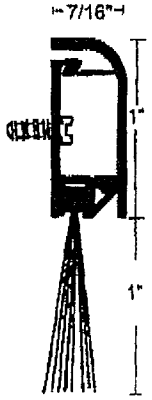
674A
674B
674DKB



675A
675B
675DKB



678A
678B
678DKB



679A
679B
679DKB

SIEWERT EQUIPMENT
A Division of CUMMINS-WAGNER - Siewert, LLC

Buffalo Office
415 Lawrence Bell Drive Suite 7
Williamsville, NY 14221
Phone: (585) 482-9640
Fax: (585) 482-4149

QUOTE DATE	APRIL 22, 2009	*DATE/RCVD*	APRIL 21, 2009	*VIA*	PHONE
TO:	BENCHMARK ENGINEERING				
ATTENTION:	**TOM FORBES**	**CC:**			
PHONE NO:	856-0599	**MOBILE:**			
FAX NO:		**EMAIL:**	FORBES@BENCHMARKES.COM		
FROM:	KATE INTERLICHIA				
SUBJECT:	PULSAFEEDER PUMP QUOTE				
FILE NUMBER:	SP-09-2172 REV	**P**	2		

IN REGARDS TO YOUR REQUEST, WE ARE PLEASED TO OFFER THE FOLLOWING;

QTY (1) PULSATRON C PLUS SERIES MODEL LD03SAVTC9XXX ELECTRONIC METERING PUMP IN PVC MATERIALS WITH TEFLON O-RINGS AND CHECK VALVE SEATS, CERAMIC BALLS, AND TYPE 9 TUBING.

NET PRICE EACH ----- [redacted]

LEAD TIME IS 1-2 WEEKS AFTER RECEIPT OF ORDER. FREIGHT IS FOB FACTORY. IF YOU HAVE ANY QUESTIONS OR REQUIRE ADDITIONAL INFORMATION, PLEASE CALL OUR OFFICE.

CC: PAT MAHANEY, SALES ENGINEER

THE PRICES ARE FIRM FOR 30 DAYS FROM THE DATE OF THIS QUOTATION.
STANDARD CREDIT TERMS ARE NET 30 DAYS FROM DATE OF INVOICE WITH APPROVED CREDIT. INVOICES NOT PAID WITHIN THIS PERIOD ARE SUBJECT TO A 1½ % MONTHLY SERVICE CHARGE. IF STARTUP SERVICES ARE PART OF THIS QUOTE, STARTUP WILL NOT BE PROVIDED ON NON-CURRENT ACCOUNTS. DOES NOT INCLUDE ANY APPLICABLE LOCAL OR STATE TAXES. APPLICABLE TAXES WILL BE ADDED TO THE INVOICE AT TIME OF ORDER.

Siewert Equipment Co., Inc.

175 Akron Street, Rochester, NY 14609

Terms & Condition of Sale

1. **Warranty**

Siewert Equipment Company warrant that the New Equipment shall be the Manufactures standard as noted. If none stated, the delivered Equipment hereunder will be free of defects in material and workmanship for a period of twelve months from the date of placing the Equipment in operation or eighteen months from the date of shipment, whichever shall first occur. The option of repair, replacement, or refund shall be at Siewert Equipment Company's discretion.
Siewert Equipment Company shall pay all transportation charges relative to its repairing or replacing the Equipment; however, Siewert Equipment Company will not be responsible for costs of removal, loading, installation, or other similar related expenses.
This warranty shall not apply to failures resulting from (a) normal wear and tear, (b) alteration, misuse, or abuse by Buyer or a third party, (c) improper installation and/or maintenance by Buyer or third party, or (d) inaccurate and/or incomplete data supplied or approved by Buyer.

THE FOREGOING OBLIGATIONS ARE IN LIEU OF ALL OTHER OBLIGATIONS AND LIABILITIES AND ALL WARRANTIES OF MERCHATNABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE EXPRESS OR IMPLIED BY FACT OR BY LAW, AND STATE BUYER'S EXLUSIVE REMEDIES FOR SIEWERT EQUIPMENT COMPANY'S BREACH OF THIS WARRANTY/PROCESS GUARANTEE OR OTHERWISE.
NOT WITHSTANDING ANYTHING TO THE CONTRARY HEREIN, SIEWERT EQUIPMENT COMPANY'S ENTIRE LIABILITY FOR CLAIMS, WHETHER BASED ON CONTRACT, WARRANTY (EXCEPT WARRANTY OF TITLE), TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY, OR OTHERWISE FOR ANY LOSS ARISING OUT OF ITS PERFORMANCE OR FAILURE TO PERFORM THIS CONTRACT SHALL (1) NOT EXCEED THE CONTRACT PRICE FOR EQUIPMENT SUPPLIED HEREUNDER WHICH WAS THE CAUSE OF SUCH CLAIM, (2) IN NO CASE EXTEND TO DIRECT, INDIRECT SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, OF ANY NATURE OR KIND, AND (3) TERMINATE UPON EXPIRATION OF THE WARRANTY PERIOD.

2. **Delivery**

Delivery dates are estimates and are based on timely receipt of complete and accurate approvals or other technical data from Buyer. We will make every effort to ship on the date specified in this Agreement, but we shall not be liable for any delay beyond our control or caused by the following; an accident disabling our plant or equipment; riots or insurrections; national emergency; labor disputes of every kind, however caused; embargoes; non delivery by suppliers; Buyer caused delays; delays of carriers or postal authorities; or governmental restrictions, prohibitions, or requirements. In the event of any such delay, the date of delivery or other performance shall be extended for a period of time equal to the time lost by reason of the delay. Regardless of the cause, Siewert Equipment Company will not accept any penalty for shipping beyond the date specified in the contract. On all shipments F.O.B. our factory, title and risk of loss shall pass to Buyer upon delivery of the goods to the carrier.

3. **Changes**

Any changes requested by the Buyer which affect the equipment or otherwise affect the scope of work, when accepted by Siewert Equipment Company may be subject to adjustments to the delivery schedule, price or other terms affected by such change. Any delay in receipt of approval drawings or information from Buyer or Buyer's requested deferment of the delivery schedule may, at our opinion, be treated as a change. In addition, in the event of Buyer's deferment of the delivery schedule, the date of completion of the equipment shall be held at Buyer's risk and Siewert Equipment Company shall have the right to invoice the Buyer for the equipment purchase price and charge Buyer for all reasonable storage and insurance expenses.

4. **Prices, Payment**

Unless otherwise specified in our proposal, published or quoted prices are net FOB our factory and are valid for order placement within thirty (30) days of the proposal date. We reserve the right to withdraw our proposal at any time prior to our receipt of the Buyer's acceptance.
Our prices do not include customs duties or taxes such as sales, used, excise, retailer's occupation, or similar taxes. Buyer is responsible for the payment of all such applicable taxes, and will be charged for same, unless Buyer provides Siewert Equipment Company with the appropriate Tax Exemption Certificate.
Prices are exclusive of expenses related to special packing or procedures to cover unique circumstances of shipment or storage unless specifically noted.
Unless otherwise specified in our proposal, orders of $100,000 or more are subject to progress payment terms of 10% of buyer purchaser order, net 10 days, 20% on initial submittal drawings, net 10 days, 30% midway between release and firm ship date, net 10 days; and balance on shipment, net 30 days. Payment for all orders less than $100,000 are due net 100% within 30 days of the invoice date. A monthly service charge equal to 1 ½% or the maximum allowed by law, whichever is lower, will be charged for any payment not received within the specified time frame. Siewert Equipment Company may decline to furnish services or to complete and deliver goods except for cash, or to stop goods in transit whenever doubt as to Buyer's financial responsibility develops. Pro-rate payments shall become due with partial shipments. Any legal or collection expenses Siewert Equipment Company may incur due to Buyer's default in payment shall be borne by the Buyer.

5. **Cancellation Charges**

A minimum cancellation charge of 20% will apply if an order is canceled prior to shipment. Additional charges will be assess for engineering, non-stock materials, partial or completed manufacture of non-stock parts, and other related costs, plus open commitments not cancelable by their terms and a reasonable profit, not to exceed the purchase order value. A 100% cancellation charge will apply to all completed orders.

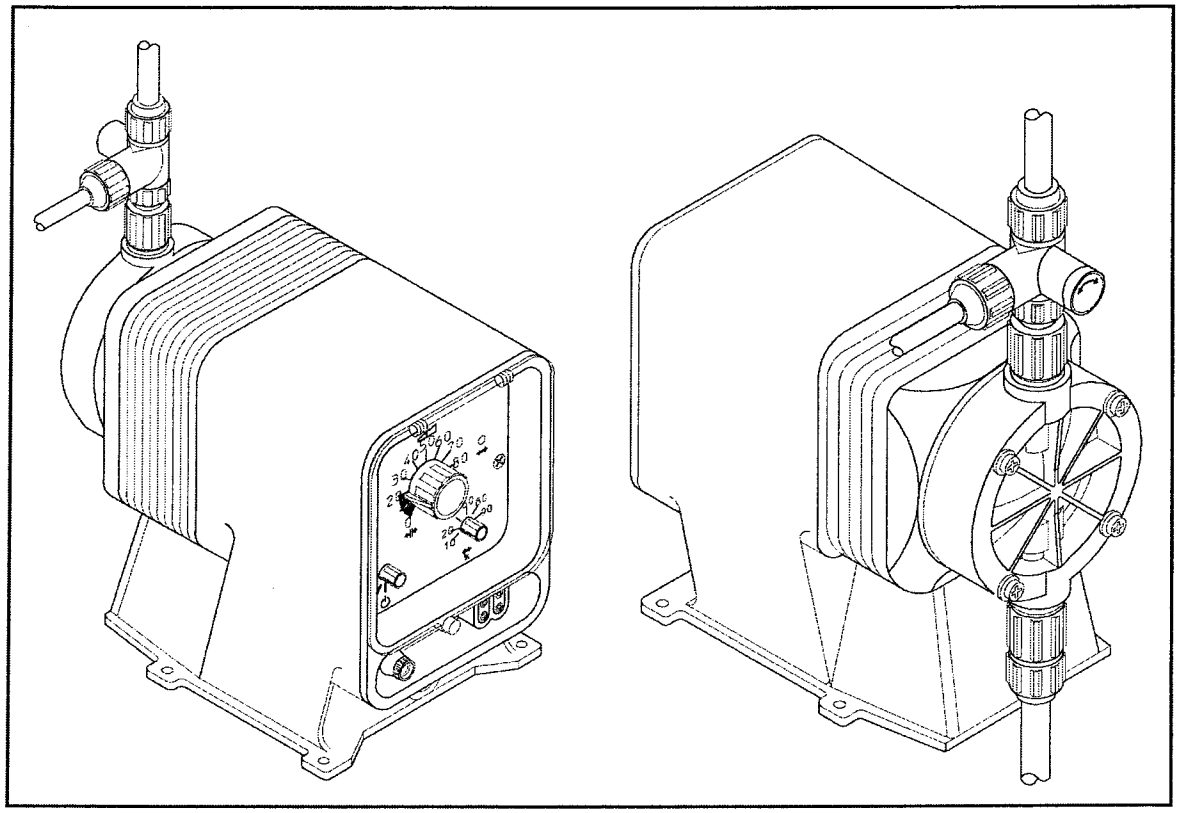
6. **Limitation of Liability**

Siewert Equipment Company's entire liability for claims, whether based on contract, warranty (except warranty of title), tort (including negligence), strict liability, or otherwise for any loss arising out of our performance of or failure to perform this contract shall (a) not exceed the contract price for equipment supplied hereunder which was the cause of such claim, (b) in no case extend to direct, indirect, special, incidental, or consequential damages, of any nature or kind, including, without limitation, lost profits, lost production, lost revenues, or lost business opportunities, and (c) terminate upon expiration of the warranty period. Buyer shall be solely responsible for any agreement that Buyer makes with its customer which is contrary to the foregoing limitation of liability and/or warranty/process guarantee.

Electronic Metering Pumps

Series C, C PLUS, A PLUS, E, E-DC and E PLUS

Installation
Operation
Maintenance
Instruction



READ ALL WARNINGS CAREFULLY BEFORE INSTALLING

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1.0 SAFETY INSTRUCTIONS

WARNING

When using chemical feed pumps, basic safety precautions should always be followed to reduce risk of fire, electric shock, and personal injury. Failure to follow these instructions could result in death or serious injury.

READ ALL INSTRUCTIONS

1.1 GENERAL SAFETY CONSIDERATIONS

- Always wear protective clothing including gloves and safety goggles when working on or near chemical metering pumps.
- Inspect tubing regularly when replenishing chemical solution for cracking or deterioration and replace as necessary. **(Always wear protective clothing and safety glasses when inspecting tubing.)**
- When pump is exposed to direct sunlight use U.V. resistant tubing.
- Follow directions and warnings provided with the chemicals from the chemical manufacturer. User is responsible for determining chemical compatibility with chemical feed pump.
- Secure chemicals and metering pumps, making them inaccessible to children and pets.
- Make sure the voltage on the chemical metering pump matches the voltage at the installation site.
- Do not cut plug or the ground lug off of the electrical cord – consult a licensed electrician for proper installation.
- Pump is **NOT** to be used to handle flammable liquids.

1.2 SAFETY OPERATING PROCEDURES

Each Electronic Metering Pump has been tested to meet prescribed specifications and safety standards.

Proper care in handling, installation and operation will help in ensuring a trouble free installation.

Please read all these cautionary notes prior to installation and start-up of your metering pump.

Important: Pump must be installed and used with supplied back pressure/injection valve. Failure to do so could result in excessive pump output.

- Handle the pump with care. Dropping or heavy impact causes not only external damage to the pump, but also to electrical parts inside.

- Install the pump in a place where the ambient temperature does not exceed 104°F (40°C). The pump is water resistant and dust proof by construction and can be use outdoors, however **do not operate the pump submerged.** To avoid high internal pump temperatures, do not operate in direct sunlight.

  ⚠CAUTION Solenoid housing, head and pump housing may be hot to touch 160°F(70°C).

- Install the pump in a place convenient for its future maintenance and inspection, and then secure it to prevent vibration.

- Protective caps must be removed prior to installing tubing onto valve assemblies. Use tubing of specified size. Connect the tubing to the suction side securely to prevent the entrance of outside air. Make sure that there is no liquid leakage on the discharge side.

- Be careful to check that the voltage of the installation matches voltage indicated on the pump data label. Most pump models are equipped with a three-prong plug. Always be sure the pump is grounded. To disconnect, do not pull wire but grip the plug with fingers and pull out. Do not use the receptacle in common with heavy electrical equipment, which generates surge voltage. It can cause failure of the electronic circuit inside the pump.

- Tampering with electrical devices can be potentially hazardous. Always place chemicals and pump installation well out of the reach of children.

- Never repair or move the metering pump while operating. Always disconnect electrical power. **For safety, always wear protective clothing (protective gloves and safety glasses) when working on or near chemical metering pumps.**

- An air bleed valve is available for most models with tubing connections. Air purges should be performed when the pump-chamber contains no fluid at the time of start-up. As a safety measure, connect the return tubing to the air bleed valve and bypass fluid back to storage tank or a suitable drain.

- For accurate volume output, the pump must be calibrated under typical operating conditions.

- Chemicals used may be dangerous and should be used carefully and according to warnings on the label. Follow the directions given with each type of chemical. Do not assume chemicals are the same because they look alike. Always store chemicals in a safe location away from children and others. We cannot be responsible for the misuse of chemicals being fed by the pump. Always have the material safety data sheet (MSDS) available for any fluid being pumped.

- All pumps are pretested with water before shipment. Remove head and dry thoroughly if you are pumping a material that will react with water, (i.e. sulfuric acid, polymers). Valve seats, ball checks, gaskets, and diaphragm should also be dried. Before placing pump into service, extreme care should be taken to follow this procedure.

- Valve cartridges are stamped to indicate fluid flow direction. Always install so that markings read from top to bottom, with the arrow pointing in the direction of flow.

- When metering hazardous material **DO NOT** use plastic tubing, strictly use proper rigid pipe. Consult supplier for special adapters or valve assemblies.

- **Pump is NOT to be used to handle or meter flammable liquids or materials.**

- Standard white discharge tubing is not recommended for installations exposed to direct sunlight. Consult supplier for special black tubing.

- Factory will not be held responsible for improper installation of pump, or plumbing. All cautions are to be read thoroughly prior to hookup and plumbing. For all installations a professional plumber should be consulted. Always adhere to local plumbing codes and requirements.

- When using pump with pressurized systems, make sure the pressure of the system does not exceed the maximum pressure rating on the pump data label. Be sure to depressurize system prior to hook up or disconnecting a metering pump.

- Electronic power modules are equipped with automatic reset thermal overload devices and may reset unexpectedly.

2.0 UNPACKING THE PUMP

Check all equipment for completeness against the order and for any evidence of shipping damage. Shortages or damages should be reported immediately to the carrier and to the seller of the equipment.

The carton should Contain:

- -Metering Pump
- -Clear Flexible Suction Tubing*
- -Stiff White Discharge Tubing*
- -Foot valve/Strainer Assembly
- -Backpressure Injection Valve Assembly
- -Manual
- -Bleed Valve Assembly*
- -Strainer Weight*

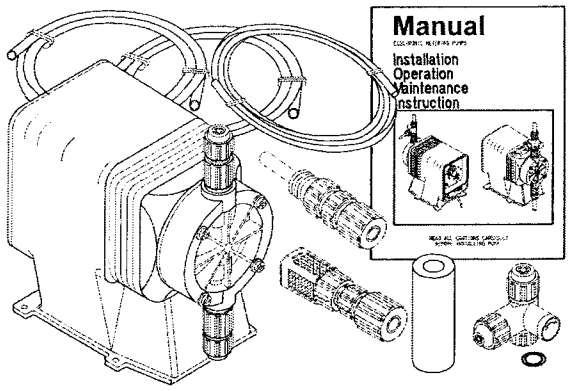


FIGURE 1

*Items may or may not be included depending on model.

Make sure that all items have been removed from the shipping carton before it is discarded.

3.0 INTRODUCTION

These installation, operation and maintenance instructions cover your electronic metering pump. Refer to the pump data label to determine the actual model.

3.1 PRINCIPLE OF OPERATION

Diaphragm metering pumps are used to dispense chemicals or fluids. This is achieved by an electromagnetic drive mechanism (solenoid), which is connected to a diaphragm. When the solenoid is pulsed by the control circuit it displaces the diaphragm, which, through the use of check valves, moves the fluid out the discharge under pressure. When the solenoid is de-energized it returns the diaphragm and pulls more fluid into the pump head and the cycle repeats.

The pump stroke rate is controlled by an internal circuit and is changed by turning the rate knob. The mechanical stroke length is controlled by the stroke length knob. Some models do not allow stroke rate control and do not have the stroke rate knob.

3.2 MATERIALS OF CONSTRUCTION

The wetted materials (those parts that contact the solution being pumped) available for construction are FPP (glass filled polypropylene), PVC, SAN, Hypalon, Viton, PTFE or FTF, 316 Stainless Steel, PVDF, Ceramic and Alloy C. These materials are very resistant to most chemicals. However, there are some chemicals, such as strong acids or organic solvents, which cause deterioration of some elastomer and plastic parts, such as the diaphragm, valve seats, or head.

3.2 MATERIALS OF CONSTRUCTION cont'd.

Consult a Chemical Resistance Guide or Supplier for information on chemical compatibility.

Various manufacturers of plastics, elastomers and pumping equipment publish guidelines that aid in the selection of wetted materials for pumping commercially available chemicals and chemical compounds. Two factors must always be considered when using an elastomer or plastic part to pump chemicals. They are:

- The temperature of service: Higher temperatures increase the effect of chemicals on wetted materials. The increase varies with the material and the chemical being used. A material quite stable at room temperature might be affected at higher temperatures.

- Material choice: Materials with similar properties may differ greatly from one another in performance when exposed to certain chemicals.

4.0 INSTALLATION

The metering pump should be located in an area that allows convenient connections to both the chemical storage tank and the point of injection. The pump is water resistant and dust proof by construction and can be used outdoors, however, **do not operate submerged.** Avoid continuous temperatures in excess of 104°F (40°C). To do otherwise could result in damage to the pump.

4.1 MOUNTING

Typical mounting arrangements are shown in Figures 3, 4, and 5.

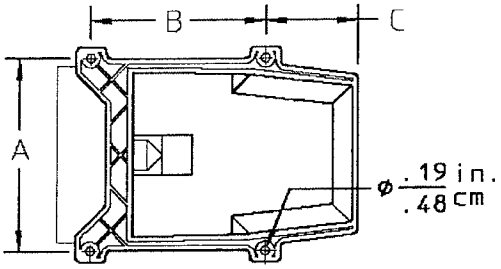
Important: Injection point must be higher than the top of the solution supply tank to prohibit gravity feeding, unless suitable backpressure is always present at the injection point. Installation of an antisiphon valve will prohibit gravity feeding.

- For wall or shelf mounting refer to Figure 3. Connect suction tubing to suction valve of chemical pump. Suction valve is the lower valve. Tubing should be long enough so that the foot valve/strainer assembly hangs about 1-2 inches (2-5 cm) above the bottom of chemical tank. To keep chemical from being contaminated, the tank should have a cover.

- Flooded suction mounting (installing the pump at the base of the chemical storage tank, Figure 4) is the most trouble free type of installation and is recommended for very low output requirements. Since the suction tubing is filled with chemical, priming is accomplished quickly and the chance of losing prime is reduced.

To mount pump, drill four holes of .25" (6 mm) diameter in the shelf as shown in the dimension drawing (Figure 2). Attach pump securely using four #10 (M5) bolts and nuts.

- The pump can be mounted on top of a solution tank as shown in Figure 5. Install chemical pump on the cover. Insert suction tubing through the center hole and cut tubing so foot valve/strainer hangs about 1 or 2 inches (2-5 cm) above the bottom of the tank. Mount the chemical pump rigidly by drilling four .25" (6 mm) holes and using four #10 (M5) screws and nuts.



MOUNTING HOLE DIMENSIONS

HOUSING SIZE	DIMENSIONS (in./cm.) A	B	C
HSG.#1	4.50/11.4	3.00/ 7.6	1.75/4.4
HSG.#2	4.81/12.2	4.38/11.1	2.19/5.6
HSG.#3	5.56/14.1	4.38/11.1	2.19/5.6

FIGURE 2

- USE AN ANTI-SIPHON VALVE IN THE DISCHARGE LINE whenever the fluid pressure in the discharge line is below atmospheric pressure. This can occur if the injection point is on the suction side of a water pump or against a "negative" head such as when feeding down into a well.

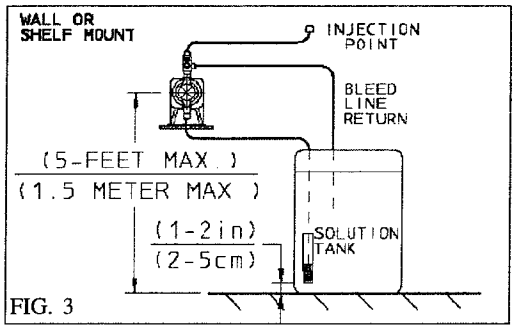


FIG. 3

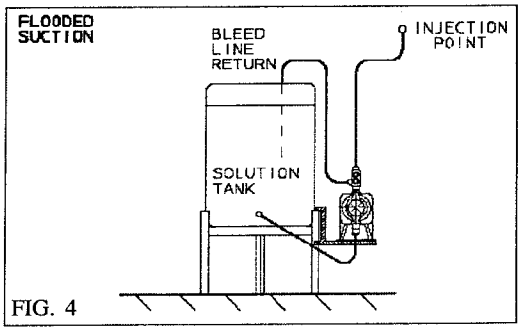


FIG. 4

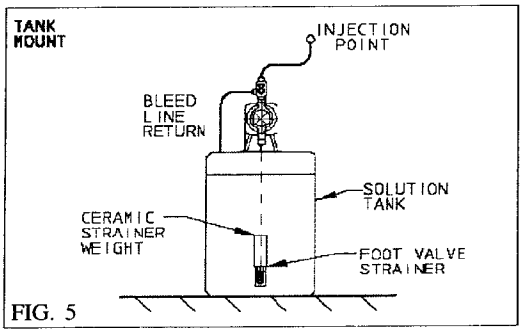


FIG. 5

4.2 PIPING

- Use provided tubing of specified size for connection. Connect tubing securely to prevent leakage of chemical and the entrance of air. Since plastic nuts are used for fittings, they should not be tightened excessively (i.e. hand tighten only). NPT suction and discharge valves must **NOT** be over tightened. Hold fitting in place while adding piping and fittings. NPT suction and discharge valves should only be tightened 25 to 35 in. lbs. (4.5-6.3 kg/cm).
- If the air bleed valve assembly is being used, a return line (tubing) should be securely connected and routed back to the storage tank. **To avoid possible injury from chemicals do not attempt to prime using a bleed valve without installing a return line.**
- When pump is shelf mounted or top mounted on tank, suction tubing should be kept as short as possible.
- To maintain metering performance, a backpressure/injection valve is provided. The spring in the standard injection valve typically adds 17 - 20 PSI (1.17 - 1.38 BAR) to the line pressure, with the exception of the H8 pump, which adds 8 - 10 PSI (.55 - .69 BAR). The injection valve must be installed in the discharge line. Best practice is to install the injection valve at the point of chemical injection.
- If the discharge tubing is going to be exposed to direct sunlight, black tubing should be used instead of the standard white translucent tubing supplied with each pump. To obtain, contact supplier.
- To prevent clogging or check valve malfunction always install a strainer assembly to the end of the suction tubing (Figure 5). This foot valve/strainer assembly should always be installed 1 to 2 inches (2-5 cm) above the bottom of the chemical tank. This will help prevent clogging the strainer with any solids that may settle on the tank bottom. The chemical tank and foot valve/strainer should be cleaned regularly, to ensure continuous trouble free operation. If the chemical being pumped regularly precipitates out of solution or does not dissolve easily or completely (e.g. calcium hydroxide), a mixer should be used in the chemical tank. These are readily available in many motor configurations and mounting. To obtain, contact supplier.
- A flooded suction (tank liquid level always at a higher elevation than the pump) is recommended when pumping solutions such as sodium hypochlorite (NaOCl), hydrogen peroxide (H_2O_2), etc., which are likely to produce air bubbles. Maintaining a low liquid temperature will also help eliminate this problem.
- Pipe corrosion can result if dilution at the injection point does not occur rapidly. This problem is easily prevented by observing this simple rule: install injection fitting so that the end is in the center of the flow stream of the line being treated. Trim injector tip as required. See Figure 6. Note: Extended injection assemblies are available for large water lines. Consult your supplier for more information.

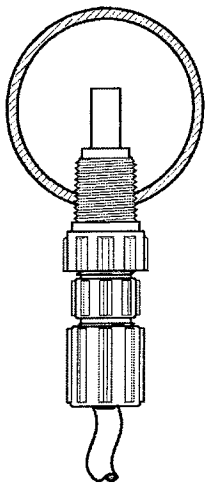


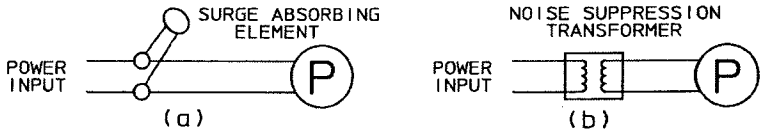
FIGURE 6

4.3 WIRING

- **⚠ WARNING—Risk of electrical shock. This pump is supplied with a three-prong grounding type power plug. To reduce risk of electric shock, connect only to a properly grounded, grounding type receptacle.**

- The metering pump should be wired to an electrical source, which conforms to those on the pump data label. Applying higher voltage than the pump is rated for will damage the internal circuit.

- In the electronic circuit of the control unit, measures for surge voltage are made by means of surge absorbing elements and high voltage semiconductors. Nevertheless, excessive surge voltage may cause failure in some areas. Therefore, the receptacle should not be used in common with heavy electrical equipment, which generates high voltage. If this is unavoidable however, measures should be taken by (a) the installation of a surge-absorbing element (varistor of min. surge resistance 2000A) to the power supply connection of the pump, or (b) the installation of a noise suppression transformer.



- Signal input to the external pulse signal input terminals ([EXTERNAL], [STOP]) must be a no-voltage signal from relay-contacts etc. and the input of other signals is prohibited. (In the case of relay contacts, 100 ohms or below when ON and 1-meg ohms or above when OFF). The pulse duration of the input signal must be 10 milliseconds or over and the frequency of the input signal must not exceed 125 times per minute. Signal cord is provided with the pump.

4.4 WELL PUMP SYSTEM INSTALLATION

Ensure that the metering pump voltage matches the voltage of the well pump. Typical well pump electrical circuits are shown in Figure 8. All electric wiring should be installed in accordance to local codes by a licensed electrician.

Install the backpressure/injection (Figure 7) on the discharge side of the metering pump into a tee which is installed into the water line going to the pressure tank.

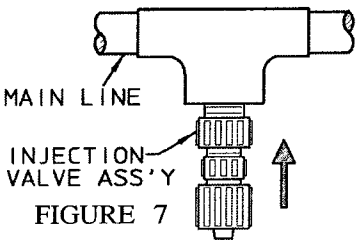


FIGURE 7

Pumps carrying the or "ETL Sanitation" (tested to NSF Standard-50) marks are listed for swimming pools, spas and hot tubs, and when proper materials are selected, are capable of handling but not linited to the following chemical solutions:

12% ALUMINUM SULPHATE,	5% SODIUM CARBONATE,
2% CALCIUM HYPOCHLORITE,	10% SODIUM HYDROXIDE,
12.5% SODIUM HYPOCHLORITE,	10% HYDROCHLORIC ACID

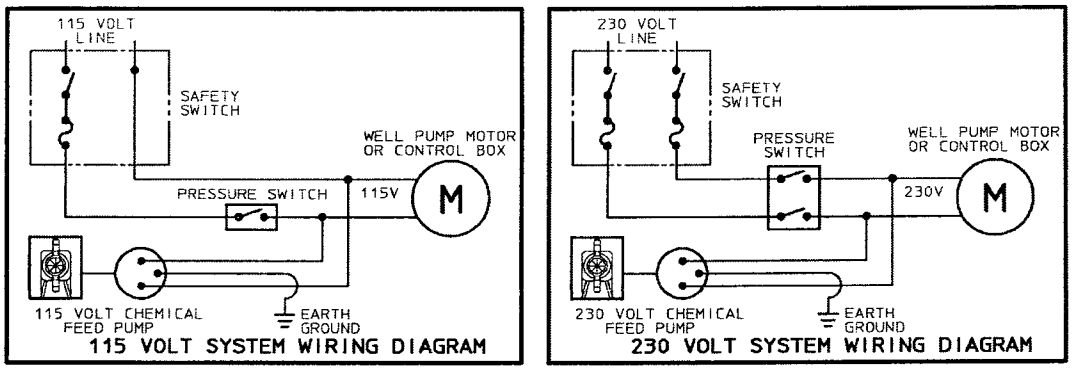


FIGURE 8

5.0 START UP AND OPERATION

5.1 POWER

All metering pumps are available in 115 and 230 volts at 50/60 Hertz, single phase. In addition, certain models are available in 12 volt DC. Prior to start-up always check to insure that the pump voltage/frequency/phase matches that of the power supply.

⚠CAUTION If pump is fitted with a PVC pump head (7th position of model number is "V" or "W". Note: PVC is gray, not black), uniformly hand tighten the four head screws before use, 18-22 in. lbs. (3.2 -3.9 kg/cm). Periodically tighten after installation.

5.2 PRIMING

⚠CAUTION **When working on or around a chemical metering pump installation, protective clothing and gloves and safety glasses should be worn at all times.**

All pumps are tested with water. If the chemical to be pumped reacts when mixed with water (e.g. sulfuric acid, polymer) the pump head should be removed and dried thoroughly along with the diaphragm and valve seats.

- Turn on the power to the pump. The green LED (not available on all models) will light up and flash off each time the pump strokes.

- Adjust the stroke rate knob to the 100% setting mark (for more information see Section 5.3, Capacity Control).

- Adjust the stroke length knob to the 100% setting mark if applicable (for more information see Section 5.3, Capacity Controls).

- If the discharge line is connected directly to a pressurized system it should be temporarily bypassed during priming of the pump. A bleed valve will simplify this operation by allowing easy bypass of the discharge fluid. Air must be purged from the pumphead before the pump will operate against pressure. (See Figure 9)

  Air Bleed Operation:
  - While pump is running, turn adjustment knob counterclockwise.
  - Run with valve open until a solid stream of fluid comes out of the bypass tubing with no air bubbles.
  - Close air bleed valve by turning adjustment screw clockwise.

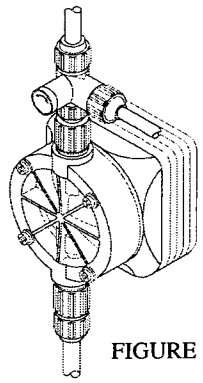


FIGURE 9

- Chemical should reach the pump head after a few minutes of operation. If not, remove the discharge fitting and moisten the discharge valve area (ball check and valve seats) with a few drops of ***chemical being fed to the metering pump.*** For safety, always use protective clothing and gloves, wear safety glasses and use a proper container to hold the chemical.

- If the pump continues not to prime, refer to Section 7.0, Troubleshooting, of these instructions.

- Once the pump has been primed and is pumping the chemical through the head, turn off the power, reconnect the discharge tubing (if it had been removed) and immediately clean any spilled chemical that is on the pump housing or head.

- Turn the power on once more and adjust the pump flow to the desired rate (see Section 5.3.3, Controlling Procedure).

- Always check the calibration of the pump after start-up. It's best to calibrate the pump under your typical use conditions.

5.3 CAPACITY CONTROL

Capacity can be controlled by means of the stroke length adjusting knob and/or stroke rate adjusting knob (except model C pumps). Control knobs provide coarse adjustment; use a calibration column for accurate calibration. Contact your pump supplier for proper calibration equipment.

5.3.1 Stroke Frequency Adjustment (E, E-DC, E Plus, A Plus & C Plus only)

- Stroke frequency can be controlled from 10 to 100% (12 to 125 strokes per minute) by means of the electronic circuit.
- Stroke frequency can be set by means of the stroke rate adjusting knob even while the pump is in operation. (See Figure 10)

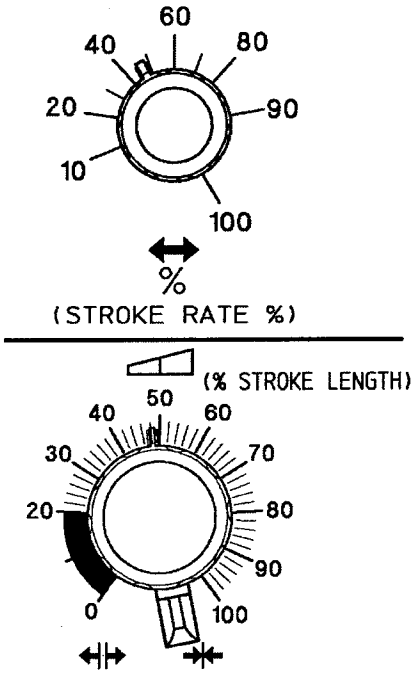


FIGURE 10

5.3.2 Stroke Length Adjustment

- Stroke length can be controlled within 0 to 100% of the diaphragm displacement. It should be controlled within 20 to 100% for practical use.
- Stroke length can be set by means of the stroke length adjusting knob while the pump is in operation. **Do not turn the knob while the pump is stopped.**

5.3.3 Controlling Procedure

Proper set points for stoke length and stroke frequency should be determined after consideration of the pump and characteristics of the fluid. The following procedure is recommended from the viewpoint of pump performance. **Note: The closer the stroke length is to 100%, the better the pump performance will be.**

- Set the stroke length to 100% then adjust the stroke frequency for coarse capacity control.
- Measure the capacity.
- When the measured capacity is less than the required value, increase the stroke frequency and measure the capacity again.
- Then, adjust the stroke length for fine capacity control.
- Finally, measure the capacity and make sure that the required value is obtained.

5.3.3 Controlling Procedure cont'd.

Example	Selected Model	=	LPD4
	Set Stroke Length	=	100%
	Set Stroke Rate	=	100%
	Output Capacity (Rated Pressure)	=	21 gallons per day (GPD)*
	Desired Flow	=	15 GPD
	Adjust Stroke Rate to 80%		
	Output Capacity	=	0.80 x 21 = 16.8 GPD*
	Stroke Length Setting	=	15/16.8 x 100 = 90% approximate

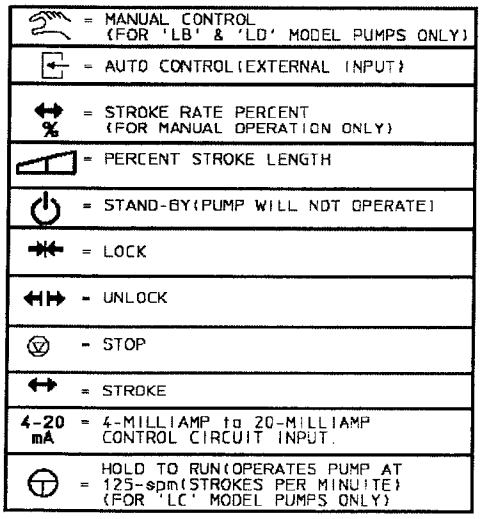
Thus to obtain the desired flow, stroke length is set at 90% and stroke rate is set at 80% i.e. output capacity = 0.90 x 0.80 x 21 = 15.12 GPD*

***IMPORTANT!**

Check these values by measurement. Output capacity is higher when feeding against less than rated pressure

5.4 CONTROL PANEL SYMBOLS

The pumps come with universally accepted symbols, the following is provided for your convenience.



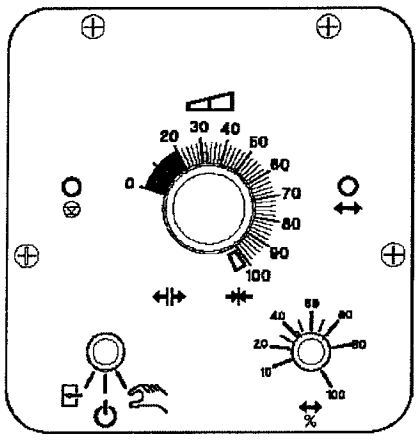


FIGURE 11

5.5 OPERATION BY EXTERNAL INPUT SIGNALS (Options):

The pump can be controlled by three types of input signals. All are fully isolated from AC input and from earth ground. The input socket connections are located at the bottom of the control panel face and the signal cords are provided with the pump. Remove rubber plugs to access plug sockets.

5.5.1 STOP FUNCTION (E Plus, A Plus, C Plus & C only)

Operation of the pump can be stopped by an external signal input. When the external signal is input to the terminal marked ⓥ which is provided at the bottom of the control panel, the ⓥ lamp (red) lights up and operation of the pump is stopped. The stop function overrides both manual settings and external input.

⚠CAUTION Operation of more than one pump from the same contact closure will damage the pump circuits. When such operation is required, the pump circuits must be electrically isolated from one another by means of a multicontact control relay or similar means.

- The input signal must be in the form of closure of a mechanical relay or other mechanical switching device, or solid-state relay or other solid-state switching device. Voltage signals are prohibited. The switching resistance of either mechanical or solid-state devices must be 100 ohms or below when ON and 1 megohm or above when OFF. If any type of solid-state device is employed, it must be installed with the proper polarity, if required for the device; and leakage current must not exceed 200 microamperes to prevent false triggering in the OFF state.

The stop function is commonly used in conjunction with a tank float switch. The float switch contacts are normally open but when the tank level falls past a certain point the contacts close and the pump stops.

5.5.2 EXTERNAL PACING FUNCTION (E Plus, A Plus, C Plus & C only)

The pump's stroke rate can be controlled by an external signal input. When the input signal line is connected and the EXTERNAL /OFF /MANUAL switch is in the external position and a contact signal is input to the terminal marked ⊡, the pump makes one discharge stroke.

⚠CAUTION Operation of more than one pump from the same contact closure will damage the pump circuits. When such operation is required, the pump circuits must be electrically isolated from one another by means of a multicontact control relay or similar means.

- When the "ON" signal pulse is input, the pump operates one stroke and the fluid is discharged. In addition, the pump can be operated continuously at a rate of up to 125 strokes/min. by repeated input of "ON" and "OFF" signals.
- After receiving an input signal, the pump generates the necessary power pulse to actuate the solenoid. The external signal input is debounced by the pump circuit. The pump will not stroke in response to a spurious or erratic input signal that follows at a rate greater than 125 spm. If the external signal rate exceeds 125 spm, the pump will stroke at half the external signal rate to prevent overdosing and to protect the pump from overheating.
- The input signal must be in the form of closure of a mechanical relay, other mechanical switching device, or of a solid-state switching device. Voltage signals are prohibited. The switching resistance of either mechanical or solid-state devices must be 100 ohms or below when ON and 1 megohm or above when OFF. If any type of solid-state device is employed, it must be installed with proper polarity, if required for the device; and leakage current must not exceed 200 microamperes to prevent false triggering in the OFF state.
- Cycle rate of the input signal should not exceed 125 times per minute.
- Typical wiring is shown at right for use with switch closure flowmeters. (Figure 12)
- 10 millisecond contact time required for each "ON" input signal.

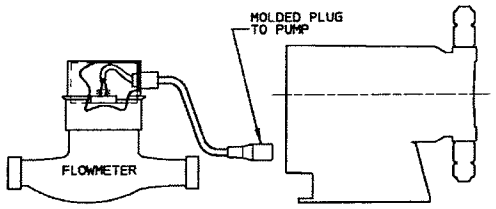


FIGURE 12

5.5.3 4-20mA DC INPUT FUNCTION (E Plus only)

The pump's stroke rate can also be controlled by a 4-20 mA DC signal to the terminal marked [4-20 mA].

- For the 4-20 mA input to have any effect on the pump output rate, the AUTO/OFF/MANUAL switch must be in the AUTO position.
- The 4-20 mA input signal affects the pump's outputs as per the graph below:

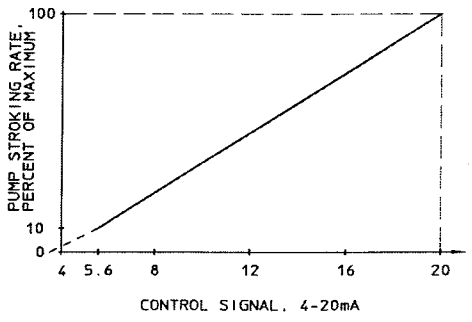


FIGURE 13

5.5.3 4-20mA DC INPUT FUNCTION cont'd.

- The signal cord polarity is:
  Black = Common
  White = Positive
  Wrong polarity can result in excess flow.

- Signal input impedance is 124 ohms.

- Remove cap from pump socket labeled 4-20 mA, use polarized cord supplied with pump to connect control circuit to pump. Plug cord into pump socket labeled 4-20 mA.

6.0 MAINTENANCE

⚠CAUTION **Before performing any maintenance or repairs on chemical metering pumps, be sure to disconnect all electrical connections, insure that all pressure valves are shut off and pressure in the pump and lines has been bled off.**

Always wear protective clothing, gloves and safety glasses when performing any maintenance or repairs on chemical metering pumps.

6.1 ROUTINE MAINTENANCE

- Routinely check the physical operating condition of the pump. Look for the presence of any abnormal noise, excessive vibration, low flow and pressure output or high temperatures [when running constantly at maximum stroke rate, the pump housing temperature can be up to 160°F (70°C)].

- For optimum performance, cartridge valves should be changed every 6-12 months. Depending on the application, more frequent changes may be required. Actual operating experience is the best guide in this situation.

- Repeated short-term deterioration of valve seats and balls usually indicates a need to review the suitability of wetted materials selected for the application. Contact the supplier for guidance.

- Check for leaks around fitting or as a result of deteriorating tubing e.g. when standard white translucent discharge tubing is exposed to direct sunlight. Take appropriate action to correct leak by tightening fittings or replacing components.

- Keep the pump free of dirt and debris as this provides insulation and can lead to excessive pump temperatures.

- If the pump has been out of service for a month or longer, clear the pump head valve assemblies by pumping fresh water for approximately 30 minutes. If the pump does not operate normally after this "purging run", replace cartridge valve assemblies.

6.2 DISASSEMBLY AND ASSEMBLY DIAPHRAGM REMOVAL

Flush pump head and valve assemblies out by running pump with water or other suitable neutralizing solution. Wash outside of pump if chemical has dripped on pump. Set stroke length knob of pump to 0% and unplug pump.

Depressurize the system and disconnect tubing or piping from the pump. Remove the four pump head screws and then remove the pump head assembly.

Remove the diaphragm by grasping it at the outer edge and turning it counter clockwise until it unscrews from the electronic power module (EPM). Don't lose the deflector plate or diaphragm shims which are behind the diaphragm, they are needed for re-assembly. Note shim quantity may be from 0 to 2.

Inspect diaphragm, if it is intended to be used again look for indications of the PTFE face being overstretched, (localized white areas) or the elastomer on the back of the diaphragm being worn. Excessive amounts of either condition require diaphragm replacement.

6.3 DIAPHRAGM REPLACEMENT

- When replacing the diaphragm, it is always a good idea to replace the valve cartridges and other worn parts. A kit is available from your supplier with all parts necessary to completely rebuild your pump's wet end. All your supplier needs to know is the "KOPkit No." on your pump's data label to supply this kit.

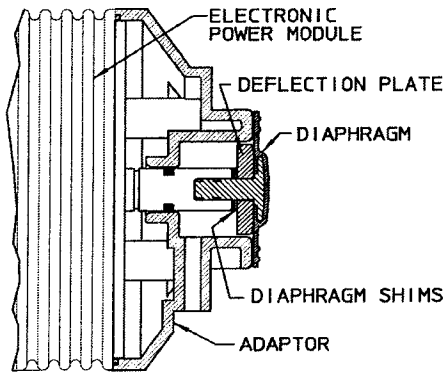


FIGURE 14

- Set pump stroke length at 50% and unplug the pump.

- If you kept the shims from the original diaphragm or know the original quantity you can avoid the next step for shimming the diaphragm.

6.3 DIAPHRAGM REPLACEMENT cont'd.

- Apply grease to areas of the diaphragm that contact the deflection plate.

- Slide the diaphragm deflection plate onto the back of the diaphragm stud, radius side towards the diaphragm. Next slide two shims onto the diaphragm threaded stud and screw the diaphragm into the EPM unit. Refer to Figure 14. Turn diaphragm clockwise until deflection plate and shims are tight against solenoid shaft and the diaphragm stops turning. If there is a gap between the adaptor and diaphragm, repeat the procedure removing one shim each time until the diaphragm just touches the adaptor or is slightly recessed.

- If not already done, adjust stroke length to 50%. Place the pump head onto the adaptor with valve flow arrows pointing up and install and tighten pump head screws. Tighten screws until pump head pulls up against adaptor.

  NOTE: Adjust stroke length only when pump is running!

- Adjust stroke length back to 100% for easier priming and place pump back into service.

6.4 VALVE REPLACEMENT

- Flush pump to clean any chemical from pump head.

- Unplug pump, release system pressure, and disconnect tubing or piping.

- Unscrew valve cartridges and discard. Also remove o-rings down inside the pump head.

- Install new valve cartridges with stamped letters reading from top to bottom, and the arrow pointing in the direction of flow. Hand tighten only, do not use wrenches or pliers. This is especially important when the pump head is made of SAN material.

- Reconnect tubing or piping and reinstall the pump.

- Check for leaks around newly installed fittings.

7.0 TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
FAILURE TO PUMP	1. Leak in suction side of pump.	1. Examine suction tubing. If worn at the end , cut approximately one inch (2.5 cm) off and reconnect.
	2. Valve seats not sealing.	2. Clean valve seats if dirty or replace with alternate material if deterioration is noted.
	3. Low setting on pump.	3. When pumping against pressure, the dial should be set above 20% capacity for a reliable feed rate.
	4. Low suction level.	4. Solution must be above foot valve strainer.
	5. Diaphragm ruptured.	5. Replace diaphragm as shown in 6.0 "Maintenance Section". Check for pressure above rated maximum at the injection point. NOTE: Chemical incompatibility with diaphragm material can cause diaphragm rupture and leakage around the pump head.
	6. Pump head cracked or broken.	6. Replace pump head as shown in 6.0 "Maintenance Section". Make sure fittings are hand tight only. Using pliers and wrench can crack pump head. Also, chemical incompatibility can cause cracking and subsequent leakage.
	7. Pump head contains air or chlorine gas.	7. Bleed pump head, see 5.0 "Start-up and Operation".
	8. Breakdown or disconnection of wiring.	8. Connect wiring properly. Check fuse or circuit breaker.
	9. Voltage drop.	9. Take measures after investigation of cause.
	10. Malfunction of electronic control board.	10. Contact supplier.

7.0 TROUBLESHOOTING cont'd.

PROBLEM	PROBABLE CAUSE	REMEDY
LOSS OF CHEMICAL RESIDUAL	1. Pump setting too low.	1. Adjust to higher setting (pump must be operting to adjust stroke length knob).
	2. Scale at injection point.	2. Clean injection parts with 8% muriatic acid or undiluted vinegar. (Also, see Maintenance Section).
	3. Solution container allowed to run dry	3. Refill the tank with solution and prime. (See Start-up and Operation Section).
TOO MUCH CHEMICAL	1. Pump setting too high.	1. Lower pump setting (pump must be operting to adjust stroke length knob).
	2. Chemical in solution tank too rich.	2. Dilute chemical solution. NOTE: For chemical that reacts with water, it may be necessary to purchase a more dilute grade of chemical direct from chemical supplier.
	3. Siphoning of chemical into well or main line.	3. Test for suction or vacuum at the injection point. If suction exists, install an anti-siphon valve.
LEAKAGE AT TUBING CONNECTIONS	1. Worn tube ends.	1. Cut off end of tubing (about 1 in/2.5 cm) and then reconnect as before.
	2. Chemical attack.	2. Consult your seller for alternate material.
LEAKAGE AT FITTING	1. Loose fittings.	1. Tighten hand tight. Replace gasket if hand tightening does not stop leakage.
	2. Broken or twisted gasket.	2. Check gaskets and replace if broken or damaged.
	3. Chemical attack.	3. Consult your pump supplier for alternate material.

8.0 POLICIES AND PROCEDURES

8.1 MANUFACTURERS PRODUCT WARRANTY

The manufacturer warrants its equipment of its manufacture to be free of defects in material or workmanship Liability under this policy extends for eighteen (18) months from the date of purchase or one (1) year from date of installation or whichever comes first. The manufacturer's liability is limited to repair or replacement of any device or part, which is returned, prepaid, to the factory and which is proven defective upon examination. This warranty does not include installation or repair cost and in no event shall the manufacturer's liability exceed its selling price of such part.

The manufacturer disclaims all liability for damage to its products through improper installation, maintenance, use or attempts to operate such products beyond their functional capacity, intentionally or otherwise, or any unauthorized repair. Replaceable elastomeric parts are expendable and are not covered by any warranty either expressed or implied. The manufacturer is not responsible for consequential or other damages, injuries or expense incurred through use of its products.

The above warranty is in lieu of any other warranty, either expressed or implied. The manufacturer makes no warranty of fitness or merchantability. No agent of ours is authorized to make any warranty other than the above.

For warranty and service matters within the European Union, contact the seller first or:

Fagotpad 2
3822 CN Amersfoort
The Netherlands

8.2 EUROPEAN TECHNICAL FILE LOCATION

P.O. Box 91
Washington
NE37 1YH
United Kingdom

8.3 RETURNS

The Customer Service Department will issue a Return Authorization (RA) number for all returns. The following information will be required:

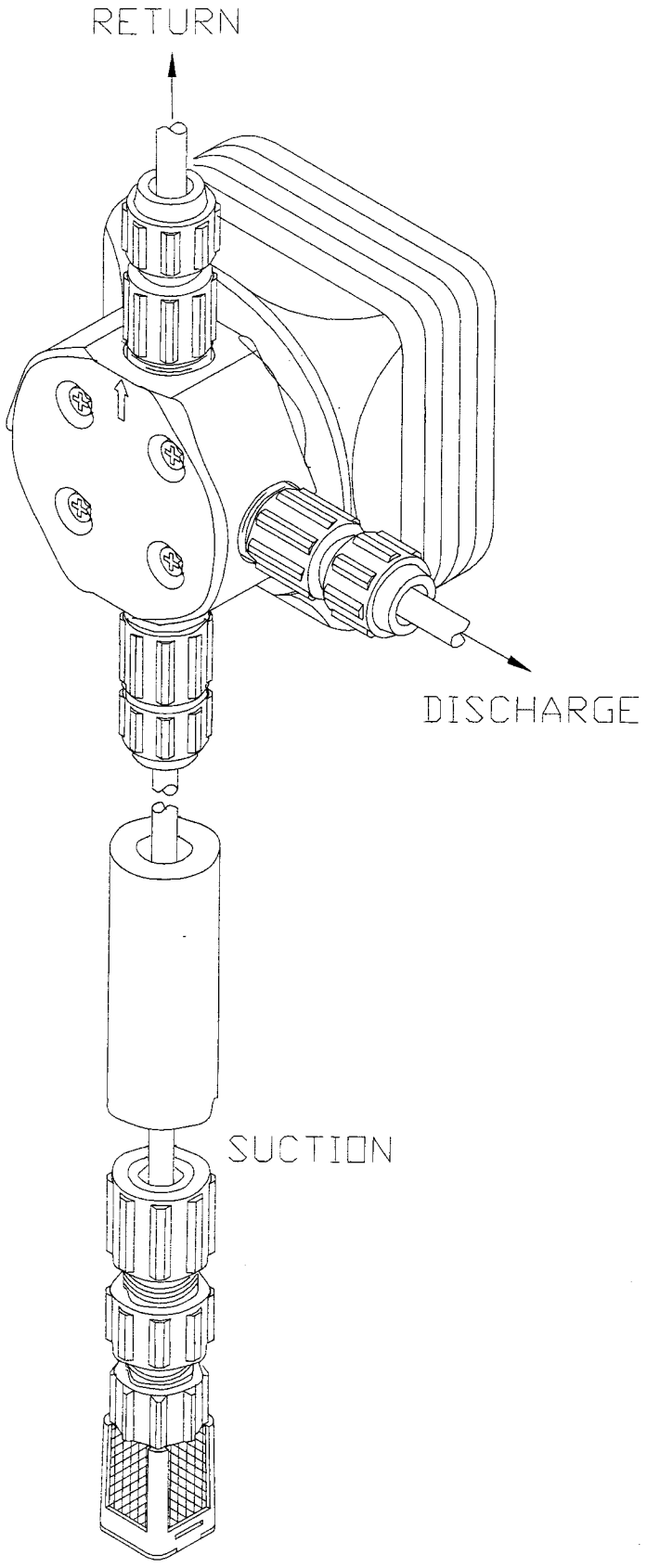
1. Billing and a ship-to address.
2. Model and serial number.
3. Contact name and phone number.
4. Reason for return.
5. Purchase order (where applicable).
6. RA number on outside of the carton.

All material must be returned freight prepaid. All merchandise must be properly packaged and free of any corrosive, toxic or otherwise hazardous chemical. All items returned must reference Return Authorization.

8.4 CREDITS

No equipment will be accepted beyond six months after date of shipment from the factory. Only unused and undamaged equipment will be accepted for return to stock. All credits are based on acceptance of materials as new and unused by our inspection personnel. A restocking fee will apply. All equipment returned for credit must have a RA number and be returned freight prepaid.

DEGASSING HEAD ASSEMBLY



DEGASSING HEAD PUMP
INSTALLATION INSTRUCTIONS

⚠CAUTION Before performing any maintenance or repairs on chemical metering pumps, be sure to disconnect all electrical connections and insure that all pressure valves are shut off and pressure in the pump and lines has been bled off.

Always wear protective clothing, gloves and safety glasses when performing any maintenance or repairs on chemical metering pumps.

FOR INSTALLING THE DESASSING HEAD: FOLLOW STEPS #6 thru #8.
OR
FOR CONVERTING FROM STANDARD HEAD TO A DEGASSING HEAD: FOLLOW STEPS #1 thru #8.

1. Disconnect the suction, discharge and return tubing (if applicable) from the pump head.

2. Remove the four head bolts from the pump head. Remove the head assembly from the pump.

3. Place the degassing pump head assembly on the pump with the arrows on the head and the suction and return valves pointing in the upward direction.

4. Reinstall the four head bolts. Tighten bolts evenly (crisscross pattern) to 18-22 inch pounds.

5. Cut approximately one inch off of the ends of the discharge and return tubing (if applicable). Cut the tubing squarely to ensure a good seal when reconnecting the tubing to the degassing head.

6. Using the clear .38" O.D. PVC suction tubing connect one end to the suction valve on the bottom of the pump head assembly.

   a) For a flooded suction installation, connect the other end of the suction tubing to the tank bulkhead fitting

   b) For non-flooded suction installation, slide the suction tubing through the strainer weight. Install the foot valve and strainer to the end of the tubing and place the suction line in the solution tank. For best performance, ensure that the suction line hangs vertically and is as short as possible with the strainer placed near the bottom of the solution tank. The strainer should be above any sediment which may form on the bottom of the solution tank.

7. Connect the discharge tubing to the discharge valve on the side of the pump head.

8. Connect the clear .38" O.D. PVC return tubing to the de-gas valve directly on the top of the pump head assembly. Secure the other end of the return tubing to the tank above the solution level. The return line must be maintained above the solution level in the tank for proper operation.
   Note: When using a degassing head, a bleed valve is not required, and should not be installed.

PRIMING

1. Turn on power to the pump.

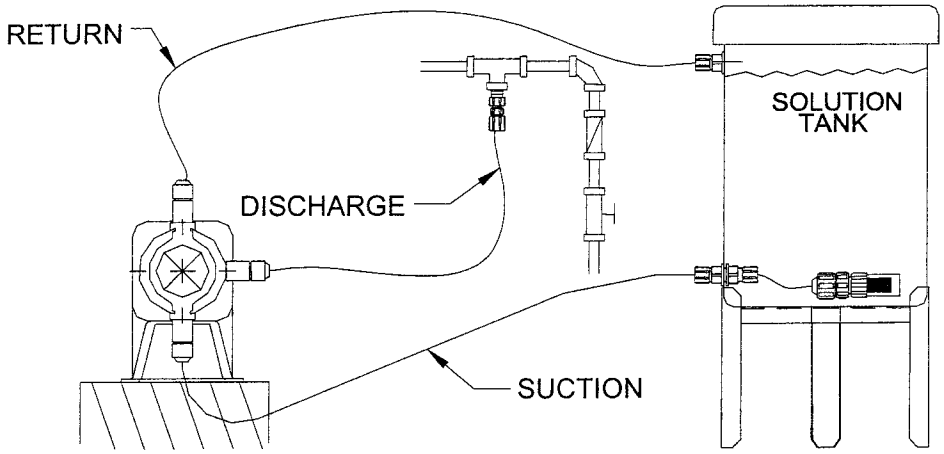
2. Adjust the stroke length knob to the 100% mark.

3. Adjust the stroke rate knob(if applicable) to the 100% mark.

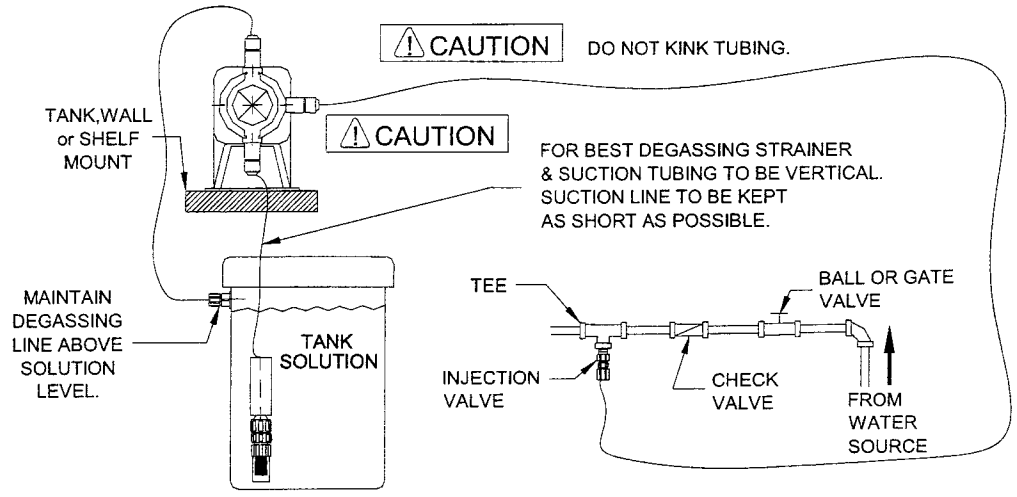
4. At this point the pump will automatically purge the air from the pump head via the degass valve. Once the fluid starts pumping out the discharge line, readjust the pump flow to the desired rate.

Please note that the de-gas valve was designed to return a small amount of fluid back to the tank when the pump is operating. Fluid being returned via the return line to the tank is part of the proper operation of the degassing head. Pump output will be reduced, verify your output and adjust as necessary.

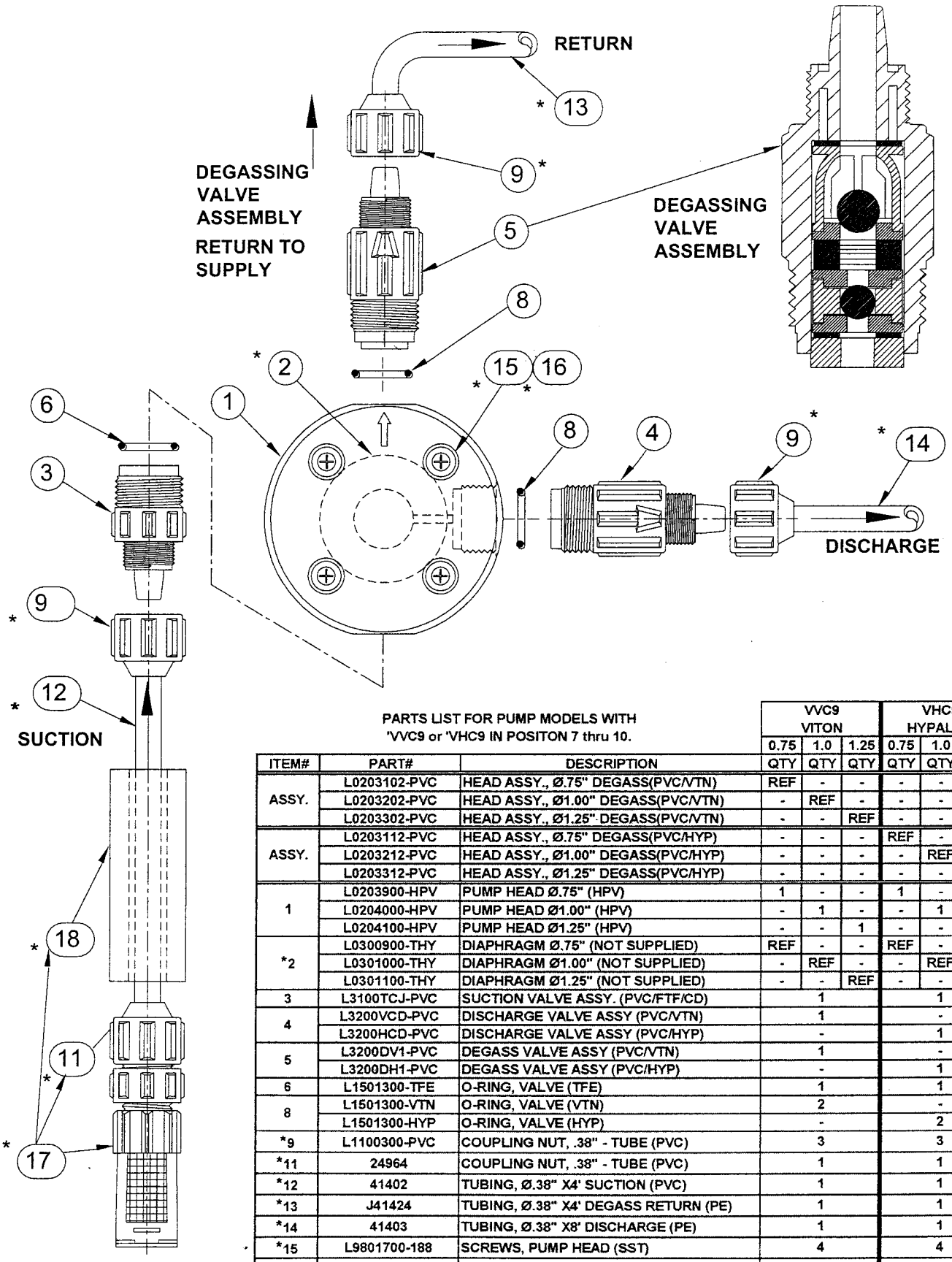
DEGASSING HEAD, FLOODED SUCTION INSTALLATION (NOT RECOMMENDED)



DEGASSING HEAD, NON-FLOODED INSTALLATION



STANDARD DEGASSING HEAD CONNECTIONS



PARTS LIST FOR PUMP MODELS WITH 'VVC9 or 'VHC9 IN POSITON 7 thru 10.

			VVC9 VITON			VHC9 HYPALON		
			0.75	1.0	1.25	0.75	1.0	1.25
ITEM#	PART#	DESCRIPTION	QTY	QTY	QTY	QTY	QTY	QTY
ASSY.	L0203102-PVC	HEAD ASSY., Ø.75" DEGASS(PVC/VTN)	REF	-	-	-	-	-
	L0203202-PVC	HEAD ASSY., Ø1.00" DEGASS(PVC/VTN)	-	REF	-	-	-	-
	L0203302-PVC	HEAD ASSY., Ø1.25" DEGASS(PVC/VTN)	-	-	REF	-	-	-
ASSY.	L0203112-PVC	HEAD ASSY., Ø.75" DEGASS(PVC/HYP)	-	-	-	REF	-	-
	L0203212-PVC	HEAD ASSY., Ø1.00" DEGASS(PVC/HYP)	-	-	-	-	REF	-
	L0203312-PVC	HEAD ASSY., Ø1.25" DEGASS(PVC/HYP)	-	-	-	-	-	REF
1	L0203900-HPV	PUMP HEAD Ø.75" (HPV)	1	-	-	1	-	-
	L0204000-HPV	PUMP HEAD Ø1.00" (HPV)	-	1	-	-	1	-
	L0204100-HPV	PUMP HEAD Ø1.25" (HPV)	-	-	1	-	-	1
*2	L0300900-THY	DIAPHRAGM Ø.75" (NOT SUPPLIED)	REF	-	-	REF	-	-
	L0301000-THY	DIAPHRAGM Ø1.00" (NOT SUPPLIED)	-	REF	-	-	REF	-
	L0301100-THY	DIAPHRAGM Ø1.25" (NOT SUPPLIED)	-	-	REF	-	-	REF
3	L3100TCJ-PVC	SUCTION VALVE ASSY. (PVC/FTF/CD)	1			1		
4	L3200VCD-PVC	DISCHARGE VALVE ASSY (PVC/VTN)	1			-		
	L3200HCD-PVC	DISCHARGE VALVE ASSY (PVC/HYP)	-			1		
5	L3200DV1-PVC	DEGASS VALVE ASSY (PVC/VTN)	1			-		
	L3200DH1-PVC	DEGASS VALVE ASSY (PVC/HYP)	-			1		
6	L1501300-TFE	O-RING, VALVE (TFE)	1			1		
8	L1501300-VTN	O-RING, VALVE (VTN)	2			-		
	L1501300-HYP	O-RING, VALVE (HYP)	-			2		
*9	L1100300-PVC	COUPLING NUT, .38" - TUBE (PVC)	3			3		
*11	24964	COUPLING NUT, .38" - TUBE (PVC)	1			1		
*12	41402	TUBING, Ø.38" X4' SUCTION (PVC)	1			1		
*13	J41424	TUBING, Ø.38" X4' DEGASS RETURN (PE)	1			1		
*14	41403	TUBING, Ø.38" X8' DISCHARGE (PE)	1			1		
*15	L9801700-188	SCREWS, PUMP HEAD (SST)	4			4		
*16	L9801300-188	WASHERS, PUMP HEAD (SST)	4			4		
*17	J60718	STNR ASY,PVD/VTN/C .38T	1			-		
	J60717	STNR ASY,PVD/HYP/C .38T	-			1		
*18	L9906700-000	WEIGHT, CERAMIC TUBE	REF			REF		

* NOT SUPPLIED WITH DEGASSING HEAD ASSEMBLY

Signet 8550-1 Flow Transmitter

English

For 1" PVC Sch 80 Tee
& Model 2536 Flow Sensor (Part 3850 P05)
K Factor (Gallons) = 352.44

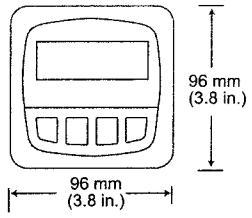
3-8550.090-1 Rev M 01/09 English

WARNING!
- Remove power to unit before wiring input and output connections.
- Follow instructions carefully to avoid personal injury.

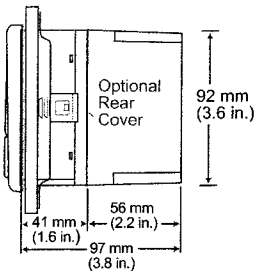
Contents

1. Specifications

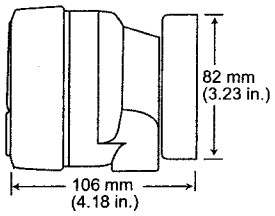
Dimensions



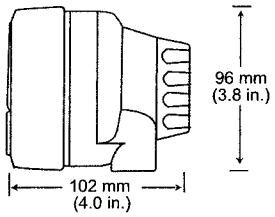
FRONT VIEW
Field Mount & Panel Mount



SIDE VIEW
Panel Mount



SIDE VIEW
Field Mount w/ 8050 Universal base



SIDE VIEW
Field Mount w/ 8051 Integral kit

General

Compatibility: Signet Flow Sensors (w/freq out)

Enclosure:
- Rating: NEMA 4X/IP65 front
- Case: PBT
- Panel case gasket: Neoprene
- Window: Polyurethane coated polycarbonate
- Keypad: Sealed 4-key silicone rubber
- Weight: Approx. 325g (12 oz.)

Display:
- Alphanumeric 2 x 16 LCD
- Update rate: 1 second
- Contrast: User selected, 5 levels
- Display accuracy: ±0.5% of reading @ 25°C
- Thermal sensitivity shift: ±0.005% of reading per °C

Electrical

- Power: 12 to 24 VDC ±10%, regulated
  61 mA max current

Sensor Input:
- Range: 0.5 to 1500 Hz
- Sensor power: 2-wire: 1.5 mA @ 5 VDC ± 1%
  3 or 4 wire: 20 mA @ 5 VDC ± 1%
  Optically isolated from current loop
- Short circuit protected

Current output:
- 4 to 20 mA, isolated, fully adjustable and reversible
- Max loop impedance: 50 Ω max. @ 12 V
  325 Ω max. @ 18 V
  600 Ω max. @ 24 V
- Update rate: 100 ms
- Accuracy: ±0.03 mA

Open-collector output, optically isolated:
- 50 mA max. sink, 30 VDC maximum pull-up voltage.
- Programmable for:
  - High or Low setpoint with adjustable hysteresis
  - Pulse operation (max rate: 300 pulses/min).

Environmental

- Operating temperature: -10 to 70°C (14 to 158°F)
- Storage temperature: -15 to 80°C (5 to 176°F)
- Relative humidity: 0 to 95%, non-condensing
- Maximum altitude: 2000 m (6562 ft)
- Insulation category: II
- Pollution degree: 2

Standards and Approvals

- CE, UL, CUL listed
- Immunity & Emissions: EN61326
- Manufactured under ISO 9001 and ISO 14001
- Chinese RoHS

For detailed information go to www.gfsignet.com

2. Installation

ProcessPro transmitters are available in two styles: panel mount and field mount. The panel mount is supplied with the necessary hardware to install the transmitter. This manual includes complete panel mounting instructions.
Field mounting requires one of two separate mounting kits. The 3-8051 integral kit joins the sensor and instrument together into a single package. The 3-8050 Universal kit enables the transmitter to be installed virtually anywhere.
Detailed instructions for integral mounting or other field installation options are included with the 3-8051 Integral kit or the 3-8050 Universal kit.

.1 Panel Installation

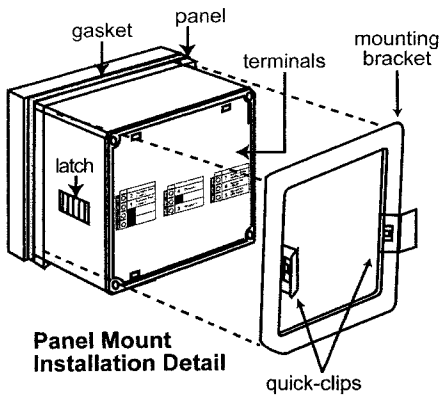
. The panel mount transmitter is designed for installation using a 1/4 DIN Punch. For manual panel cutout, an adhesive template is provided as an installation guide. Recommended clearance on all sides between instruments is 1 inch.

. Place gasket on instrument, and install in panel.

. Slide mounting bracket over back of instrument until quick-clips snap into latches on side of instrument.

. To remove, secure instrument temporarily with tape from front or grip from rear of instrument. DO NOT RELEASE.

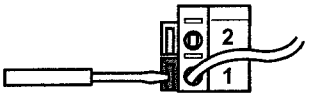
'ress quick-clips outward and remove.



Panel Mount Installation Detail

). Electrical Connections

Caution: Failure to fully open terminal jaws before removing wire may permanently damage instrument.



Viring Procedure

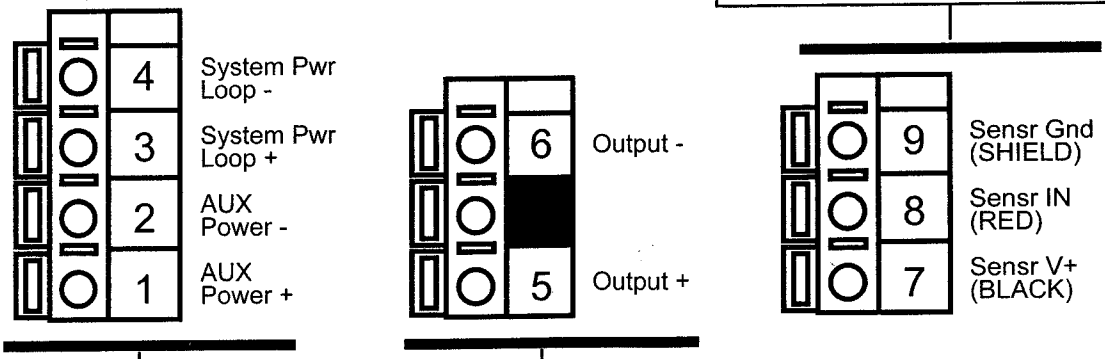
1. Remove 0.5 - 0.625 in. (13-16 mm) of insulation from wire end.
2. Press the orange terminal lever downward with a small screwdriver to open terminal jaws.
3. Insert exposed (non-insulated) wire end in terminal hole until it bottoms out.
4. Release orange terminal lever to secure wire in place. Gently pull on each wire to ensure a good connection.

Viring Removal Procedure

1. Press the orange terminal lever downward with a small screwdriver to open terminal jaws.
2. When fully open, remove wire from terminal.

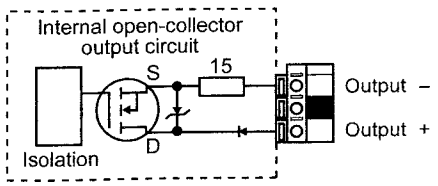
Terminals 3 and 4: Loop Power
12-24 VDC ±10% system power and current loop output.
Max. loop impedance:
50 Ω max. @ 12 V
325 Ω max. @ 18 V
600 Ω max. @ 24 V

Terminals 7-9: Flow sensor input



Terminals 1 and 2: AUXILIARY power
Used only if the flow sensor requires more than 1.5 mA current. For Signet sensors this is limited to the following products:

- 2000
- 2507
- 2551, 2552
- Open Collector Input > 1.5 mA

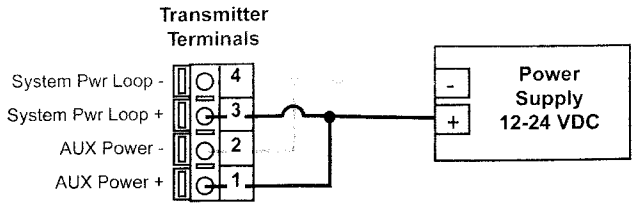


Terminals 5 and 6: Open-collector Output
A transistor output, programmable (see CALIBRATE menu) as:

- High or Low setpoint with adjustable hysteresis
- Volumetric pulse
- Frequency based on flow rate
- May be disabled (Off) if not used.

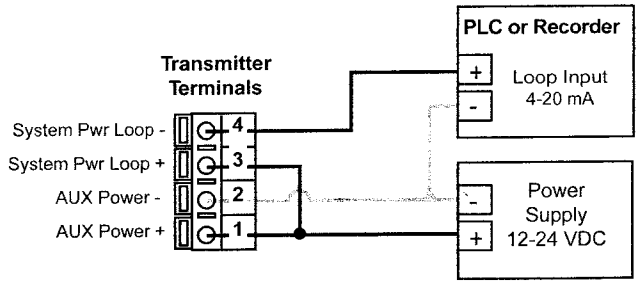
3.1 System Power/Loop Connections

Stand-alone application, no current loop used



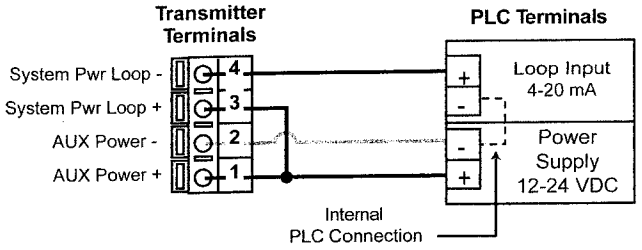
* See AUX POWER Note

Connection to a PLC/Recorder, separate supply



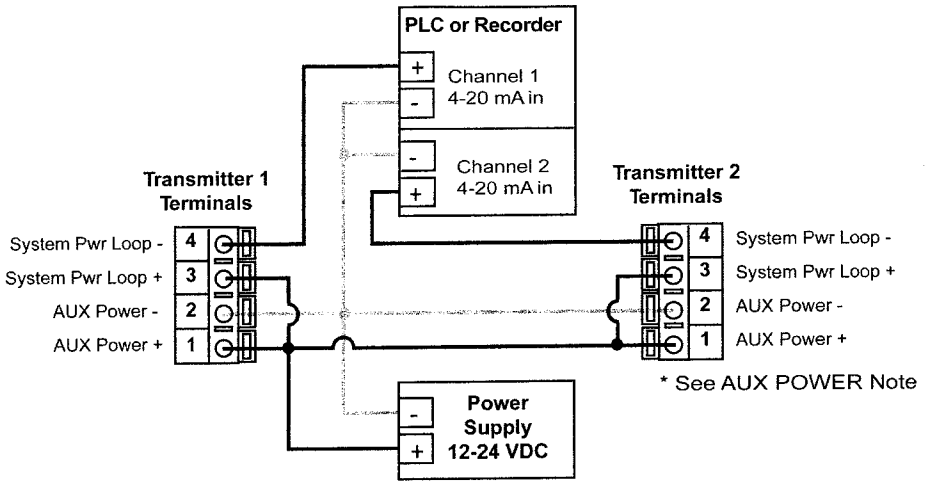
* See AUX POWER Note

Connection to a PLC with built-in power supply



* See AUX POWER Note

Example: Two transmitters connected to PLC/Recorder with separate power supply



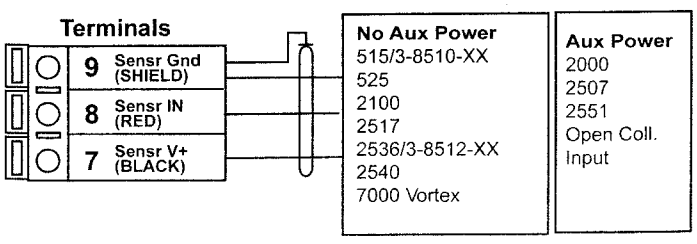
* See AUX POWER Note

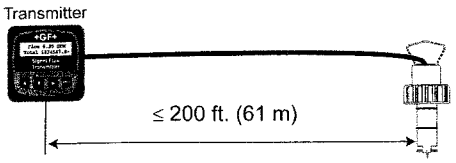
Auxiliary Power note:
AUXILIARY power is used only if the flow sensor requires more than 1.5 mA current.
For Signet sensors this is limited to the following products: 2000, 2507, 2551, open collector input signals.

3.2 Sensor Input Connections

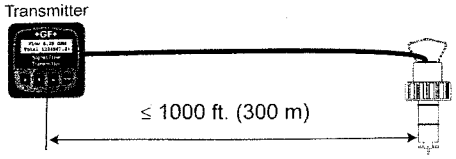
Wiring Tips:

- Do not route sensor cable in conduit containing AC power wiring. Electrical noise may interfere with sensor signal.
- Routing sensor cable in grounded metal conduit will help prevent electrical noise and mechanical damage.
- Seal cable entry points to prevent moisture damage.
- Only one wire should be inserted into a terminal. Splice double wires outside the terminal.





Maximum cable length is 200 ft. for 515/8510-XX, 525 , 2517 and any sinusoidal flow signal.



Maximum cable length is 1000 ft. for 2536/8512-XX, 2537, 2540, 7000, and any open collector flow signal.

3.3 Open Collector Output

The Open collector output can be used as a switch that responds when the flow rate moves above or below a setpoint, or it can be used to generate a pulse that is relative to the flow volume or to the flow rate.

- **Low**

Output triggers when the flow rate is less than the setpoint. The output will relax when the flow rate moves above the setpoint plus the hysteresis value.

- **High**

Output triggers when the flow rate is greater than the setpoint. The output will relax when the flow rate drops below the setpoint plus the hysteresis value.

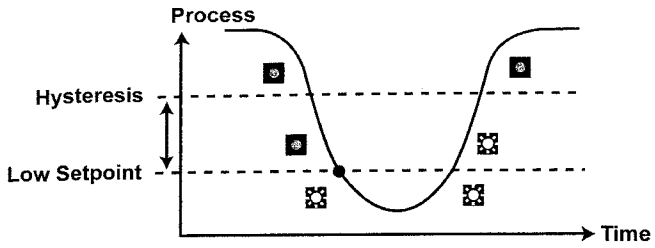
- **Frequency**

Output is a pulse stream that is based on the input flow sensor signal. Set for 1 (input frequency = output frequency). Set for even numbers (2, 4, 6, 8 . . . . 254 maximum) to scale output frequency.

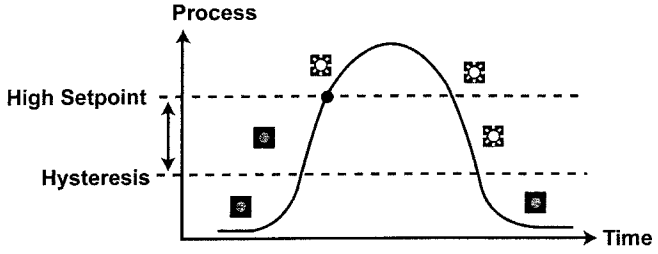
- **Pulse**

Output is a pulse based on the volume of fluid that passes the sensor. Set any value from 0.0001 to 99999.

The output may be disabled (Off) if not used.

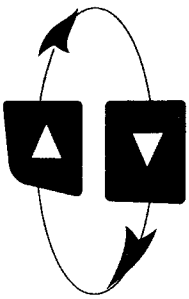


Output energized
Output relaxed



VIEW menu

- During normal operation, the ProcessPro displays the VIEW menu.
- When using the CALIBRATE or OPTIONS menus, the ProcessPro will return to the VIEW menu if no activity occurs for 10 minutes.
- To select the item you want displayed, press the UP or DOWN arrow keys. The items will scroll in a continuous loop. Changing the display selection does not interrupt system operations.
- No key code is necessary to change display selection.
- Output settings cannot be edited from the VIEW menu.



View Menu

Display	Description
0.0 GPM Total: 12345678 >	Monitor the flow rate and the resettable totalizer. Press the RIGHT ARROW key to reset the totalizer. If the Reset is locked, you will need to enter the Key Code first. Lock or Unlock the totalizer in the OPTIONS menu. This is the permanent View display.

All of the displays below are temporary. After ten minutes the display will return to the permanent display.

Perm: 12345678 Gallons	Monitor the Permanent Totalizer value.
Loop Output: 12.00 mA	Monitor the 4-20 mA Loop output.
Last CAL: 02-10-09	Monitor date for scheduled maintenance or date of last calibration. (See description in Calibrate Menu.)

ProcessPro Editing Procedure:

Step 1. Press and hold ENTER key:
- 2 seconds to select the CALIBRATE menu
- 5 seconds to select the OPTIONS menu.

Step 2. The Key Code is UP-UP-UP-DOWN keys in sequence.
- After entering the Key Code, the display will show the first item in the selected menu.

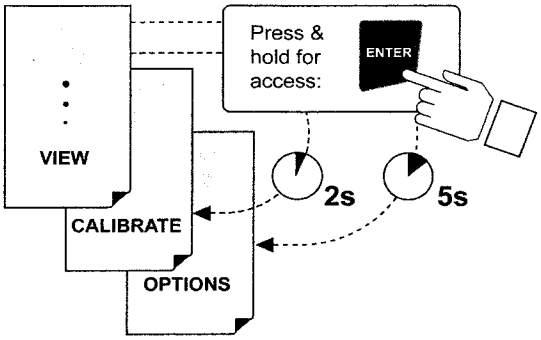
Step 3. Scroll menu with UP or DOWN arrow keys.

Step 4. Press RIGHT ARROW key to select menu item to be edited.
- The first display element will begin flashing.

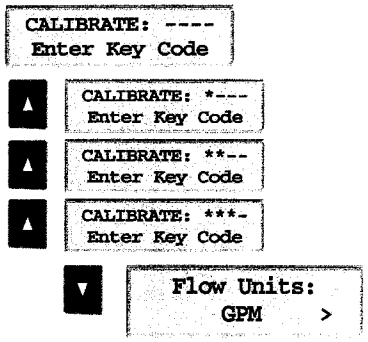
Step 5. Press UP or DOWN keys to edit the flashing element.
- RIGHT ARROW key advances the flashing element.

Step 6. Press ENTER key to save the new setting and return to Step 3.

Notes on Step 1:
- The View Menu is normally displayed.
- The CALIBRATE and OPTIONS menus require a KEY CODE.

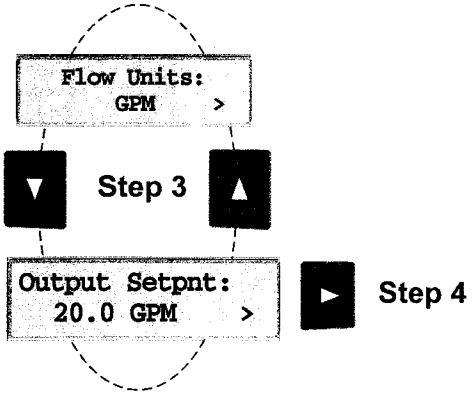


Notes on Step 2:
If no key is pressed for 5 minutes while display is showing "Enter Key Code", the display will return to the VIEW menu.

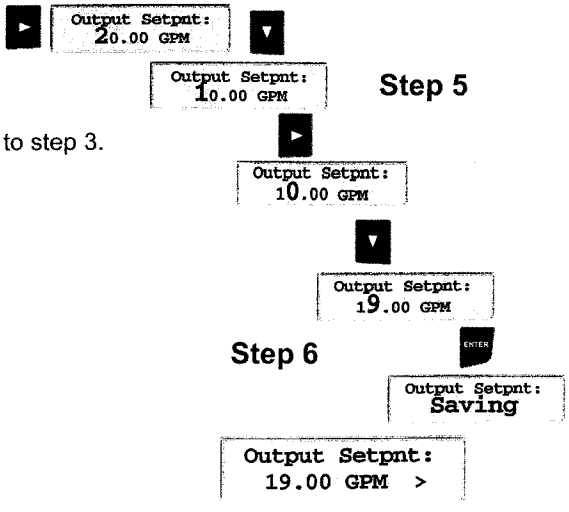


Notes on Steps 3 and 4:
- Refer to pages 6 and 7 for complete listing of menu items and their use.
- From the Step 3 display, pressing the UP and DOWN keys simultaneously will return the display to the VIEW menu.
- If no key is pressed for 10 minutes, display will also return to the VIEW menu.

Step 3: Finished Editing?
Press the UP and DOWN keys simultaneously after saving the last setting to return to normal operation.



Notes on Steps 5 and 6:
- All output functions remain active during editing.
- Only the flashing element can be edited.
- RIGHT ARROW key advances the flashing element in a continuous loop.
- Edited value is effective immediately after pressing ENTER key.
- If no key is pressed for 10 minutes unit will restore the last saved value and return to step 3.
- Step 6 (pressing ENTER key) always returns you to Step 3.
- Repeat steps 3-6 until all editing is completed.



Step 5: Made an Error?

Press the UP and DOWN keys simultaneously while any element is flashing. This will recall the last saved value of the item being edited and return you to Step 3.

Calibrate Menu

Display (Factory settings shown)	Description
Flow Units: GPM >	The first three characters set the Flow Rate units of measure. They have no effect on calculations. They may be any alpha or numeric character, upper or lower case. The last character sets the Flow rate Timebase. Select S (seconds), M (minutes), H (hours) or D (days).
Flow K-Factor: 60 >	This setting tells the transmitter how to convert the input frequency from the flow sensor into a flow rate. The K-factor is unique to the sensor model and to the pipe size and schedule. Refer to data in the sensor manual for the correct value. Limits: 0.0001 to 99999. (The K-factor cannot be set to 0)
Total Units: Gallons >	This setting identifies the Totalizer units. It has no effect on any calculation. It serves as a label only. Each character can be any alpha or numeric selection, upper or lower case.
Total K-Factor 60 >	This setting tells the transmitter how to convert the input frequency from the flow sensor into a volumetric total. It also is used as the basis for the Open Collector pulse mode. The setting is usually the same as the Flow K-factor, or different by x10 or x100. Limits: 0.0001 to 99999. (The K-factor cannot be set to 0)
Loop Range: GPM 000.00 → 100.00 >	Select the minimum and maximum values for the 4-20 mA Current loop output. The 8550 will allow any values from 0.0000 to 99999.
Output Mode: Low >	Select the desired mode of operation for the Open Collector output. Options available are High, Low, volumetric Pulse, or Frequency. The signal may be disabled (Off) if not used.
Output Setpnt: 10.0 GPM >	In Low or High Mode, the Open Collector output will be activated when the Flow rate reaches this value. Be sure to modify this setting if you change the Flow Units.
Output Hys: 5.0 GPM >	The Open Collector output will be deactivated at Setpoint ± Hysteresis, depending on High or Low Setpoint selection. (See details on page 4.)
Output Volume: 100.00 Gallons >	In Pulse mode, the Open collector output will generate one pulse when this volume of flow passes the sensor. The measurement is based on the Total K-factor. The 8550 will allow any value from 0.0001 to 99999.
Output PlsWdth: 0.1 Seconds >	In Pulse mode, this setting defines the duration of the Open Collector output pulse. The 8550 allows any value from 0.1 seconds to 999.9 seconds.
Output Freq.: Divide by 1 >	In Frequency mode, the Open Collector output will simulate the sensor frequency, divided by this setting. Set for 1 (input frequency = output frequency). Set for even numbers (2, 4, 6, 8 . . . 254 maximum) to scale output frequency.
Last CAL: 2-10-09	Use this "note pad" to record important dates, such as annual recertification or scheduled maintenance.

Options Menu

Display (Factory settings shown)	Description
Contrast: 3 >	Adjust the LCD contrast for best viewing. A setting of 1 is lower contrast, 5 is higher. Select lower contrast if the display is in warmer ambient surroundings.
Flow Decimal *****. >	Set the decimal to the best resolution for your application. The display will automatically scale up to this restriction. Select *****., ****.*, ***.**, **.*** or *.****
Total Decimal ******.** >	Set the totalizer decimal to the best resolution for your application. Select ********., *******.*, or ******.**
Averaging: Off >	OFF provides the quickest output response to changes in flow. Longer averaging period produces more stable display and output response. Select OFF, 8 s, 20 s, 50 s or 120 s.
Sensitivity 0 >	Sensitivity works in conjunction with Averaging to balance response time with signal stability. Selections are 0 to 9. Select 0 (zero) for the minimum sensitivity, or 9 for the maximum sensitivity. The function is described below.
Total Reset: Lock Off >	Lock Off : No key code required to reset the resettable totalizer. Lock On : The Key Code must be entered to reset the resettable totalizer.
Loop Adjust: 4.00 mA > Loop Adjust: 20.00 mA >	Adjust the minimum and maximum current output. The display value represents the precise current output. Adjustment limits: • 3.80 mA < 4.00 mA > 5.00 mA • 19.00 mA < 20.00 mA > 21.00 mA Use this setting to match the system output to any external device.
Output Active: Low >	Active HIGH: This setting is used to turn a device (pump, valve) ON at the setpoint. Active LOW: This setting is used to turn a device OFF at the setpoint.
Test Loop: >	Press UP or DOWN keys to manually order any output current value from 3.6 mA to 21.00 mA to test current loop output.
Test Output: >	Press UP or DOWN keys to manually toggle the state of open collector output.

▪ ▪ ▪ ▪ No AVERAGING, no SENSITIVITY

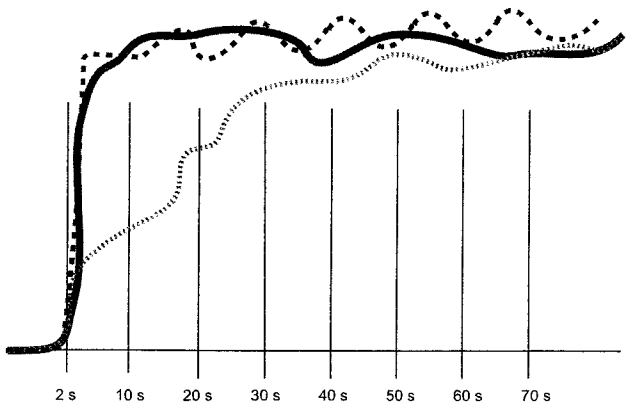
With AVERAGING set to 0 (zero) and with SENSITIVITY set to OFF (0 seconds), the 8550 responds to every unstable shift in the flow. The dashed red line represents the actual output of the flow sensor in unstable flow conditions.

AVERAGING only

With AVERAGING set to 50 seconds and SENSITIVITY still set to zero the flow rate is stabilized, but a sharp change in flow rate is not represented for 50 seconds or longer. (dotted green line).

AVERAGING and SENSITIVITY

With AVERAGING at 50 seconds and SENSITIVITY set to 4 OR 5, the flow rate is stabilized, while the sudden shift in flow is reflected very quickly. (Solid blue line)



NOTE: The SENSITIVITY function is ineffective if the AVERAGING function is set to zero (seconds).

Troubleshooting

Display Condition	Possible Causes	Suggested Solutions
"- - - - -"	Flow rate exceeds display capability	• Increase Flow units time base • Move flow decimal one place to the right
"Pulse Overrun"	• Open Collector pulse rate exceeds maximum of 300 pulses per minute. • Pulse width set too wide.	• Increase Pulse volume setting • Decrease pulse width setting. • Reduce system flow rate
"Value must be more than 0"	K-factors cannot be set to 0.	Enter K-factor from 0.0001 to 99999
Open Collector is always activated	• Hysteresis value too large • Defective transmitter	• Change the hysteresis value • Replace transmitter

Ordering Information

Mfr. Part No.	Code	Description
3-8550-1	159 000 047	Flow transmitter, Field mount
3-8550-1P	159 000 048	Flow transmitter, Panel mount
3-8550-2	159 000 049	Flow transmitter, Field mount with relays
3-8550-2P	159 000 050	Flow transmitter, Panel mount with relays
3-8550-3	159 000 051	Flow transmitter, Field mount with dual input/output
3-8550-3P	159 000 052	Flow transmitter, Panel mount with dual input/output

Accessories

Mfr. Part No.	Code	Description
3-8050	159 000 184	Universal mounting kit
3-8051	159 000 187	Flow Integral Mnt NPT
3-8050.395	159 000 186	Splashproof rear cover
3-8050.396	159 000 617	RC Filter kit (for relay use)
3-0000.596	159 000 641	Heavy duty wall mount bracket
3-5000.598	198 840 225	Surface Mount Bracket
3-5000.399	198 840 224	5 x 5 inch adapter plate for Signet retrofit
3-9000.392	159 000 368	Liquid tight connector kit for rear cover (includes 3 connectors)
3-9000.392-1	159 000 839	Liquid tight connector kit, NPT (1 piece)
3-9000.392-2	159 000 841	Liquid tight connector kit, PG13.5 (1 piece)
7300-7524	159 000 687	24 VDC Power Supply 7.5 W, 300mA
7300-1524	159 000 688	24 VDC Power Supply 15 W, 600mA
7300-3024	159 000 689	24 VDC Power Supply 30 W, 1.3 A
7300-5024	159 000 690	24 VDC Power Supply 50 W, 2.1 A
7300-1024	159 000 691	24 VDC Power Supply 100 W, 4.2 A

+GF+

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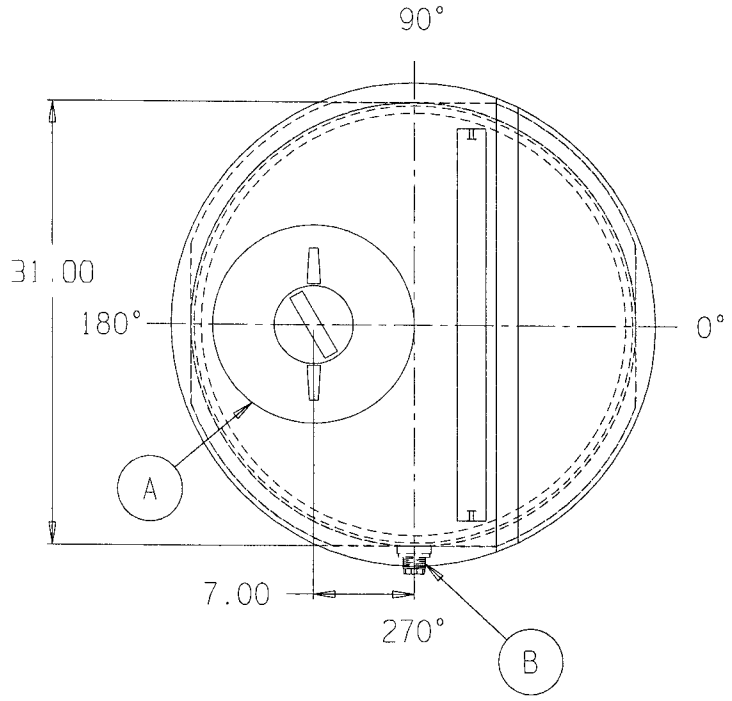
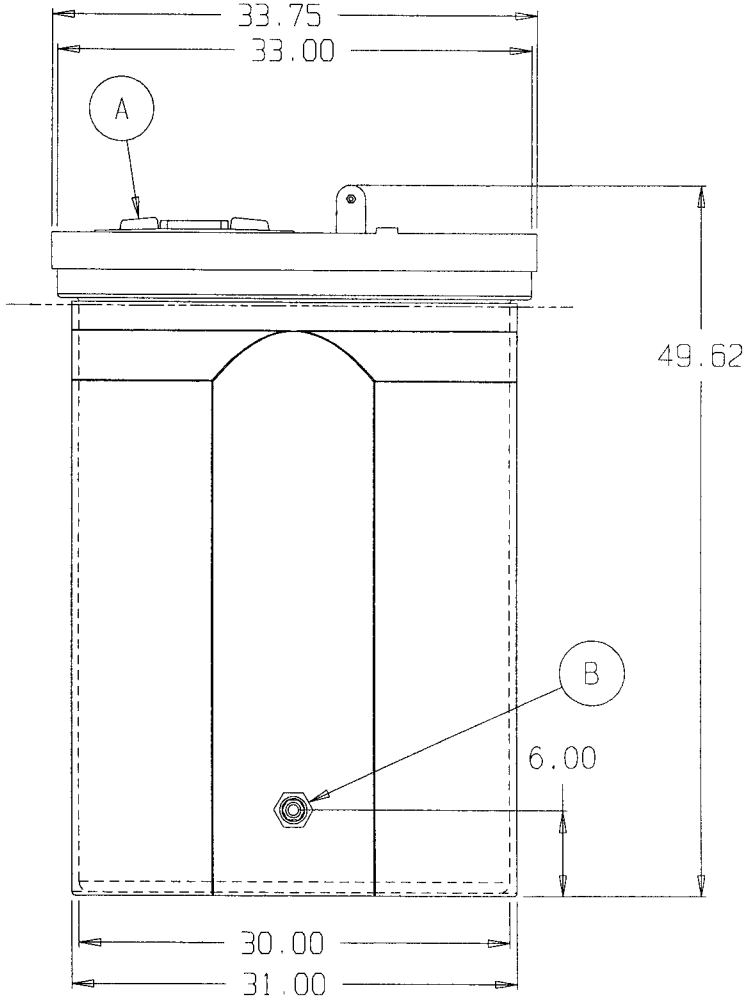
KT SALES
PO #9471

BENCHMARK





NOTE:
ALL EXTERNAL PIPING MUST BE INDEPENDENTLY SUPPORTED.

A. 14" PE THREADED-VENTED MANWAY W/11-3/8" ACCESS [P/N 34701243]
B. 3/4" PVC SxT BH FTG W/VITON GASKET [P/N 34700235]
B. 3/4" VITON GASKET FOR HYWD FITTINGS [P/N 33100092]
C. PROTECTIVE PLASTIC PACKAGING, 0 - 200 GAL. [P/N 000001711] - NOT SHOWN
* BASE FITTINGS TO BE LEFT INSTALLED AT TIME OF SHIPMENT PER SII PROCEDURE
* Consult Snyder's Guidelines for Use and Installation prior to delivery.
Available on-line at www.snydernet.com

APPROVED: _____

SIGNATURE: _____ DATE: ____
DRAWING NOT VALID UNLESS SIGNED
(all dimensions in inches)

SNYDER INDUSTRIES INC.

120 GALLON CONTAINMENT SYSTEM

TANK ASSEMBLY #: 5980000N97208
PRIMARY #: 5700000N97204
HDLPE/NATURAL/1.9 SG
CONTAINMENT #: 5980000N97201
HDLPE/NATURAL/1.9 SG
REF#: 23180a 10/27/09

APPENDIX F

GOWANDA SIU DISCHARGE PERMIT

VILLAGE OF GOWANDA

"Gateway to the Southern Tier"
27 E Main Street ♦ Gowanda NY 14070
(716)532-3353 ♦ Fax (716)532-2938

JUN 2 2 2009

"The Village of Gowanda is an Equal Opportunity Provider and Employer"

TO: TOM FORBES / BENCH MARK
FROM: MIKE HUTCHINSON
DATE: 6/16/09
RE: Peter Cooper Site / SIU Discharge Permit

Tom:

Attached please find SIU Discharge Permit. Any questions, please contact me

MIKE

Permit Permit

SCHEDULE A

Specific and General Conditions to
SIU Discharge Permit #

Issued By:

VILLAGE OF GOWANDA SEWER DEPARTMENT

TO

PETER COOPER SITE
POTENTIALLY RESPONSIBLE PARTIES
C/O
BENCHMARK ENVIRONMENTAL
726 EXCHANGE STREET
SUITE 624
BUFFALO, NEW YORK 14210

In accordance with the provisions in Chapter 46, Articles 4 & 5, of the Village of Gowanda Municipal Code, the Peter Cooper Site PRPs, c/o Benchmark Environmental, 726 Exchange Street, Suite 624 Buffalo, New York 14210, hereinafter referred to as "Permittee", is hereby authorized to discharge leachate from a ground water collection system located at 70 Palmer Street in the Village of Gowanda, New York only through the outfall(s) identified herein into the Village of Gowanda's Sewage Treatment Plant (the "GSTP") in accordance with the effluent limitations, monitoring requirements, and other conditions set forth in Section 1 (Specific) and Section 2 (General) and Section 3 (Enforcement) attached hereto and incorporated by reference herein as part of this permit (collectively the "Permit").

Compliance with this Permit does not relieve the Permittee of its obligation to comply with all pretreatment regulations, standards or requirements under local, state and federal laws, including any such laws, regulations, standards or requirements that may become effective during the term of this Permit.

Noncompliance with the terms and conditions of this Permit shall constitute a violation of the Village of Gowanda Municipal Code.

This Agreement shall commence the date on which the Consent Decree between EPA & CPRPs becomes effective and shall terminate on the last day of the sixtieth (60^{th}) month following the month of commencement of the Term. The Village reserves the right to terminate this Agreement in the event that there are any violations of any Village, state or federal laws and regulations. This Agreement may be renewed as provided in the SIU Permit.

The Permittee shall not discharge after the date of expiration. If the Permittee wishes to continue to discharge after the expiration date, an application must be filed for re-issuance of this Permit in accordance with the requirements of Chapter 46, Articles 4 and 5, of the Village of Gowanda Municipal Code, a minimum of ninety (90) days prior to the expiration date.

ABBREVIATIONS

BOD	Biological Oxygen Demand
CFR	Code of Federal Regulations
COD	Chemical Oxygen Demand
Code	Village of Gowanda Code of Ordinances
Superintendent	Superintendent of Public Works
EPA	Environmental Protection Agency (Federal)
mg/L	milligrams per liter (equivalent to ppm, or parts per million)
SNC	Significant Noncompliance
SOP	Standard Operating Procedures
TRC	Technical Review Criteria
TSS	Total Suspended Solids
TTO	Total Toxic Organics
SIU	Wastewater Discharge Permit
WWF	Wastewater Facility

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Part 16. Duty to comply with permit conditions, falsifying information or tampering with monitoring equipment.

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Part 18. Severability

SECTION 3. Enforcement

Part 1. Notice of violation

Part 2. Significant noncompliance

Part 3. Civil penalties

Part 4. Emergency actions

Part 5. Duty to mitigate

Part 6. Recovery of costs incurred

SECTION 1. SPECIFIC CONDITIONS

Part 1. Operation and effluent origins.

a) Description and regulation of operation

Permittee will discharge leachate to the GSTP in connection with a system installed to recover such leachate pursuant to the Record of Decision issued by the Environmental Protection Agency for the Peter Cooper Site, dated 9/30/05, relating to property located at 70 Palmer Street in the Village of Gowanda, New York.

b) The discharge shall not exceed 30,000 gallons peak daily.

Part 2. Effluent Limitations

a) Outfall

1. During the Permit period, Permittee is authorized to discharge leachate to the GSTP from the outfall 003 listed below.

   Description of outfalls:

Outfalls	Description
003	Constructed sewer line to Village manhole – C-116 and test immediately before discharge to Village system.

2. The Permittee shall apply, in writing, to the Superintendent for permission to discharge leachate to any other outfall other than indicated above. Reasons for the change and detailed plans and drawings of the proposed new outfall(s) must accompany the request.

b) Effluent Limitations

During the Permit period, the discharge from the outfall 003 listed above shall not exceed the following effluent limitations. Effluent from outfall consists of all origins listed in Section 1. Effluent from this outfall consists of leachate from an industrial landfill.

[Remainder of Page Intentionally Blank]

TABLE 1 (Effluent Limitations)

Parameter	Daily Maximum Concentration	lb/d Daily Maximum
Flow	30,000 gpd	
Total Toxic Organic Compounds (TTO)	1.37 mg/L	
Total Organic Halogen (TOX)	0.1	
BOD		200lb/d
COD	monitor only	
Total Solids		181 lb/d
PH	5.0 – 10.5	
Total Arsenic		0.0062 lb/d
Total Chromium		0.032 lb/d
Hex Chromium		0.0048 lb/d
Phenol		0.78 lb/d
Ammonia		75 lb/d
Dissolved Oxygen[1]	2.0 mg/L	
Sulfides	9.0mg/L	

[1] The discharge shall maintain a minimum concentration of Dissolved Oxygen content of 2.0 mg/L when sulfide concentrations are in excess of 9.0 mg/L.

c) Modification of Local Limits.

In accordance with the Municipal Code, the established local limits are subject to change and shall be modified as needed based on regulatory requirements and standards, GSTP operation, performance and processes, the industrial user base, potable water quality and domestic wastewater characteristics. Modification to the established local limits must be reviewed and approved prior to implementation. Implementation shall be effective thirty (30) days from notice of acceptance of the modified limits. New local limits will be issued as an addendum to this wastewater discharge permit. Any modification of local limits that would require the Permittee to construct and operate, or modify an existing pretreatment system, shall include a reasonable schedule of compliance.

Part 3. Operation and maintenance of pollution controls.

a) Proper operation and maintenance

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the terms of this SIU. Proper operation and maintenance includes but is not limited to: effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and

process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the SIU.

b) Duty to halt or reduce activity

Upon reduction of efficiency of operation, or loss or failure of all or part of the treatment facility, the Permittee shall, to the extent necessary to maintain compliance with this SIU, control its production or discharges (or both) until operation of the treatment facility is restored or an alternative method of treatment is provided. This requirement applies, for example, when the primary source of power of the treatment facility fails or is reduced. It shall not be a defense for a Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance of the SIU.

c) Bypass of treatment facilities

1. Bypass is prohibited unless it is unavoidable to prevent loss of life, personal injury or severe property damage or no feasible alternative exist.

2. Bypass not exceeding limitations. The Permittee may allow bypass to occur which does not cause effluent limitations to be exceeded, but only if it is also for essential maintenance to assure efficient operation

d) Notification of bypass

1. Anticipated bypass. If the Permittee knows in advance of the need for a bypass, it shall submit prior written notice, at least ten days before the date of the bypass, to the Superintendent.

2. Unanticipated bypass. The Permittee shall immediately notify the Superintendent and submit a written notice to the WWF within 5 days. This report shall specify:

(i) A description of the bypass, and its cause and duration;
(ii) Whether the bypass has been corrected; and
(iii) The steps being taken or to be taken to reduce, eliminate or prevent a recurrence of the bypass.

Part 4. Sampling and monitoring requirements

a) Sample points

During the permit period, the Permittee shall collect samples and monitor the leachate discharge from the following sample points:

Outfall 003 described in Section 1 of this SIU Permit or other locations approved by the Superintendent.

This is the only sampling point that is approved by the Superintendent for the collection of samples.

b) Sampling and Analysis; Notification of Sample Collection

The samples collected by the Permittee or its authorized representative shall be analyzed for the parameters listed in Section 1. Frequency and types of samples to be taken are indicated below:

TABLE 2 (Sampling and Monitoring)

Parameter	Sampling Location	Frequency	Sample Type
USEPA Priority Pollutant Volatiles, Semi-Volatiles	MH C-116	Prior to initial discharge, Then quarterly for the 1st year, if parameters warrant (USEDA PP, VOCS, SVOCS)	Grab
Sulfates	MH C-116	Weekly the 1st month; then monthly the 1st year	Composite
Sulfides (collected both prior to and following pre-treatment)		Weekly the 1st month; then monthly the 1st year If test results warrant	Composite
BOD/5 TSS Phenols TKN Ammonia PH (field measured)		Weekly the 1st month; Then monthly the 1st year, if test results warrant	Composite 24/hr. Composite
Metals: Arsenic Calcium Total Chromium Hexavalent Chromium Cooper Cyanide Lead Mercury Nickel Silver Zinc	MH C-116	Prior to initial discharge, then quarterly for the 1st year, if test results warrant	24 hr. composite
Dissolved Oxygen	MH C-116	Daily the 1st week, then weekly thereafter	GRAB
Total Organic Halogen	MHC-116	Prior to discharge, monthly for the first year	GRAB

* An updated Complete Discharge Analysis consisting of all parameters listed above, must be provided to the Village Sewer Department prior to the initial discharge.

1. Sampling frequency shall be determined by the Superintendent based on the nature.

volume and concentrations of parameters of concern identified in this SIU Permit, as demonstrated during the first year of monitoring.

2. Samples collected by the Permittee or its authorized representative shall be as representative as possible of the volume and nature of the Permittee's discharge throughout the daily period of system operation. All handling and preservation of collected samples shall be performed in accordance with 40 CFR Part 136 and any amendments thereto. The Village reserves the right to spot check sampling procedures by the Permittee or the Permittee's contract laboratory at any time.

3. The Village reserves the right to modify the frequency of analysis. If laboratory analysis indicates any parameter exceeds the levels set in the Village's Sewer Use Ordinance or this SIU Permit or the Superintendent determines that any parameter present in the discharge poses a treatment concern.

c) Permittee's analytical laboratory

The Permittee shall utilize a State of New York certified laboratory of its choosing for the purposes of complying with the requirements of this SIU. Certification must be current during the performance of a required analysis for each parameter measured. The Permittee is directly responsible for ensuring the validity of all analytical measurements received from its laboratory as required by this SIU.

The Village will only accept analytical results that are performed by a laboratory certified by the State of New York for environmental analysis. Analytical measurements submitted by non certified laboratories or resulting from analysis of samples during periods of non certification for the analyte will be considered null and void and the facility will be considered as not having monitored for these parameters.

d) Sampling procedures

All sampling procedures shall comply with the requirements contained in Standard Methods

If the Permittee performs its own sampling, the Permittee shall prepare a written description of its procedures and shall submitted such document to the Village. The Village may, at its option, observe the collection of the required samples by the Permittee to ensure that approved sampling methods are complied with in full. Failure to follow sampling procedures will result in the Village's rejection of the sample and any resulting analytical results that may be submitted by the Permittee.

If the Permittee's chosen laboratory performs the sampling for the Permittee, the Village may, at its option, observe the collection of the required samples to ensure that approved sampling methods are complied with in full by the laboratory concerned. Failure to follow sampling procedures will result in the Village's rejection of the sample and any resulting analytical results that may be submitted by the Permittee or its laboratory.

Part 5. Reporting requirements

a) Periodic compliance reports (PCR)

Annual compliance reports must be submitted to the Village of Gowanda by February 1 of each year covering January 1 to December 31st of the previous year.

1. Annual compliance report information is to be submitted on NYSDEC FROSI report

forms.

2. A copy of the original contracting laboratory's analysis, including all chain of custody forms.

The due date for submission of the PCR report and attachments is thirty days after the last day of the month in which the samples are required to be taken. If a report is submitted more than 30 days after the due date, the facility will be deemed to be in significant noncompliance (SNC) and appropriate enforcement proceedings will be initiated by the Village.

A report shall be considered incomplete and in violation of reporting requirements if it does not contain the above required information and attachments. Incomplete reports will be returned to sender.

b) Extra monitoring

If the Permittee monitors its discharge for any pollutant more frequently than required by this SIU, using test procedures prescribed in 40 CFR Part 136 or any New York State regulation or amendments thereto, or otherwise approved by EPA or as specified in this WPD, the results of such monitoring shall be included in the calculation and results shall be reported in the PCR reports and submitted to the Superintendent.

c) Automatic re-sampling

If the results of the Permittee's discharge analysis indicate a violation has occurred, the Permittee must:

1. Inform the Superintendent within 24 hours of becoming aware of the violation, as defined in Section 3 of this SIU; and

2. Repeat the sampling and pollutant analysis for the parameter in violation and submit the results of the second analysis in writing to the Village within 30 days after becoming aware of the violation.

d) Accidental discharge report

The Permittee shall notify the Superintendent immediately upon the occurrence of an accidental discharge of substances prohibited by the Municipal Code or any slug loads or spills that may enter the public sewer. During normal business hours, the Superintendent should be notified by telephone at 716-532-5931 At all other times, the Superintendent should be notified by telephone at 716-913-1455 or 716-532-4077 after 4:30 p.m. Monday - Friday or weekends and holidays. The Permittee shall inform the Superintendent of the location of discharge, date and time, type of waste, including concentration and volume, and corrective actions taken. The Permittee's notification of accidental release in accordance with this section does not relieve it of other reporting requirements that arise under local, State, or Federal laws. Within five (5) days following an accidental discharge, the Permittee shall submit to the Superintendent a detailed written report. The report shall specify:

1. Description and cause of the upset, slug or accidental discharge, the cause thereof and the impact on the Permittee's compliance status. The description should also include location of discharge, type, concentration and volume of waste.

2. Duration of noncompliance, including exact dates and times of noncompliance, and if the noncompliance continues, the time by which compliance is reasonably expected to occur.

3. All steps taken or to be taken to reduce, eliminate, and prevent recurrence of such an upset, slug, accidental discharge, or other conditions of noncompliance.

e) The cooperating PRPs will provide the Village with copies of all post-remedial inspections, sampling, analysis, evaluation reporting, and any other document or report submitted to EPA and required by USEPA to demonstrate performance and permanence of the remedial measures including but not limited to:

1. Gas Vent Emissions testing and reporting;

2. Groundwater and surface water data assessment and reporting for the first five (5) years following completion of remedial construction.

3. Periodic site inspections to observe cover system integrity and observe seep/ground water collection system operation and maintenance.

f) Report Submission

The Permittee shall submit all reports required by this Permit to the Superintendent at the following address:

Superintendent of Public Works
Village of Gowanda
27 East Main Street
Gowanda, New York 14070

PART 6. Demand monitoring costs

Any required demand monitoring, inspections and surveillance deemed to be necessary as a result of a violation will be carried out by the Village and charged directly to the Permittee at the Village's cost, which costs shall be a charge against the OM&M Account.

SECTION 2. GENERAL REQUIREMENTS AND CONDITIONS

PART 1. Compliance with applicable pretreatment standards and requirements; Costs

a) Compliance with this permit does not relieve the Permittee from its obligations regarding compliance with any and all applicable local, State and Federal pretreatment standards, regulations, laws, and requirements including any that become effective during the term of this permit. This SIU shall be expressly subject to all provisions of the Municipal Code, as amended, and all other applicable codes and regulations.

b) The Permittee shall reimburse the Village for monitoring all parameters required by the DEC, EPA or the Village and at the frequency requested by any of these agencies or any other agency having jurisdiction over the discharge and for all cost associated with any Village SPDES Permit modifications associated with the acceptance of the discharge, which costs shall be a charge against the OM&M Trust Account.

PART 2. Duty to reapply

The Permittee shall apply for permit re-issuance at least ninety (90) days, but no more than one hundred and eighty (180) days prior to the expiration of the Permittee's permit. The Permittee shall be informed of any proposed changes to the permit at least thirty (30) days prior to the effective date of change. Any changes or new conditions in the permit shall include a reasonable time schedule for compliance.

PART 3. Continuation of expired SIU

An expired SIU will continue to be effective and enforceable until the SIU is reissued if:

a) The Permittee has submitted a complete SIU application at least ninety (90) days prior to the expiration date of the Permittee's existing SIU.

b) The failure to reissue the SIU, prior to expiration of the previous SIU, is not due to any act or failure to act on the part of the Permittee.

PART 4. Signatory requirements

All applications, reports, or information submitted to the Village of Gowanda must contain the following certification statement:

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

All reports required by this permit shall contain the name/title of a principal executive officer of the Permittee, and shall be signed by the principal executive officer or his/her authorized representative.

PART 5. Right of entry

The Permittee shall allow the Village or its representatives, exhibiting proper credentials and identification, to enter upon the premises of the Permittee, at all reasonable hours for the purposes of inspection, sampling, or records inspection and duplication. Reasonable hours in the context of inspection and sampling include any time the Permittee is operating any process which results in a process wastewater discharge to the Village's WWF.

PART 6. Limitation on permit transfer

Discharge permits are issued to a specific Permittee for a specific operation. They shall not be reassigned, or transferred, or sold to a new owner, new significant Permittee, or transferred to a different premises without Village approval.

PART 7. Changed conditions

The Permittee shall report to the Village prior to the introduction of new discharge any substantial change in the volume or characteristics of the wastewater being discharged into the WWF from the Permittee's processes.

PART 8. Records Retention

a) The Permittee shall retain and preserve for no less than five (5) years, any records, books, and documents, memoranda, reports, correspondence and any and all summaries thereof, relating to monitoring, sampling and chemical analyses made by or on behalf of the Permittee in connection with its discharge.

b) All records that pertain to matters that are the subject of special orders or any other enforcement or litigation activities brought by the Village shall be retained and preserved by the Permittee until all enforcement activities have concluded and all periods of limitation with respect to any and all appeals have expired.

PART 9. Sample type and notification of sample collection

All samples shall be 24-hour (flow-proportioned or time-proportioned) composite samples where feasible, except VOC sampling which are grab samples.

PART 10. Measurements for discharge limitations

a) Daily Maximun concentration mg/l.

b) Lb/d Day Maximum: Total Daily flow in MGD x concentration in mg/l x 8.34

c) For each measurement or sample taken pursuant to the requirements of this permit, the following information shall be recorded:

i) The exact place, date and time of sampling;

ii) The dates the analysis were performed;

iii) The person responsible for performing the sampling or measurement;

iv) The person(s) who performed the analyses;

v) The analytical techniques or methods used, and

vi) The results of all required analyses.

PART 11. Violation of notification and resample requirement

If sampling performed by Permittee indicates a violation of any part of this Permit or Village Code, as amended, the Permittee shall notify the Superintendent within 24 hours of becoming aware of the violation. The Permittee shall repeat the sampling and analysis and submit both results of the analysis to the Superintendent within 30 days after becoming aware of the violation.

PART 12. Dilution

No Permittee shall increase the use of potable or process water or in any way attempt to dilute a discharge as a partial or complete substitute for adequate treatment to achieve compliance with the limitations contained in the permit

PART 13. General prohibitive standards

The Permittee shall not discharge wastewater to the sewer system:

a) Any point source wastewater having a temperature greater than 65° Celsius (C) (150° Fahrenheit (F)) or which will inhibit biological activity in the treatment plant resulting in interference.

b) Containing any gasoline, benzene, naphtha, fuel oil or other flammable or explosive liquids, solids or gases; and in no case pollutants with a closed cup flashpoint of less than 60° C (140 °F), or pollutants which cause an exceedance of 10 percent of the Lower Explosive Limit (LEL) at any point within the WWF.

c) Any water having a pH less than 5.5 or greater than 10.5, or wastewater having any other corrosive property capable of causing damage or hazard to structures or equipment, or endangering Village personnel.

d) Solids or viscous substances in amounts which will cause obstruction of the flow in the wastewater treatment facility resulting in interference, but in no case solids greater than one-half inch in any dimension.

e) Any wastewater containing pollutants, including oxygen-demanding pollutants (BOD, etc.), released in a discharge at a flow rate and/or pollutant concentration which, either singly or by interaction with other pollutants, will cause interference with either the WWF, the collection system, or any wastewater treatment or sludge process, or which will constitute a hazard to humans or animals.

f) Any wastewater in mixture which causes the temperature at the introduction into the WWF to exceed 40° C (104° F).

g) Petroleum oil, non-biodegradable cutting oil or products of mineral oil origin in amounts which will cause interference or pass-through.

h) Any pollutants which result in the presence of toxic gases, vapors or fumes within the WWF in a quantity which may cause acute worker health and safety problems.

i) Any noxious or malodorous liquids, gases, solids or other wastewater which, either singly or by interaction with other wastes, are sufficient to create a public nuisance or a hazard to life, or prevent entry into the sewers for maintenance and repair.

j) Any wastewater containing any radioactive wastes or isotopes.

k) Stormwater, surface water, groundwater, artesian well water, roof runoff, subsurface drainage, swimming pool drainage, condensate, deionized water, non-contact cooling water, and unpolluted industrial wastewater, unless specifically authorized by the Superintendent.

l) Any sludges, screenings or other residues from the pretreatment of industrial wastes.

m) Any wastewater causing the treatment plant's effluent to fail a Village requirement or cause a violation of any requirements of the Village's State Pollution Discharge Elimination Permit ("SPDES ~~Permit") imposed by either~~ The New York State Department of Environmental Conservation or the Environmental Protection Agency or any wastes containing detergents, surface active agents or other substances which may cause excessive foaming in the WWF.

n) Any discharge of chemicals used to dissolve grease.

o) Any wastewater which imparts color which cannot be removed by the treatment process, such as but not limited to dye wastes and vegetable tanning solutions, which consequently imparts color to the treatment plant's effluent thereby violating the Village's operating permit.

PART 14. Flow measurements

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to insure the accuracy and reliability of measurements of the volume of monitoring discharges. The devices shall be installed, calibrated, and maintained by the Permittee to insure that the accuracy of the measurements are consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than +1- 10% from the true discharge rates throughout the range of expected discharge volumes.

PART 15. Suspension/termination of service and/or permit

The Village may suspend discharge treatment service and/or the SIU when such suspension is necessary to stop an actual or threatened discharge which would endanger the health or welfare of persons or the environment, cause interference with GSTP operations, cause sludge quality degradation, or cause the Village to violate any conditions of its operating permit Conditions for termination of this permit include but are not limited to the following:

a) Falsifying self-monitoring reports;

b) Tampering with monitoring equipment;

c) Refusing to allow timely access to the Permittee's premises and records;

d) Failure to meet effluent limitations;

e) Failure to pay fines;

f) Failure to pay sewer charges, and

g) Failure to meet compliance schedules.

PART 16. Duty to comply with permit conditions, falsifying information or tampering with monitoring equipment

The Permittee must comply with all conditions of this permit. Any Permittee who willfully or negligently fails to comply with provisions of this permit shall be subject to the imposition of penalties and appropriate recovery of costs by the Village. Any person who knowingly makes any false statements, representation or correction in any record, report, plan or other document filed pursuant to this permit, or who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required under this permit shall, upon conviction, be subject to the imposition of penalties prescribed by the Code or any other applicable local, State or Federal law.

PART 17. Modification or revision of the permit

The Superintendent may modify a SIU for good cause, including, but not limited to, the following reasons:

a) To incorporate any new or revised Federal, State or local pretreatment standards or requirements;

b) To address significant alterations or additions to the Permittee's operation, processes, or discharge volume or character since the time of the SIU issuance;

c) A change in the WWF that requires either a temporary or permanent reduction or elimination of the authorized discharge;

d) Information indicting that the permitted discharge poses a threat to the Village's WWF, personnel, or the receiving waters;

e) Violation of any term or condition of the permit;

f) Misrepresentation or failure to fully disclose all relevant facts in the wastewater discharge permit application or in any required reporting;

g) To correct typographical or other errors in the permit; or

h) To reflect a transfer of the facility ownership or operation to a new owner or operator.

PART 18. Severability

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

SECTION 3. ENFORCEMENT

PART 1. Notice of violation

a) Any violation of requirements including, but not limited to, discharge limits, sampling, analysis,

meeting compliance schedules and regulatory deadlines, and reporting shall be considered as noncompliance for which the Permittee is liable for enforcement, including penalties. The Permittee shall respond to any notice of violation in writing within 30 days of the notice. This written notification shall include the reason for the violation(s), the actions taken to correct the violation(s) and what steps will be taken to prevent the violation(s) from occurring in the future.

b) The failure of the Village to reject any discharge shall not, in any way, relieve or diminish the Permittee's liabilities to the Village for any damages the Village may incur as a result of the discharge being in violation of any provisions of this Permit.

PART 2. Significant noncompliance (SNC)

Violations shall be identified as those violations or patterns of violations by the Permittee that are instances of Significant Noncompliance (SNC). The determination of SNC is patterned after criteria used in the EPA program (40 CFR 123.45). Instances of SNC are Permittee violations which meet one or more of the following criteria:

1. Violation of wastewater discharge limits:

   a) Chronic Violations: If 66% or more of the measurements obtained from the testing described in this permit exceed the permit limits in a 6 month period (any magnitude of exceedance), then chronic violations will have occurred.

   b) Technical Review Criteria (TRC) violations, when thirty-three (33%) percent or more of all measurements taken during six (6) month period equal or exceed the permit limit multiplied by the applicable TRC factor.

   c) Any other violation(s) of an effluent limit (average or daily maximum) that the Village believes has caused, alone, or in combination with other discharges, interference (e.g. slug loads or pass though) or endangered the health of the WWF personnel or the public.

   d) Any discharge of a pollutant that has caused imminent endangerment to human welfare, or to the environment, and has resulted in the Village's exercise of its emergency authority to halt or prevent such a discharge.

   e) Failure to meet within ninety (90) days after the schedule, a compliance schedule milestone required.

2. Failure to provide reports as stipulated in this permit within thirty (30) days from the due date.

3. Failure to accurately report non-compliance.

4. Any other violation or group of violations that the Village considers to be significant.

As part of its enforcement action, the Village shall notify the Permittee of each incidence of SNC, and each notice shall include an order for the Permittee to come into compliance immediately, or to enter into a compliance agreement with the Village.

PART 3. Civil penalties

A Permittee who has violated or continues to violate any provision of the Municipal Code, a SIU or other order issued, or any other pretreatment standard or requirement shall be liable to the Village for a

maximum civil penalty of $1,000.00 per violation, per day.

The Village may recover reasonable attorney's fees, court costs and other expenses associated with enforcement activities, including sampling and monitoring expenses and the cost of actual damage incurred by the Village.

In determining the amount of the civil liability, the court shall take into account all relevant circumstances including, but not limited to, the extent of harm caused by the violation, any economic benefit gained through the Permittee's violation, corrective actions by the Permittee, the compliance history of the Permittee and any other factor as justice requires.

Filing a suit for civil penalties shall not be a bar against or a prerequisite for taking any other action against the Permittee.

PART 4. Emergency actions

The Superintendent shall have authority and procedures to immediately and effectively halt any discharge to the WWF which endangers public health or welfare. The Superintendent shall also have the authority and procedures to prevent any discharge to the WWF which endangers the environment or which threatens to interfere with the operations of the WWF. Notice shall be provided to the Permittee prior to such action. If public health or welfare are not endangered, the Permittee shall be given an opportunity to respond to the notice.

PART 5. Duty to mitigate

The Permittee shall take all reasonable steps to minimize or correct any adverse impact to the public treatment plant or the environment resulting from noncompliance with this SIU, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncompliant discharge.

PART 6. Recovery of costs incurred

In addition to civil liability, the Permittee violating any of the provisions of this SIU, of the Municipal Code or causing damage to or otherwise inhibiting the Village of Gowanda wastewater disposal system shall be liable to the Village of Gowanda for any expense, or damage caused by such violation or discharge. The Superintendent shall bill the Permittee for the costs incurred by the Village for any demand monitoring, analysis, cleaning, repair, or replacement work caused by the violation or discharge.

6/19/08

Michael Hutchinson, Superintendent

PART II

SOIL / FILL MANAGEMENT PLAN

SITE MANAGEMENT PLAN
PART II

SOIL/FILL MANAGEMENT PLAN

PETER COOPER LANDFILL SUPERFUND SITE
GOWANDA, NEW YORK

August 2010 0021-010-100

Prepared by:

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

SOIL/FILL MANAGEMENT PLAN
PETER COOPER LANDFILL SUPERFUND SITE

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SOIL/FILL MANAGEMENT PLAN
PETER COOPER LANDFILL SUPERFUND SITE

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APPENDICES

1.0 INTRODUCTION

This Soil/Fill Management Plan (SFMP or Plan) has been prepared for inclusion in the Site Management Plan (SMP) for the Peter Cooper Landfill Superfund Site, also referred to as the "Peter Cooper Gowanda Site" or the "Site" (see Figure 1). As illustrated on Figure 2, the Site is bordered to the north by Cattaraugus Creek; to the south by Palmer Street; to the west by a former hydroelectric dam and wetland area; and to the east by residential properties.

1.1 Background and History

The Peter Cooper Landfill Superfund Site was historically used for animal glue and synthetic adhesives manufacturing. Based on historic operations, the portion of the Site that generally contained a rail spur plant support facilities and a landfill used for disposal of certain by products from the animal glue manufacturing process has been deemed the "Inactive Land Fill Area." This portion of the property is situated on the western side of the Site and covers approximately 15.6 acres (see Figure 3). The western edge of the Inactive Landfill Area is located on property owned by New York State Electric and Gas (NYSEG). The portion of the Inactive Landfill Area that contains waste fill, referred to as the Elevated Fill Subarea, encompasses approximately 5 acres in the northwest corner of the Site.

The remainder of the Site that historically contained animal glue and adhesives manufacturing facilities has been deemed the "Former Manufacturing Plant Area." This portion of the property is located on the eastern side of the Site, and includes the remaining 10.4-acre portion of the Site east of the Inactive Landfill Area (see Figure 4).

In April 2000, USEPA issued Unilateral Administrative Order CERCLA-02-2000-2014 to several Potentially Responsible Parties (PRPs) directing completion of a Remedial Investigation and Feasibility Study (RI/FS) for the entire 26-acre Site. Benchmark Environmental Engineering & Science, PLLC (Benchmark) and Geomatrix Consultants, Inc. (Geomatrix) performed RI field activities at the Site on several occasions beginning in August 2000 and continuing through April 2001. The RI report was submitted to the USEPA in November 2003 (Ref. 1).

Concurrent with completion of RI activities, the Village of Gowanda in association with the University at Buffalo Center for Integrated Waste Management developed a Reuse

Assessment and Concept Plan (Ref. 2) for the Site that concluded that the "highest and best use" of the property would be as a multi-use recreational facility. The Reuse Assessment and Concept Plan, funded in part by the USEPA through its Superfund Redevelopment Initiative, envisions a publicly available Site incorporating elements such as a walking/biking trail, fishing access, outdoor picnic areas, sports fields, and other related recreational features.

The Feasibility Study was substantially completed by the cooperating PRPs (CPRPs) in July 2004, and was finalized in June 2005 (Ref. 3). Remedial Action Objectives (RAOs) were developed in the FS, taking into consideration potential unacceptable human health risks identified in the RI, as well as applicable, relevant and appropriate requirements (ARARs) potentially governing closure of the Elevated Fill Subarea. Based on the RAOs, the media and areas of potential concern for which several remedial alternatives were developed and evaluated included:

- Seeps/groundwater emanating from the Elevated Fill Subarea along the bank of Cattaraugus Creek (to address aesthetic issues and potential localized surface water quality impacts by ammonia).
- Soil/fill and landfill gas within the Elevated Fill Subarea (in terms of potential closure options to satisfy ARARs).
- Arsenic-impacted soil/fill in the vicinity of RI sample location LFSS-6 (to address hypothetical future construction worker risks).
- Chlorinated volatile organic compound (VOC)-impacted soil/fill in the vicinity of RI sample location MWFP-3 (to address hypothetical future construction worker risks).
- Site groundwater (to address hypothetical future risks associated with use of groundwater for potable purposes).

1.1.1 Proposed Plan and Record of Decision

In July 2005 USEPA issued a Proposed Plan for the Site that identified the following proposed remedial measures:

- Excavating impacted soil/fill from the MWFP-3 and LFSS-6 Subareas (deemed "hotspots" in the Proposed Plan) and consolidating the excavated soil/fill in the

Elevated Fill Subarea prior to cover soil placement. In addition, USEPA identified a third "hotpot" at RI sample location SB-2, where arsenic was detected at a concentration of 168 mg/kg. Excavation and on-site consolidation in the Elevated Fill Subarea was proposed for the SB-2 hotspot as well. No arsenic cleanup goal was established in the Proposed Plan.

- Covering the 5-acre Elevated Fill Subarea with a low-permeability equivalent design barrier cap, consistent with the requirements of 6NYCRR Part 360, including seeding with a mixture to foster natural habitat. The cap under this approach was defined in the Proposed Plan as incorporating 6 to 12 inches of topsoil and 18 to 24 inches of low permeability barrier soil.
- Installing a passive gas venting system in conjunction with a final cover system for the Elevated Fill Subarea.
- Collecting leachate seeps and discharging the seeps to the POTW collection system. The seeps would be pre-treated, if necessary. As a contingency, if treatment of the seeps in the POTW were not available the seeps would be treated on-site using a sequencing batch reactor and discharged directly to Cattaraugus Creek.
- Stabilizing the Creek bank.
- Establishing institutional controls in the form of deed restrictions/environmental easements and restrictive covenants on future uses of the Elevated Fill Subarea and to prevent use of groundwater on the Site for potable purposes.
- Installing a groundwater diversion system upgradient of the Elevated Fill Subarea.
- Performing long-term operation and maintenance of the landfill cap, gas venting, and seep/leachate systems.
- Performing landfill gas, surface water, and groundwater quality monitoring
- Evaluating Site conditions at least once every five years to determine if a modification to the selected alternative is necessary.

During the ensuing public comment period, representatives of the CPRPs submitted comments to USEPA disputing certain elements of the Proposed Plan, particularly the proposed groundwater diversion system.

On September 30, 2005, following review of public comments, USEPA issued a Record of Decision (ROD) for the Peter Cooper Landfill NPL Site. The ROD remained effectively unchanged from the Proposed Plan, with the following exceptions: it was revised to indicate that if additional data collected in the remedial design stage of the project showed that installation of a groundwater diversion wall would provide no substantial additional

environmental benefit, the diversion wall would not be installed; and the arsenic cleanup goal for the LFSS-6 and SB-2 Subarea soil/fill was established as 120 mg/kg. In addition, the ROD called for a Site Management Plan to assure appropriate handling of subsurface soil/fill during Site redevelopment.

Following issuance of the ROD, a diversion wall assessment was completed by Benchmark and Geomatrix Consultants to show that installation of an upgradient groundwater diversion wall around the Elevated Fill Subarea would not materially change the effectiveness of the planned remedial measures. The assessment involved hydrogeologic modeling to show that the potential loading of landfill constituents to Cattaraugus Creek via the combined effects of leaching and groundwater migration would be adequately addressed by the planned seep/groundwater collection system, resulting in conformance with NY State Surface Water quality criteria irrespective of an upgradient groundwater diversion system. Based on this assessment the USEPA subsequently removed the diversion wall requirement from the scope of work incorporated in the remedial Consent Decree.

1.2 Summary of Remedial Construction Measures

A general description of the remedial construction measures implemented at the Site is presented in this section. Additional details of the construction are contained in the Remedial Action Report (Ref. 4). Remedial measures are shown schematically on Figure 5.

1.2.1 Elevated Fill Subarea

1.2.1.1 Groundwater/Seep Collection and Conveyance

The remedial measures for the Elevated Fill Subarea involved re-grading of the adjacent bank (excluding the riprap-stabilized area on NYSEG's property) and removal of concrete blocks and boulders to provide a more uniform slope for reduced erosion potential. A seep collection trench was then excavated into the surface of the weathered shale bedrock at the toe of the slope to intercept and collect the seeps. A perforated drainage pipe and granular media envelope collect and transmit water to a packaged leachate pump station. The slope of the regraded bank is lined with a geocomposite drainage layer, leading to the collection trench, covered by a geomembrane liner to prevent seep breakout and creek and mitigate surface water infiltration during high water conditions. The liner extends vertically

to the 100-year floodplain elevation, and is protected from erosion by a surface layer of medium and large riprap over a non-woven geotextile fabric and gravel bed.

Collected seep water and shallow groundwater are conveyed from the pump station via force main to a pretreatment building where an oxidant delivery system is available to mitigate hydrogen sulfide odors, as needed. Pretreated seeps/groundwater is discharged to the Village of Gowanda's sanitary sewer collection system on Palmer Street for treatment at the Village POTW consistent with the approved discharge permit.

1.2.1.2 Cover System Improvements

Containment/isolation with soil cover enhancement involved: clearing and grubbing the approximate 5-acre Elevated Fill Subarea; moderate regrading and/or filling of low spots across the 5-acre area to facilitate runoff; supplementing existing cover to provide for a minimum 18 inch thickness of recompacted soil barrier layer and 6 inches of topsoil over the 5-acre area; and reseeding of the Elevated Fill Subarea cover to provide for a good stand of grass that will foster natural habitat. Cover soils were tested to assure conformance with the lesser of health-based Commercial Soil Cleanup Objectives (SCOs) or levels protective of groundwater quality as published in 6NYCRR Part 375-6.8

1.2.1.3 Passive Gas Venting

Five passive gas vents were installed through the sludge fill in the Elevated Fill Subarea to relieve gas buildup beneath the cover system. The vents were constructed with individual risers that extend to a sufficient height above ground surface to promote atmospheric dispersion of odor-causing constituents and prevent direct inhalation of vented gases by trespassers or future Site users.

1.2.2 Soil "Hotspot" Remediation

1.2.2.1 MWFP-3 Subarea

The remedial alternative to address the MWFP-3 Subarea "hotspot" involved excavation of approximately 196 cubic yards of VOC-impacted soil/fill from the MWFP-3 Subarea and consolidation within the Elevated Fill Subarea. Confirmatory sampling of the

sidewalls and bottom of the excavation was performed to verify that no residual soil/fill remained above cleanup goals established in the ROD. Following removal and confirmatory sampling, the MWFP-3 Subarea was backfilled with clay borrow soils from the same source used for the Elevated Fill Subarea soil barrier layer.

1.2.2.2 LFSS-6 and SB-2 Subareas

The remedial measures to address the LFSS-6 and SB-2 Subarea "hotspots" involved excavation of arsenic-impacted soil/fill from these areas (approximately 146 and 25 cubic yards, respectively) with consolidation of impacted soil/fill beneath the cover system in the Elevated Fill Subarea. Following removal and verification sampling of the excavation sidewalls to confirm concentrations below the cleanup goals, theses Subareas were backfilled with clay borrow soils from the same source used for the Elevated Fill Subarea soil barrier layer.

1.3 Non-Remedial Redevelopment Improvements

As discussed above, the Village of Gowanda is interested in redeveloping the site as a park, and during the design phase of the project negotiated to provide the CPRPs certain post-remedial operation, maintenance and monitoring services in exchange for non-remedial site improvements and other compensation that will facilitate redevelopment. These improvements, which occurred coincidental with the remedial work, included:

- Removal of C&D debris from the Former Manufacturing Plant Area of the site (i.e., eastern portion of the Site), with wood debris disposed offsite and remaining C&D materials (brick, concrete, etc.) disposed under the Elevated Fill Subarea cover system.
- Construction of a clean utility corridor with a 2-inch HDPE water line to facilitate utility service to a future multi-use building. The corridor was excavated to approximate dimensions of 24" wide x 48" deep, and lined with a geotextile fabric to provide demarcation from surrounding soil/fill. The corridor and HDPE pipe were backfilled with suitable commercial aggregate material. The utility corridor location and orientation are shown on Figure 5.

- Grading of the Elevated Fill Subarea along the Creek bank to provide a benched area for a future bike or walking trail.

1.4 Purpose and Scope

This SFMP was developed for the purpose of identifying:

- Requirements for addressing unknown subsurface impacts (i.e., outside of the Elevated Fill Subarea) if encountered during maintenance or redevelopment activities[1].
- Quality assurance requirements for imported subgrade soil used to fill depressions or increase elevation during, or in anticipation of, redevelopment.
- Quality assurance requirements for imported cover soils to be placed prior to public or private use of the site, or as replacement to such soil cover, if the Site is redeveloped in accordance with the Environmental Easement (Part III of the Site Management Plan).

This SFMP applies to all soil/fill handling activities at the Site. As such, this SFMP provides protocols for the proper handling of site soil/fill during redevelopment and site maintenance-related activities, including but not limited to: clearing and site grading; infrastructure construction (e.g., roads, waterline, sewers, electric cable, etc) outside of the clean utility corridor; foundation excavation; and repair or replacement of remedial measures or monitoring devices.

This document contains four Sections as summarized below.

- Section 1.0 identifies the site background, purpose and scope, and program responsibilities
- Section 2.0 provides criteria for post-remedial excavation, grading, sampling, and handling of Site soil/fill. Included in this section are criteria for imported subgrade soil and final cover (if the site is redeveloped); notification and reporting

[1] Per the Environmental Easement (see Part III of the SMP), certain site use activities are prohibited including those that would interfere with, or adversely affect, the integrity or protectiveness of the Elevated Fill Subarea cap or groundwater/leachate collection system.

requirements; erosion and dust control measures to be employed during intrusive work; access controls; and a description of the site use restrictions contained in the environmental easement.

- Section 3.0 identifies health and safety procedures for subsurface construction work and the protection of the surrounding community.
- Section 4.0 contains references cited herein.

1.5 Soil/Fill Management Program Responsibility

The property owner will be responsible for all monitoring, implementation, and reporting requirements of this Plan. Notification and reporting to regulatory agencies (i.e., USEPA Region 2 and New York State Department of Environmental Conservation [NYSDEC] Region 9) prior to and following site development are described in Section 2.9. Property owners or their authorized agents shall notify the USEPA and NYSDEC immediately after encountering any substance that indicates signs of environmental impact as described in Section 2.1. Responsibility for its implementation is incorporated into an environmental easement filed with the Cattaraugus County Clerk (see Part III of the Site Management Plan). As such, the responsibility for implementation of the SFMP shall run with the land.

Site developers, lessees, licensees and contractors to the property owner will be provided copies of the SFMP by the property owner and will be required by written agreement not to perform, contract, or permit their employees, agents, or assigns to engage in any intrusive activities at the Site, except as delineated in this Plan.

Upon transfer of ownership of the Site or portions of the Site, the new owner(s) will be responsible for implementing this SFMP. The USEPA or NYSDEC may provide periodic construction oversight and monitoring during site redevelopment activities to verify adherence to the requirements of this SFMP.

2.0 SOIL/FILL MANAGEMENT

2.1 Excavation and Handling of On-Site Soil/Fill

During intrusive work on the Site (excluding incidental surficial landscaping maintenance or intrusive work completely within the confines of the above-described clean utility corridor), an Environmental Professional (refer to ASTM E1527-05 for definition) with experience in environmental site investigations will inspect excavations or disturbances on behalf of the property owner, lessee, licensee, and/or developer. The excavated material will be inspected for signs of environmental impact, including:

- Visual or olfactory evidence of impact. This would include observed petroleum or chemical product, sheens or chemical/petroleum odors.
- Obvious signs of sludge fill material as evidenced by strong ammonia or sulfur odors and/or traces of animal hair.
- Other waste materials, excluding inert construction and demolition debris as described below or cindery fill material, which are expected to be encountered at various locations across the Site

In addition, excavations will also be field screened for the presence of VOCs with a photoionization detector (PID) or similar device for field detection of volatile organic compounds. The PID will be calibrated as per the manufacturer's requirements. Soil/fill material exhibiting sustained readings in the excavation atmosphere greater than 5 parts per million (ppm) above background will be considered impacted.

2.1.1 Impacted Soil/Fill

If soil/fill is encountered outside of the 5-acre Elevated Fill Subarea that exhibits one or more signs of impact as described above, the USEPA will be contacted and a cleanup plan for addressing the impacted material will be developed. Depending on the nature of the finding and the status of the Site, the USEPA may delegate responsibility for approval and oversight of the cleanup plan to the NYSDEC. The cleanup plan will likely involve excavation and off-site disposal of the observed impacted material at an approved off-site treatment, storage or disposal facility. A licensed transporter shall be employed for off-site disposal activities.

If off-site disposal is selected as the remedial approach, analysis for disposal purposes will be in accordance with the protocols delineated in Section 2.3 of this SFMP.

2.1.2 Inert C&D Debris and Cindery Fill

Inert, un-impacted construction and demolition (C&D) debris (e.g., concrete, brick, wood or structural metal) attributable to demolition of the former factory buildings and associated facilities may be encountered during excavation activities at the site. These materials are not considered impacted unless they are intermingled with soil/fill materials exhibiting characteristics described in Section 2.1. In addition, the Remedial Investigation (Ref. 1) identified cindery fill materials across most areas of the Site. These materials were characterized by a primarily dark gray to black silty sand matrix with various mixtures of gravel, cinders and ash, slag, and intermingled construction and demolition debris. The presence of these cindery fill materials is not considered an unknown subsurface condition and therefore is not considered to represent environmental impact warranting notice to the USEPA or NYSDEC unless they are intermingled with soil/fill materials exhibiting characteristics described in Section 2.1.

If inert C&D materials are encountered from the demolition of the remaining former factory and facility foundations, they may be: disposed offsite in accordance with applicable disposal regulations; managed and consolidated onsite for use as subgrade fill (providing they are structurally suitable for such use); or recycled for offsite use. If any C&D debris is to be recycled for off-site use, the USEPA must be contacted for approval. If the materials are to be used in New York State, a Beneficial Use Determination (BUD) from the NYSDEC may be required. The need for a BUD will be determined on a case by case basis with the NYSDEC.

2.1.3 Export of Soil/Fill

No soil/fill material shall be exported from the site for off-site reuse. If excess soil/fill materials are generated and cannot be reused as subgrade fill per Section 2.2, the USEPA shall be informed of the plan for disposal of the material. In such instance the material shall be characterized in accordance with Section 2.3 and properly disposed off-site in a RCRA-permitted treatment, storage and disposal facility or state permitted solid waste disposal facility. A licensed transporter shall be employed for off-site disposal activities. The property owner, developer or lessee generating the excess soil/fill shall be considered

the Generator and shall designate an authorized representative to prepare, sign, track and submit to the required agencies copies of hazardous and/or non-hazardous waste manifests, as appropriate. The generator will be responsible for all transportation and disposal fees and taxes.

2.2 Subgrade Backfill Material

2.2.1 Use Criteria

Subgrade material used to backfill excavations or to increase site grades or elevations prior to or beneath final surface cover may be comprised of excavated on-site soil/fill, inert C&D debris, or off-site soil/fill. The criteria under which these materials may be used as subgrade backfill are presented below.

- **Excavated, On-Site Soil/Fill or Inert C&D Debris:** Soil/fill that is excavated from the Site, including soils excavated for the purpose of accessing impacted soils (e.g., shallow soils overlying deeper impacted soils) may be used on-site as subgrade backfill provided it does not exhibit signs of impact as described in Section 2.1.
- **Off-Site Soil/Fill:** Off-site soil/fill may be used as subgrade backfill provided that it originates from known sources having no evidence of disposal or releases of hazardous substances; hazardous, toxic or radioactive wastes; or petroleum, and is tested and meet the criteria shown on Table 1[2]. In addition, no off-site materials meeting the definition of a solid waste as defined in 6 NYCRR, Part 360-1.2 (a) shall be used as backfill.
- **Other Off-Site Material:** The following material may be imported, without chemical testing, as backfill beneath pavement, building floors or the final soil cover (i.e., the uppermost 1 or 2 feet, depending on the site's use restriction), provided it contains less than 10% (by weight) material that would pass through a size 200 sieve: 1) Rock or stone, consisting of virgin material from a permitted mine or quarry; 2) Recycled concrete, brick, or asphalt from a NYSDEC-registered or permitted C&D debris processing facility (as specified in Section 360-16.1 of 6 NYCRR Part 360) that conforms to Section 304 of the New York State Department of Transportation Standard Specifications Construction and Materials Volume 1 (2002). As stated in Section 360-16.4(b)(2), the facility may only accept recognizable, uncontaminated, non-pulverized C&D debris or C&D debris from other authorized C&D processing

[2] The criteria presented in Table 1 represent the lesser of Commercial Soil Cleanup Objectives (SCOs) or levels protective of groundwater quality as published in 6NYCRR Part 375-6.8.

facilities. According to Section 360-16.2(c), "uncontaminated" means C&D debris that is not mixed or commingled with other solid waste at the point of generation, processing, or disposal, and that is not contaminated with spills of a petroleum product, hazardous waste, or industrial waste.

2.2.2 Subgrade Borrow Source Sampling Requirements

Off-site subgrade borrow soils shall be tested to assure conformance with the criteria identified on Table 1. If an off-site soil/fill borrow source is of unknown origin or originates from a previously-developed commercial, industrial or urban site, then a tiered approach based on the volume of impacted soil/fill being excavated will be used to determine the frequency of characterization sampling. In such instances, a minimum of one sample will be collected for each 250 cubic yards (CY) up to 1,000 CY of material excavated. If more than 1,000 CY of soil/fill are excavated from the same general vicinity and all samples of the first 1,000 CY meet the criteria listed in Table 1, the sample collection frequency may be reduced to one sample for each additional 1,000 CY of soil/fill from the same general vicinity, up to 5,000 CY. For borrow sources greater than 5,000 CY, sampling frequency may be reduced to one sample per 5,000 CY, provided all earlier samples met Table 1 criteria.

For off-site soil borrow sources originating from known, virgin sources, a similar sampling frequency as described above will be employed but initial sampling will be at a frequency of one per 1,000 CY in lieu of one per 250 CY.

Grab samples will be collected for VOC analysis. For all other required analyses, a minimum of four grab samples will be collected to form a single composite sample. Approximately equal aliquots of the grab samples will be composited in the field using a stainless steel trowel and bowl. The trowel and bowl shall be decontaminated with a non-phosphate detergent (e.g., Alconox®) and potable water wash solution followed by a distilled water rinse between sampling locations. The soil/fill samples will be analyzed in accordance with USEPA SW-846 Methodology by a New York State Department of Health (NYSDOH) ELAP-certified laboratory.

Analytical results must be maintained on file for review in support of the periodic institutional and engineering control certification required per the Environmental Easement.

2.3 Impacted Soil/Fill Sampling and Analysis Protocol

Soil/fill encountered during intrusive redevelopment or maintenance-related activities outside of the Elevated Fill Subarea that exhibits signs of environmental impact will be temporarily left in place pending development of a cleanup approach, or excavated and transferred to plastic sheeting in an area away from primary work activities and then sampled to determine whether it is subject to special disposal requirements. No redevelopment activity shall occur within the Elevated Fill Subarea (see Figure 2) unless it is pre-approved by the USEPA and NYSDEC and does not interfere with the integrity of the Elevated Fill Subarea cover system.

Excavated soil/fill that is designated for off-site disposal will be sampled in accordance with the requirements of the off-site disposal facility and the appropriate regulatory authorities. In addition, the resulting excavation following removal of impacted soil/fill may require verification sampling and analysis to determine the limits of impact. Both characterization and verification sampling and analysis are discussed in the following sections.

2.3.1 Impacted Soil/Fill Characterization

The following procedure represents a suggested method for determining off-site disposal requirements for impacted soil/fill designated for off-site disposal. The sampling procedures, frequency, and parameter list must be coordinated with the off-site disposal facility prior to undertaking characterization work.

- Excavated soil/fill should be separately stockpiled in 250 CY or smaller piles. A single grab sample will be collected from each stockpile, with the grab biased toward the zone displaying the most elevated field PID reading or field evidence of impact. If the stockpiles are from a single source area, sampling may be reduced to one sample per 1,000 CY following receipt of data from four 250 CY stockpiles.
- The grab samples will be analyzed by a New York State Department of Health (NYSDOH) ELAP-certified laboratory for leachable (RCRA-listed) metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and herbicides per 40 CFR Part 261. Analyses will be in accordance with the toxicity characteristic leaching procedure (TCLP) and USEPA SW-846 methodology. Additional parameters, including cyanide/sulfide reactivity, ignitibility (flashpoint), pH and PCBs may be required for disposal characterization purposes.

- If the material is determined to be hazardous by state or federal definition, the soil/fill will be transported to a RCRA-permitted Treatment Storage and Disposal Facility (TSDF). If the material is deemed non-hazardous, the soil/fill may be disposed off-site at a permitted solid waste disposal facility.

2.3.2 Verification Sampling

Field evidence of impact will prompt the need for soil/fill removal and define the limits of excavation. In general, excavation of soil/fill will continue laterally and vertically until field evidence of impact does not remain and/or the USEPA or NYSDEC agrees that no further excavation is required. The location and approximate dimensions (i.e., length, width, and depth) of the excavation and associated excavation quantities will be documented. Post-excavation verification samples will not be collected unless specifically required by the USEPA or NYSDEC, in which case a verification sampling approach will be prepared and presented for approval as part of the remedial plan referenced in Section 2.1.1. Backfill materials will conform to Section 2.2.1 requirements for Subgrade materials and Section 2.4 requirements for final surface coverage.

2.4 Final Surface Coverage

The property is currently vacant and is zoned industrial. The Environmental Easement restricts reuse or redevelopment of the Site to a public park. Vegetated soil cover or other structural surface coverage (e.g., asphalt parking/roadways, buildings, or concrete), or a combination thereof, must be placed to prevent contact with site Soil/Fill and imported subgrade soil/fill prior to changing the site use to a public park. Surface cover must be placed over all areas of the site excluding the Elevated Fill Subarea, which was covered with imported soil during the remedial measures construction.

The thickness and characteristics of the cover will be determined based on the constructed park use. In accordance with 6NYCRR Part 375-1.8(g)(2), passive recreational uses are uses with limited potential for soil contact and fall within the category of "commercial use" as defined in the Part 375 regulations. Active recreational uses are defined as uses with reasonable potential for soil contact and fall within the category of "restricted residential use" as defined in the Part 375 regulations.

2.4.1 Passive Recreational Use

If the property will be used for passive recreational purposes, areas where structural cover is placed over subgrade soils must be comprised of asphalt, concrete or similar materials providing at least 6 inches of barrier between surface and underlying soil/fill. Areas where vegetated soil cover is placed over subgrade soils must provide for at least a one foot thick soil barrier between surface and underlying soil/fill. The soil cover must meet the chemical quality criteria for passive recreational uses per Table 2, or as otherwise approved in writing by the NYSDEC. These values represent the lower of commercial health-based SCOs or levels protective of groundwater quality per 6NYCRR Part 375-6.8(b).

2.4.2 Active Recreational Use

If all or portions of the property will be used for active recreational purposes, areas where structural cover is placed over subgrade soils must be comprised of asphalt, concrete or similar materials providing at least 6 inches of barrier between surface and underlying soil/fill. In areas where active recreational use is contemplated, vegetated soil cover must be placed over subgrade soils to provide for at least a two foot thick soil barrier between surface and underlying soil/fill. The soil cover must meet the chemical quality criteria for passive recreational uses per Table 2, or as otherwise approved in writing by the NYSDEC. These values represent the lower of restricted-residential health-based SCOs or levels protective of groundwater quality per 6NYCRR Part 375-6.8(b).

2.4.3 Cover Soil Borrow Source Sampling Requirements

Off-site borrow soils used for surface cover shall be tested to assure conformance with the applicable criteria identified on Table 2. Sample collection methodology and frequency shall follow the same procedure as described in Section 2.2.2.

Analytical results must be maintained on file for review in support of the periodic institutional and engineering control certification required per the Environmental Easement.

2.4.4 Vegetation

The upper 6-inches of the vegetated cover soil must be of suitable quality to support vegetation. In general, this would be a well-graded topsoil with a pH of 5.5 – 7.6, a minimum organic content of 2.5%, and a soluble salt content not greater than 500 parts per

million. Vegetation must be comprised of grasses or other plantings sufficiently dense to prevent wind and surface water erosion.

As described in Section 2.9, periodic certifications indicating that the final vegetated soil cover has been maintained are required.

2.5 Erosion Controls

An important element of soil/fill management on this site is the mitigation and control of surface erosion from stormwater runoff. For this reason, a Master Erosion Control Plan to be used by all developer or others has been prepared and incorporated as Appendix A.

2.6 Dust Controls

Particulate monitoring will be performed along the downwind perimeter of the Site during subgrade excavation, grading, and handling activities in accordance with the NYSDOH Generic Community Monitoring Plan and NYSDEC Technical Assistance and Guidance Memorandum (TAGM) 4031: Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites (see Appendix B). Dust suppression techniques will be employed as necessary to mitigate fugitive dust from non-vegetated or disturbed soil/fill during post-remediation construction and redevelopment.

Techniques to be used may include one or more of the following:

- Applying water on haul roads.
- Wetting equipment and excavation faces.
- Hauling materials in properly tarped containers or vehicles.
- Restricting vehicle speeds on-site.
- Covering or proof-rolling excavated areas and materials after excavation activity ceases.
- Reducing the excavation size and/or number of excavations.

All reasonable attempts will be made to keep visible and/or fugitive dust to a minimum.

2.7 Fencing and Access Control

Interior temporary fencing shall be erected and maintained as necessary during construction activities to control access to open excavations and construction areas. Temporary fencing will be relocated as necessary as construction proceeds. All temporary fencing will be posted with "No Trespassing" signs.

2.8 Property Use Limitations

An environmental easement has been prepared for the Site (see SMP Section III) and was filed with Cattaraugus County. The environmental easement includes:

- Use restrictions for redevelopment of the Site only as a park.
- Prohibition on the extraction of groundwater and any activities that would interfere with, or adversely affect, the integrity or protectiveness of the Elevated Fill Subarea cap and groundwater/leachate collection system.
- Requirements for periodic certification as discussed in Section 2.9.

Upon transfer of ownership of the Site or portions of the Site, the new owner(s) will be responsible for adapting and implementing this SFMP in accordance with the environmental easement.

2.9 Notification and Reporting Requirements

The USEPA and NYSDEC will be notified by the property owners five working days prior to any new significant intrusive activities planned for the Site. An Environmental Professional shall inspect all subsurface excavation work for conformance with this SFMP (see Section 2.1). Per the environmental easement, the property owner(s) shall complete and submit to the USEPA and NYSDEC a periodic report (every 3 years per the Easement): (i) containing certification by a NY State Licensed Professional Engineer that the institutional and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with NYSDEC/USEPA-approved modifications; (ii) allowing the NYSDEC and USEPA access to the Site; and (iii) stating that nothing has occurred that would impair the ability of the control to protect public health or the environment, or to constitute a violation or failure to comply with the Site Management Plan unless otherwise approved by the NYSDEC and USEPA.

If the cover system has been breached during the period covered by the periodic report, the property owner(s) shall include a certification that all work was performed in conformance with the SFMP and indicate the corrective action that was taken to repair the breach.

3.0 HEALTH AND SAFETY PROCEDURES

During intrusive activities, the developer will be responsible for implementing suitable procedures to prevent both Site construction workers and the community from adverse exposure to residual parameters of concern and other potential hazards posed by the work. This will be accomplished through adherence to a written site-specific worker Health and Safety Contingency Plan (HSCP), prepared and implemented as part of the remedial measures for the Site. The HSCP must be prepared in accordance with the regulations contained in OSHA 29CFR 1910.120, and include a Community Air Monitoring Plan (CAMP) in conformance with NYSDOH requirements. The HSCP and CAMP will be implemented during post-remedial construction work involving disturbance or handling of Site soil/fill. The developer's HSCP and CAMP shall be equally or more stringent as the HSCP and CAMP included as Appendix B to the RD Work Plan (Ref. 4).

4.0 REFERENCES

1. Geomatrix Consultants, Inc. & Benchmark Environmental Engineering and Science, PLLC, November 2003. *Remedial Investigation Report – Final, Peter Cooper Landfill Site, Gowanda, NY.*

2. University at Buffalo Center for Integrated Waste Management, December 2002. *Reuse Assessment and Concept Plan – Peter Cooper Gowanda Superfund Site.*

3. Benchmark Environmental Engineering and Science, PLLC, July 2004 and revised June 2005. *Feasibility Report – Final, Peter Cooper Landfill Site, Gowanda, NY.*

4. Benchmark Environmental Engineering and Science, PLLC. August 2010. *Remedial Action Report for the Peter Cooper Landfill Superfund Site, Gowanda, New York.*

TABLES

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TABLE 1

CRITERIA FOR USE OF BORROW SOURCE SOIL AS SUBGRADE MATERIAL

Soil/Fill Management Plan
Peter Cooper Landfill NPL Site
Gowanda, New York

Parameter	Subgrade Soil Criteria[1]
Metals (mg/kg)	
Arsenic	16
Barium	400
Beryllium	47
Cadmium	7.5
Chromium, Hexavalent[2]	19
Chromium, Trivalent[2]	1500
Copper	270
Cyanide	27
Lead	450
Manganese	2000
Mercury (total)	0.73
Nickel	130
Selenium	4
Silver	8.3
Zinc	2480
PCBs/Pesticides (mg/kg)	
2,4,5-TP Acid (Silvex)	3.8
4,4'-DDE	17
4,4'-DDT	47
4,4'-DDD	14
Aldrin	0.19
Alpha-BHC	0.02
Beta-BHC	0.09
Chlordane (alpha)	2.9
Delta-BHC	0.25
Dibenzofuran	210
Dieldrin	0.1
Endosulfan I	102
Endosulfan II	102
Endosulfan sulfate	200
Endrin	0.06
Heptachlor	0.38
Lindane	0.1
Polychlorinated biphenyls	1

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TABLE 1

CRITERIA FOR USE OF BORROW SOURCE SOIL AS SUBGRADE MATERIAL

Soil/Fill Management Plan
Peter Cooper Landfill NPL Site
Gowanda, New York

Parameter	Subgrade Soil Criteria[1]
Semi-Volatile Organic Compounds (mg/kg)	
Acenaphthene	98
Acenaphthylene	107
Anthracene	500
Benzo(a)anthracene	1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	1.7
Benzo(g,h,i)perylene	500
Benzo(k)fluoranthene	1.7
Chrysene	1
Dibenz(a,h)anthracene	0.56
Fluoranthene	500
Fluorene	386
Indeno(1,2,3-cd)pyrene	5.6
m-Cresol(s)	0.33
Naphthalene	12
o-Cresol(s)	0.33
p-Cresol(s)	0.33
Pentachlorophenol	0.8
Phenanthrene	500
Phenol	0.33
Pyrene	500
Volatile Organic Compounds (mg/kg)	
1,1,1-Trichloroethane	0.68
1,1-Dichloroethane	0.27
1,1-Dichloroethene	0.33
1,2-Dichlorobenzene	1.1
1,2-Dichloroethane	0.02
1,2-Dichloroethene(cis)	0.25
1,2-Dichloroethene(trans)	0.19
1,3-Dichlorobenzene	2.4
1,4-Dichlorobenzene	1.8
1,4-Dioxane	0.1
Acetone	0.05
Benzene	0.06
Butylbenzene	12
Carbon tetrachloride	0.76
Chlorobenzene	1.1
Chloroform	0.37
Ethylbenzene	1
Hexachlorobenzene	3.2

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TABLE 1

CRITERIA FOR USE OF BORROW SOURCE SOIL AS SUBGRADE MATERIAL

Soil/Fill Management Plan
Peter Cooper Landfill NPL Site
Gowanda, New York

Parameter	Subgrade Soil Criteria[1]
Volatile Organic Compounds (mg/kg)	
Methyl ethyl ketone	0.12
Methyl tert-butyl ether	0.93
Methylene chloride	0.05
Propylbenzene-n	3.9
Sec-Butylbenzene	11
Tert-Butylbenzene	5.9
Tetrachloroethene	1.3
Toluene	0.7
Trichloroethene	0.47
Trimethylbenzene-1,2,4	3.6
Trimethylbenzene-1,3,5	8.4
Vinyl chloride	0.02
Xylene (mixed)	1.6

Notes:

1. Subgrade use criteria are lesser of concentrations protective of groundwater or commercial health-based Soil Cleanup Objectives (SCOs) per 6NYCRR Part 375-6.8(b).

2. The SCO for Hexavalent or Trivalent Chromium is considered to be met if the analysis for the total species of this contaminant is below the specific SCO for Hexavalent Chromium.

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TABLE 2

CRITERIA FOR USE OF BORROW SOURCE SOIL AS COVER MATERIAL

Soil/Fill Management Plan
Peter Cooper Landfill NPL Site
Gowanda, New York

Parameter	Passive Recreation Areas (requires 1 ft depth of material)	Active Recreation Areas (requires 2 ft depth of cover soil)
	Cover Soil Criteria[1]	Cover Soil Criteria[2]
Metals (mg/kg)		
Arsenic	16	16
Barium	400	400
Beryllium	47	47
Cadmium	7.5	4.3
Chromium, Hexavalent[3]	19	19
Chromium, Trivalent[3]	1500	180
Copper	270	270
Cyanide	27	27
Lead	450	400
Manganese	2000	2000
Mercury (total)	0.73	0.73
Nickel	130	130
Selenium	4	4
Silver	8.3	8.3
Zinc	2480	2480
PCBs/Pesticides (mg/kg)		
2,4,5-TP Acid (Silvex)	3.8	3.8
4,4'-DDE	17	8.9
4,4'-DDT	47	7.9
4,4'-DDD	14	13
Aldrin	0.19	0.097
Alpha-BHC	0.02	0.02
Beta-BHC	0.09	0.09
Chlordane (alpha)	2.9	2.9
Delta-BHC	0.25	0.25
Dibenzofuran	210	59
Dieldrin	0.1	0.1
Endosulfan I	102	24
Endosulfan II	102	24
Endosulfan sulfate	200	24
Endrin	0.06	0.06
Heptachlor	0.38	0.38
Lindane	0.1	0.1
Polychlorinated biphenyls	1	1

BENCHMARK
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TABLE 2

CRITERIA FOR USE OF BORROW SOURCE SOIL AS COVER MATERIAL

Soil/Fill Management Plan
Peter Cooper Landfill NPL Site
Gowanda, New York

Parameter	Passive Recreation Areas (requires 1 ft depth of material)	Active Recreation Areas (requires 2 ft depth of cover soil)
	Cover Soil Criteria[1]	Cover Soil Criteria[2]
Semi-Volatile Organic Compounds (mg/kg)		
Acenaphthene	98	98
Acenaphthylene	107	100
Anthracene	500	100
Benzo(a)anthracene	1	1
Benzo(a)pyrene	1	1
Benzo(b)fluoranthene	1.7	1
Benzo(g,h,i)perylene	500	100
Benzo(k)fluoranthene	1.7	1.7
Chrysene	1	1
Dibenz(a,h)anthracene	0.56	0.33
Fluoranthene	500	100
Fluorene	386	100
Indeno(1,2,3-cd)pyrene	5.6	0.5
m-Cresol(s)	0.33	0.33
Naphthalene	12	12
o-Cresol(s)	0.33	0.33
p-Cresol(s)	0.33	0.33
Pentachlorophenol	0.8	0.8
Phenanthrene	500	100
Phenol	0.33	0.33
Pyrene	500	100
Volatile Organic Compounds (mg/kg)		
1,1,1-Trichloroethane	0.68	0.68
1,1-Dichloroethane	0.27	0.27
1,1-Dichloroethene	0.33	0.33
1,2-Dichlorobenzene	1.1	1.1
1,2-Dichloroethane	0.02	0.02
1,2-Dichloroethene(cis)	0.25	0.25
1,2-Dichloroethene(trans)	0.19	0.19
1,3-Dichlorobenzene	2.4	2.4
1,4-Dichlorobenzene	1.8	1.8
1,4-Dioxane	0.1	0.1
Acetone	0.05	0.05
Benzene	0.06	0.06
Butylbenzene	12	12
Carbon tetrachloride	0.76	0.76

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TABLE 2

CRITERIA FOR USE OF BORROW SOURCE SOIL AS COVER MATERIAL

Soil/Fill Management Plan
Peter Cooper Landfill NPL Site
Gowanda, New York

Parameter	Passive Recreation Areas (requires 1 ft depth of material)	Active Recreation Areas (requires 2 ft depth of cover soil)
	Cover Soil Criteria[1]	Cover Soil Criteria[2]
Volatile Organic Compounds (mg/kg)		
Chlorobenzene	1.1	1.1
Chloroform	0.37	0.37
Ethylbenzene	1	1
Hexachlorobenzene	3.2	1.2
Methyl ethyl ketone	0.12	0.12
Methyl tert-butyl ether	0.93	0.93
Methylene chloride	0.05	0.05
Propylbenzene-n	3.9	3.9
Sec-Butylbenzene	11	11
Tert-Butylbenzene	5.9	5.9
Tetrachloroethene	1.3	1.3
Toluene	0.7	0.7
Trichloroethene	0.47	0.47
Trimethylbenzene-1,2,4	3.6	3.6
Trimethylbenzene-1,3,5	8.4	8.4
Vinyl chloride	0.02	0.02
Xylene (mixed)	1.6	1.6

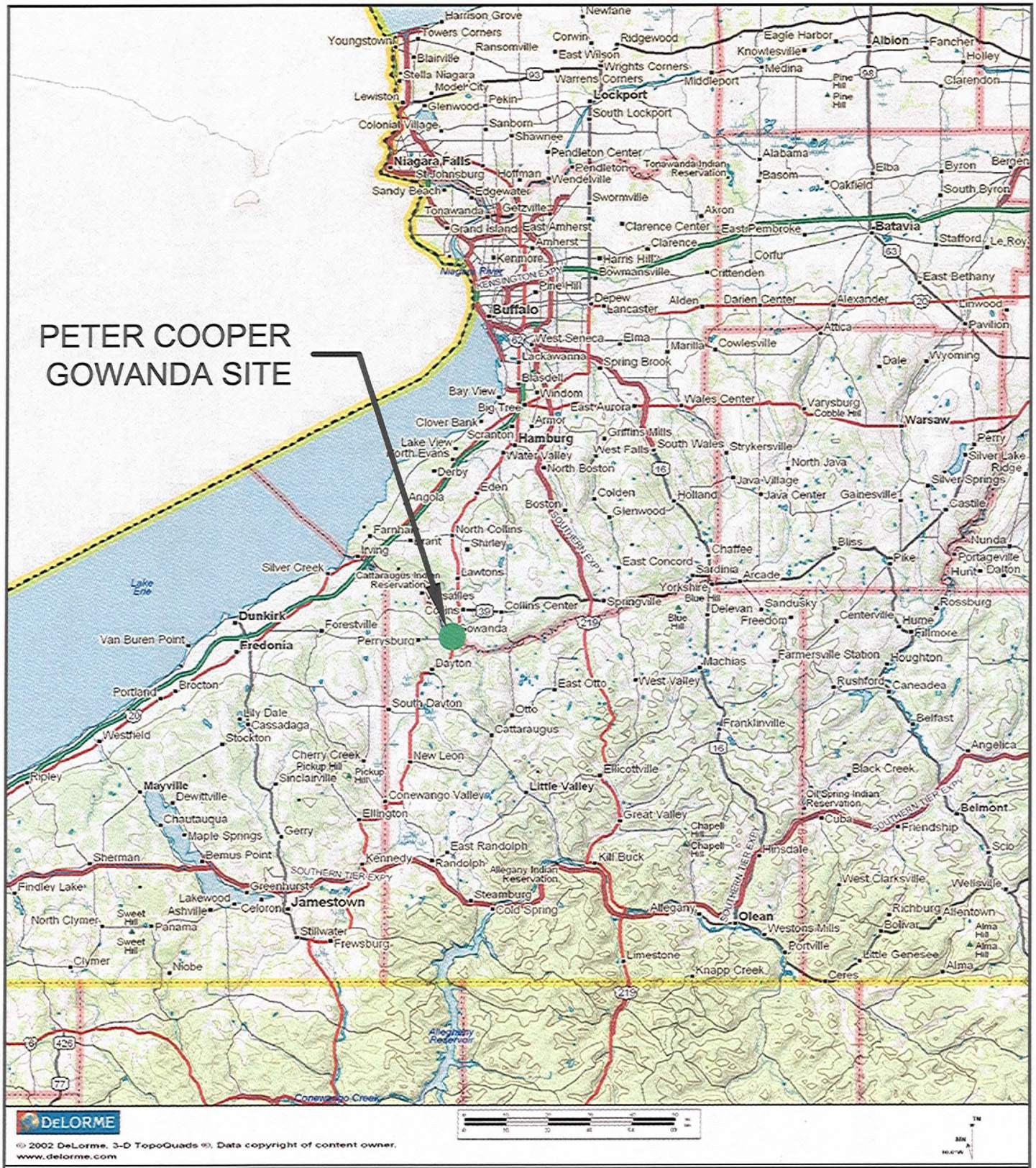
Notes:

1. Passive recreation cover soil use criteria are lesser of concentration protective of groundwater or commercial health-based soil cleanup objectives (SCOs) per 6NYCRR Part 375-6.8(b).
2. Active recreation cover soil use criteria are lesser of concentration protective of groundwater or restricted-residential health-based soil cleanup objectives (SCOs) per 6NYCRRR Part 375-6.8(b).
3. The SCO for Hexavalent or Trivalent Chromium is considered to be met if the analysis for the total species of this contaminant is below the specific SCO for Hexavalent Chromium.

FIGURES

F:\CAD\Benchmark\Collier Shannon\Gowanda Site\Site Management Plan\SFMP\Figure 1; Regional Vicinity Map.dwg, 6/3/2009 3:49:41 PM, Adobe PDF

FIGURE 1



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PROJECT NO.: 0021-001-900

DATE: JUNE 2009

DRAFTED BY: AJZ

REGIONAL VICINITY MAP

SOIL/FILL MANAGEMENT PLAN

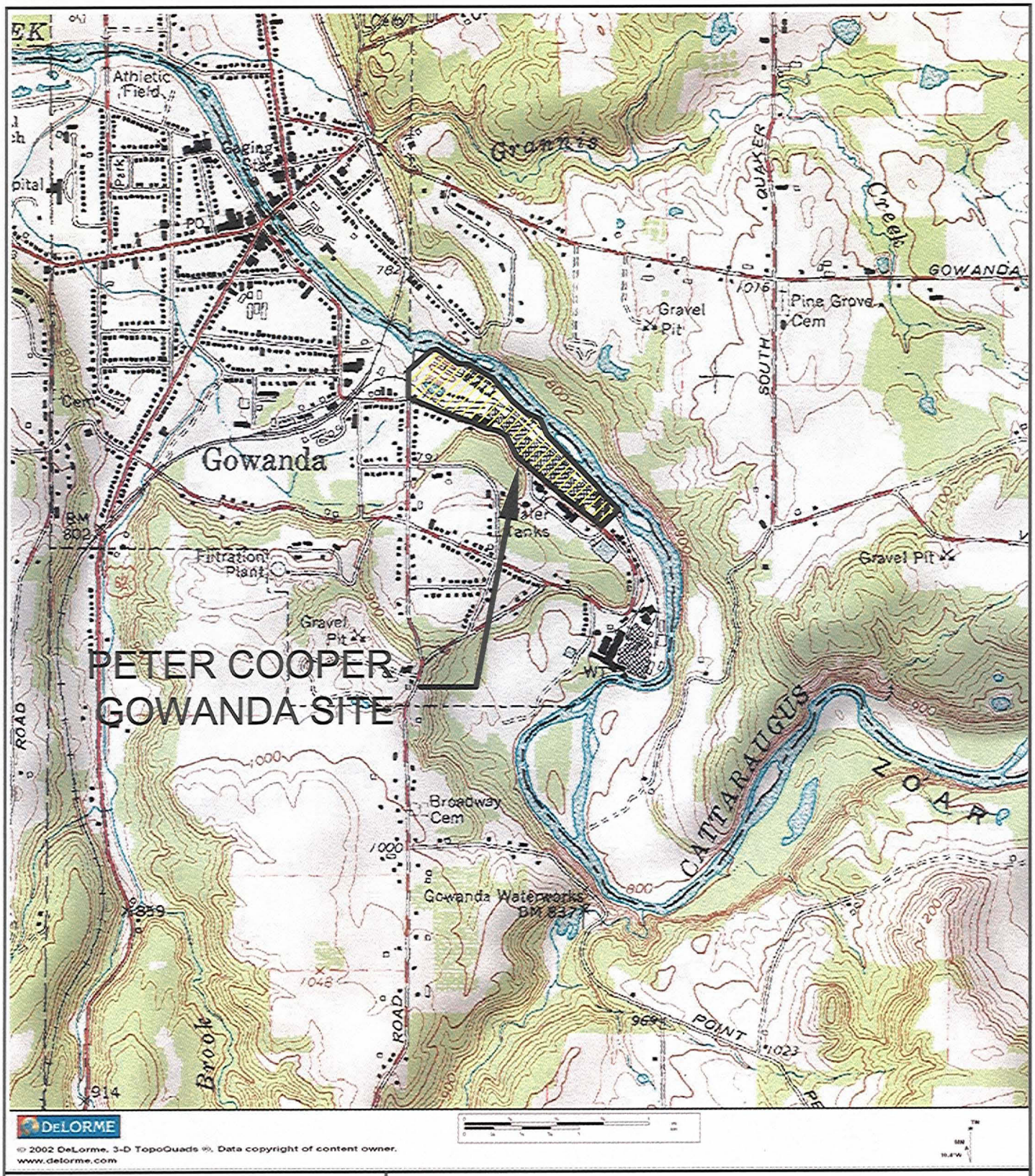
PETER COOPER GOWANDA SITE
GOWANDA, NEW YORK

PREPARED FOR

COOPERATING PRPs FOR PETER COOPER GOWANDA SITE

F:\CAD\Benchmark\Collier Shannon\Gowanda Site\Site Management Plan\SFMP\Figure 2; Site Location Map.dwg, 6/3/2009 3:59:11 PM, Adobe PDF

FIGURE 2



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PROJECT NO.: 0021-001-900

DATE: JUNE 2009

DRAFTED BY: AJZ

SITE LOCATION MAP

SOIL/FILL MANAGEMENT PLAN

PETER COOPER GOWANDA SITE
GOWANDA, NEW YORK

PREPARED FOR

COOPERATING PRPs FOR PETER COOPER GOWANDA SITE

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EXISTING CONCRETE DAM

NYSEG PROPERTY (APPROXIMATE)

ERIE COUNTY

CATTARAUGUS COUNTY

FORMER SLUICEWAY

CATTARAUGUS CREEK

INACTIVE LANDFILL AREA

FORMER MANUFACTURING PLANT AREA (SEE FIGURE 4)

APPROXIMATE DIVIDING LINE BETWEEN LANDFILL AREA & MANUFACTURING AREA

MW-1S MW-1SR MW-2S(R) MW-5 MW-6 MW-7S GMW-1 GMW-2 GMW-3

LEGEND:

- MW-1S — MONITORING WELL LOCATION
- GMW-1 — LANDFILL GAS MONITORING WELL LOCATION
- APPROXIMATE ELEVATED FILL SUBAREA LIMIT
- PROPERTY BOUNDARY

120' 0' 120' 240'

SCALE: 1 INCH = 120 FEET
SCALE IN FEET
(approximate)

DATE: JUNE 2009
DRAFTED BY: AJZ

BENCHMARK
ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC
2558 HAMBURG TURNPIKE
SUITE 300
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JOB NO.: 0021-001-900

INACTIVE LANDFILL AREA SITE MAP

SOIL/FILL MANAGEMENT PLAN

PETER COOPER GOWANDA SITE
GOWANDA, NEW YORK

PREPARED FOR
COOPERATING PRPs FOR PETER COOPER GOWANDA SITE

FIGURE 3

DATE: JUNE 2009
DRAFTED BY: AJZ

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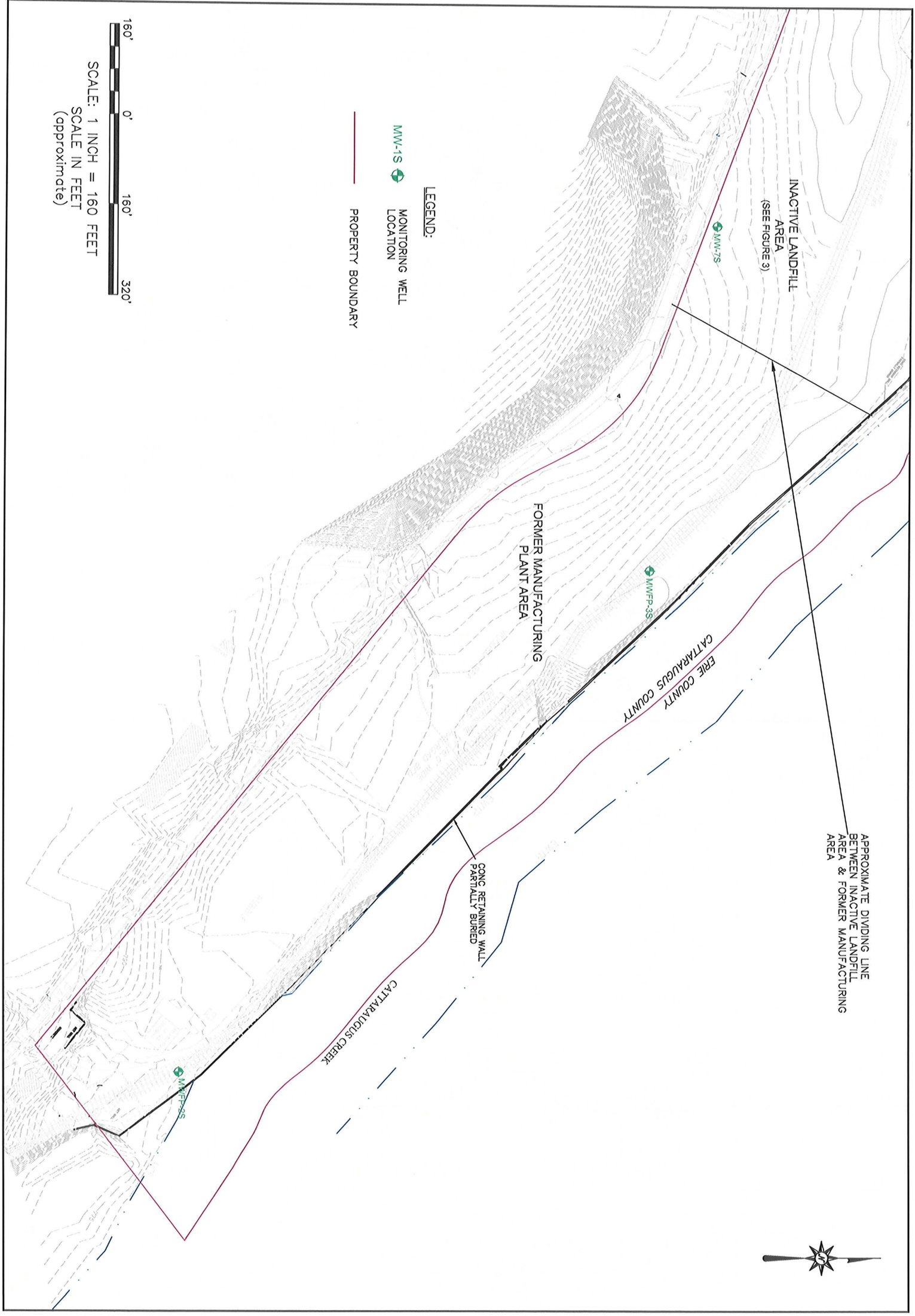

FIGURE 4

FORMER MANUFACTURING PLANT AREA SITE MAP

SOIL/FILL MANAGEMENT PLAN

PETER COOPER GOWANDA SITE
GOWANDA, NEW YORK

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APPROXIMATE LIMITS OF EXISTING NYSEG BANK STABILIZATION (i.e., RIP RAP) (BLUE HATCH)

APPROXIMATE LIMITS OF PROPOSED BANK STABILIZATION (0.24 ACRES) (BROWN HATCH)

APPROXIMATE LOCATION OF LEACHATE COLLECTION TRENCH KEYED INTO BEDROCK (637' LONG) (RED LINE)

EXISTING CONCRETE DAM

NYSEG PROPERTY (APPROXIMATE)

LIFT STATION TO FORCE MAIN

HDPE FORCE MAIN (836' LONG)

APPROXIMATE ELEVATED FILL SUBAREA LIMIT

TIE-IN TO EXISTING OR NEW MANHOLE ON SANITARY SEWER

APPROXIMATE DIVIDING LINE BETWEEN LANDFILL AREA & MANUFACTURING AREA

INACTIVE LANDFILL AREA

FORMER MANUFACTURING PLANT AREA (SEE FIGURE 4)

FORMER MANUFACTURING PLANT AREA

ERIE COUNTY

CATTARAUGUS COUNTY

FORMER SLUICEWAY

CATTARAUGUS CREEK

SUBAREA LFSS-6 APPROXIMATE EXCAVATION AREA

SUBAREA MWFP-3 APPROXIMATE EXCAVATION AREA

CONC RETAINING WALL PARTIALLY BURIED

SUBAREA SB-2 APPROXIMATE EXCAVATION AREA

SB-2

765

760

755

750

200' 0' 200' 400'

SCALE: 1 INCH = 200 FEET
SCALE IN FEET
(approximate)

DATE: JUNE 2009
DRAFTED BY: AJZ

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REMEDIAL MEASURES
SOIL/FILL MANAGEMENT PLAN
PETER COOPER GOWANDA SITE
GOWANDA, NEW YORK

PREPARED FOR
COOPERATING PRPs FOR PETER COOPER GOWANDA SITE

FIGURE 5

APPENDIX A

MASTER EROSION CONTROL PLAN (MECP)

SOIL/FILL MANAGEMENT PLAN
APPENDIX A

MASTER EROSION CONTROL PLAN (MECP)

PETER COOPER LANDFILL NPL SITE
GOWANDA, NEW YORK

August 2010 0021-010-100

Prepared by:

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

SOIL/FILL MANAGEMENT PLAN
APPENDIX A

MASTER EROSION CONTROL PLAN
PETER COOPER LANDFILL NPL SITE

Table of Contents

APPENDICES

1.0 INTRODUCTION

1.1 Background and History

The Peter Cooper Landfill National Priority List (NPL) Site encompasses approximately 26 acres, and is bordered to the north by Cattaraugus Creek; to the south by Palmer Street; to the west by a former hydroelectric dam and wetland area; and to the east by residential properties. Remedial measures were initiated in June 2009 under an USEPA-issued Order (CERCLA-02-2000-2014).

1.2 Purpose and Scope

The Soil/Fill Management Plan (SFMP) describes protocols for the proper handling of Site soil/fill during post-remedial construction activities. The property owner will be responsible for all monitoring, implementing, and reporting requirements of the SFMP.

Since erosion control will be a critical component in preventing the potential migration of contaminants off-site, this Master Erosion Control Plan (MECP) was prepared to provide guidance to the property owner during intrusive activities on the Site. This MECP is a critical component of the SFMP, is generic in nature, and provides minimum erosion control practices to be used by the current and subsequent property owners.

2.0 GENERAL PERMIT REQUIREMENTS

If construction activities disturb more than 1 acre of land, the Federal Water Pollution Control Act (as amended, 33 U.S.C. 1251 et. seq.) and the New York State Environmental Conservation Law (Article 17, Titles 7 and 8, and Article 70) would apply.

With some exceptions, operators of construction activities that will result in the disturbance of 1 or more acres of land must obtain coverage under SPDES General Permit (GP-0-10-001) prior to the commencement of soil disturbance. Also requiring a permit are construction activities disturbing less than 1 acre if they are part of a larger common plan of development or sale with a planned disturbance of equal to or greater than 1 acre, or activities that are designated by the NYSDEC. The NYSDEC can require a permit for construction activities disturbing less than 1 acre based on the potential for contribution to a violation of a water quality standard or for significant contribution of pollutants to waters of the United States.

To obtain coverage under the general permit, the operator of a construction activity must file a completed Notice of Intent (NOI) with the NYSDEC. Projects where municipalities have separate storm sewer systems (i.e., MS4s, such as the Village of Gowanda) must prepare and submit a submit a Stormwater Pollution Prevention Plan (SWPPP) to the municipality for approval prior to submitting the NOI to the NYSDEC, which must be accompanied by the MS4 signoff. The NOI is an affirmation that a Stormwater Pollution Prevention Plan (SWPPP) has been prepared for the site and will be implemented prior to the commencement of construction activities. Depending on the nature of the project coverage under the general permit will begin either 5 or 60 business days after receipt of a completed NOI by the NYSDEC. The most up to date version of the interactive NOI and SPDES General Permit are available through the NYSDEC's Website at: http://www.dec.ny.gov/chemical/43133.html. To avoid unnecessary duplication costs these documents are not reproduced here.

3.0 POTENTIAL EROSION CONTROL CONCERNS

Potential areas and erosion control concerns during post-remedial construction activities include the following:

- Any disturbed portion of the cover system that requires repair.
- Soil/fill excavations will require proper handling and disposal.
- Runoff from soil stockpiles will require erosion controls.
- Runoff from athletic field construction

4.0 EROSION CONTROL MEASURES

4.1 Background

Standard soil conservation practices need to be incorporated into the construction plans to mitigate soil erosion damage, off-site sediment migration, and water pollution from erosion. These practices combine vegetative and structural measures, many of which will be permanent in nature and become part of the completed project (i.e., drainage channels and grading). Other measures will be temporary and serve only during the construction stage. Selected erosion and sediment control measures will meet the following criteria:

- Minimize erosion through project design (maximum slopes, phased construction, etc.).
- Incorporate temporary and permanent erosion control measures.
- Remove sediment from sediment-laden storm water before it leaves the Site.

4.2 Temporary Measures

Temporary erosion and sedimentation control measures and facilities will be used during post-remedial construction activities. They will be maintained until they are either no longer needed or until such time as permanent measures are installed and become effective. Erosion and sediment controls shall be installed in accordance with the standards and specifications presented in Appendix A-1. At a minimum, the following temporary measures will be used:

- Silt fencing
- Straw/hay bales
- Temporary vegetation/mulching
- Temporary sedimentation basins
- Cautious placement, compaction and grading of stockpiles

4.2.1 Silt Fencing

Construction and regrading activities will result in surface water flow to drainage ditches and swales, storm sewers, and adjacent properties. Silt fencing will be the primary sediment control measure used in these areas. Prior to extensive soil excavation or grading activities, silt fences will be installed along the perimeter of all construction areas. The orientation of the fencing will be adjusted as necessary as the work proceeds to accommodate changing Site conditions.

Intermediate fencing will be used upgradient of the perimeter fencing to help lower surface water runoff velocities and reduce the volume of sediment to perimeter fencing. Stockpiles will also be surrounded with silt fencing.

As sediment collects, the silt fences will be cleaned as necessary to maintain their integrity. Removed sediment will be used elsewhere on-site as general fill. All perimeter silt fences will remain in place until construction activities in an area are completed and vegetative cover has been established.

4.2.2 Straw and/or Hay Bales

Straw and/or hay bales will be used to intercept sediment laden storm water runoff in drainage channels during construction. The use of either hay or straw will be based on the availability of materials at the time of construction.

Bales will be placed in swales and ditches where the anticipated flow velocity is not expected to be greater than 5 feet/second (fps). Intermediate bales will be placed upgradient of the final barrier to reduce flow velocities and sediment loadings where higher velocities are anticipated.

As with silt fencing, sediment will be removed as necessary from behind the bales and disposed of on-site. Bales that have become laden with sediment or that have lost their structural integrity or effectiveness due to the weather will be replaced.

4.2.3 Cautious Placement of Stockpiles

Excavation activities will produce stockpiles of soil and subgrade soil/fill materials. Careful placement and construction of stockpiles will be required to control erosion. Stockpiles will be placed no closer than 50 feet from storm water inlets and parcel

boundaries. Additionally, stockpiles will be graded and compacted as necessary for positive surface water runoff and dust control. Impacted stockpiles will be underlain and covered with secured polyethylene tarpaulin until proper disposal has been secured.

4.3 Permanent Control Measures during Site Redevelopment

Permanent erosion and sedimentation control measures and structures will be installed as soon as practical during construction for long-term erosion protection. Examples of permanent erosion control measures could include:

- Using maximum slopes in erosion prone areas to limit erosion.
- Minimizing the potential contact with, and migration of, subsurface soil/fill through the placement of a "clean" soil cover system in all areas not covered with structures, roads, parking areas, sidewalks, etc.
- Planting and maintaining vegetation.
- Limiting runoff flow velocities to the extent practical.
- Lining collection channels with riprap, erosion control fabric, vegetation, or similar materials.

5.0 CONSTRUCTION MANAGEMENT PRACTICES

5.1 General

The following general construction practices should be evaluated for erosion and sedimentation control purposes during post-remedial construction activities:

- Clearing and grading only as much area as is necessary to accommodate the construction needs to minimize disturbance of areas subject to erosion (i.e., phasing the work).
- Covering exposed or disturbed areas of the Site as quickly as practical.
- Installing erosion and sediment control measures before disturbing the Site subgrade.
- Minimizing on-site and off-site tracking of soil by vehicles using routine entry/ exit routes.

5.2 Monitoring, Inspection, and Maintenance Plan

All erosion and sedimentation controls described in this Plan will be inspected by a qualified representative of the property owner within 24 hours of a heavy rainfall event and repaired or modified as necessary to effectively control erosion of turbidity problems. Inspections should include areas under construction, stockpile areas, erosion control devices (i.e., silt fences, hay bales, etc.), and locations where vehicles enter and leave the Site. Routine inspections of the entire Site should also be made on a monthly basis during development.

If inspections indicate problems, corrective measures should be implemented within 24 hours. A report summarizing the scope of the inspection, name of the inspector, date, observations made, and a description of the corrective actions taken should be completed. Appendix A-2 includes an example of inspection forms to be completed.

APPENDIX A-1

EROSION CONTROL DETAILS

- *Silt Fence*
- *Straw Bale Dike*
- *Perimeter Dike/Swale*
- *Temporary Swale*
- *Sediment Trap for Drop Inlet*

New York State
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Water

New York State Standards and Specifications for Erosion and Sediment Control

August 2005

New York State
Department of Environmental Conservation

George E. Pataki, Governor

STANDARD AND SPECIFICATIONS FOR TEMPORARY CRITICAL AREA PLANTINGS

Definition

Providing erosion control protection to a critical area for an interim period. A critical area is any disturbed, denuded slope subject to erosion.

Purpose

To provide temporary erosion and sediment control. Temporary control is achieved by covering all bare ground areas that exist as a result of construction or a natural event.

Conditions Where Practice Applies

Temporary seedings may be necessary on construction sites to protect an area, or section, where final grading is complete, when preparing for winter work shutdown, or to provide cover when permanent seedings are likely to fail due to mid-summer heat and drought. The intent is to provide temporary protective cover during temporary shutdown of construction and/or while waiting for optimal planting time.

Criteria

Water management practices must be installed as appropriate for site conditions. The area must be rough graded and slopes physically stable. Large debris and rocks are usually removed. Seedbed must be seeded within 24 hours of disturbance or scarification of the soil surface will be necessary prior to seeding.

Fertilizer or lime are not typically used for temporary seedings.

IF: Spring or summer or early fall, then seed the area with ryegrass (annual or perennial) at 30 lbs. per acre (Approximately 0.7 lb./1000 sq. ft. or use 1 lb./1000 sq. ft.).
IF: Late fall or early winter, then seed Certified 'Aroostook' winter rye (cereal rye) at 100 lbs. per acre (2.5 lbs./1000 sq. ft.).

Any seeding method may be used that will provide uniform application of seed to the area and result in relatively good soil to seed contact.

Mulch the area with hay or straw at 2 tons/acre (approx. 90 lbs./1000 sq. ft. or 2 bales). Quality of hay or straw mulch allowable will be determined based on long term use and visual concerns. Mulch anchoring will be required where wind or areas of concentrated water are of concern. Wood fiber hydromulch or other sprayable products approved for erosion control (nylon web or mesh) may be used if applied according to manufacturers' specification. Caution is advised when using nylon or other synthetic products. They may be difficult to remove prior to final seeding.

STANDARD AND SPECIFICATIONS FOR MULCHING

Definition

Applying coarse plant residue or chips, or other suitable materials, to cover the soil surface.

Purpose

The primary purpose is to provide initial erosion control while a seeding or shrub planting is establishing. Mulch will conserve moisture and modify the surface soil temperature and reduce fluctuation of both. Mulch will prevent soil surface crusting and aid in weed control. Mulch is also used alone for temporary stabilization in non-growing months.

Conditions Where Practice Applies

On soils subject to erosion and on new seedings and shrub plantings. Mulch is useful on soils with low infiltration rates by retarding runoff.

Criteria

Site preparation prior to mulching requires the installation of necessary erosion control or water management practices and drainage systems.

Slope, grade and smooth the site to fit needs of selected mulch products.

Remove all undesirable stones and other debris to meet the needs of the anticipated land use and maintenance required.

Apply mulch after soil amendments and planting is accomplished or simultaneously if hydroseeding is used.

Select appropriate mulch material and application rate or material needs. Determine local availability.

Select appropriate mulch anchoring material.

NOTE: The best combination for grass/legume establishment is straw (cereal grain) mulch applied at 2 ton/ acre (90 lbs./1000sq.ft.) and anchored with wood fiber mulch (hydromulch) at 500 – 750 lbs./acre (11 – 17 lbs./1000 sq. ft.). The wood fiber mulch must be applied through a hydroseeder immediately after mulching.

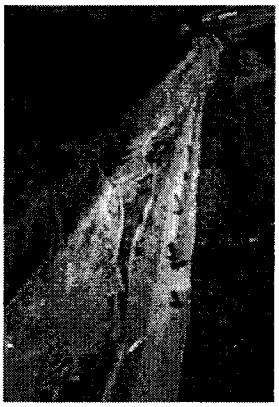
Table 3.7
Guide to Mulch Materials, Rates, and Uses

Mulch Material	Quality Standards	per 1000 Sq. Ft.	per Acre	Depth of Application	Remarks
Wood chips or shavings	Air-dried. Free of objectionable coarse material	500-900 lbs.	10-20 tons	2-7"	Used primarily around shrub and tree plantings and recreation trails to inhibit weed competition. Resistant to wind blowing. Decomposes slowly.
Wood fiber cellulose (partly digested wood fibers)	Made from natural wood usually with green dye and dispersing agent	50 lbs.	2,000 lbs.	—	Apply with hydromulcher. No tie down required. Less erosion control provided than 2 tons of hay or straw.
Gravel, Crushed Stone or Slag	Washed; Size 2B or 3A—1 1/2"	9 cu. yds.	405 cu. yds.	3"	Excellent mulch for short slopes and around plants and ornamentals. Use 2B where subject to traffic. (Approximately 2,000 lbs./cu. yd.). Frequently used over filter fabric for better weed control.
Hay or Straw	Air-dried; free of undesirable seeds & coarse materials	90-100 lbs. 2-3 bales	2 tons (100-120 bales)	cover about 90% surface	Use small grain straw where mulch is maintained for more than three months. Subject to wind blowing unless anchored. Most commonly used mulching material. Provides the best micro-environment for germinating seeds.
Jute twisted yarn	Undyed, unbleached plain weave. Warp 78 ends/yd., Weft 41 ends/ yd. 60-90 lbs./roll	48" x 50 yds. or 48" x 75 yds.	—	—	Use without additional mulch. Tie down as per manufacturers specifications. Good for center line of concentrated water flow.
Excelsior wood fiber mats	Interlocking web of excelsior fibers with photodegradable plastic netting	8" x 100" 2-sided plastic, 48" x 180" 1-sided plastic	—	—	Use without additional mulch. Excellent for seeding establishment. Tie down as per manufacturers specifications. Approximately 72 lbs./roll for excelsior with plastic on both sides. Use two sided plastic for centerline of waterways.
Compost	Up to 3" pieces, moderately to highly stable	3-9 cu. yds.	134-402 cu. yds.	1-3"	Coarser textured mulches may be more effective in reducing weed growth and wind erosion.
Straw or coconut fiber, or combination	Photodegradable plastic net on one or two sides	Most are 6.5 ft. x 3.5 ft.	81 rolls	—	Designed to tolerate higher velocity water flow, centerlines of waterways, 60 sq. yds. per roll.

Table 3.8
Mulch Anchoring Guide

Anchoring Method or Material	Kind of Mulch to be Anchored	How to Apply
1. Peg and Twine	Hay or straw	After mulching, divide areas into blocks approximately 1 sq. yd. in size. Drive 4-6 pegs per block to within 2" to 3" of soil surface. Secure mulch to surface by stretching twine between pegs in criss-cross pattern on each block. Secure twine around each peg with 2 or more tight turns. Drive pegs flush with soil. Driving stakes into ground tightens the twine.
2. Mulch netting	Hay or straw	Staple the light-weight paper, jute, wood fiber, or plastic nettings to soil surface according to manufacturer's recommendations. Should be biodegradable. Most products are not suitable for foot traffic.
3. Wood cellulose fiber	Hay or straw	Apply with hydroseeder immediately after mulching. Use 500 lbs. wood fiber per acre. Some products contain an adhesive material ("tackifier"), possibly advantageous.
4. Mulch anchoring tool	Hay or straw	Apply mulch and pull a mulch anchoring tool (blunt, straight discs) over mulch as near to the contour as possible. Mulch material should be "tucked" into soil surface about 3".
5. Tackifier	Hay or straw	Mix and apply polymeric and gum tackifiers according to manufacturer's instructions. Avoid application during rain. A 24-hour curing period and a soil temperature higher than 45^0 Fahrenheit are required.

STANDARD AND SPECIFICATIONS FOR TEMPORARY SWALE



Definition

A temporary excavated drainage way.

Purpose

The purpose of a temporary swale is to prevent runoff from entering disturbed areas by intercepting and diverting it to a stabilized outlet or to intercept sediment laden water and divert it to a sediment trapping device.

Conditions Where Practice Applies

Temporary swales are constructed:

1. to divert flows from entering a disturbed area.

2. intermittently across disturbed areas to shorten overland flow distances.

3. to direct sediment laden water along the base of slopes to a trapping device.

4. to transport offsite flows across disturbed areas such as rights-of-way.

Swales collecting runoff from disturbed areas shall remain in place until the disturbed areas are permanently stabilized.

Design Criteria

See Figure 5A.2 on page 5A.5 for details.

	Swale A	Swale B
Drainage Area	<5 Ac	5-10 Ac
Bottom Width of Flow Channel	4 ft	6 ft
Depth of Flow Channel	1 ft	1 ft
Side Slopes	2:1 or flatter	2:1 or flatter
Grade	0.5% Min. 20% Max.	0.5% Min. 20% Max.

For drainage areas larger than 10 acres, refer to the Standard and Specification for Waterways on page 5B.11.

Stabilization

Stabilization of the swale shall be completed within 7 days of installation in accordance with the appropriate standard and specifications for vegetative stabilization or stabilization with mulch as determined by the time of year. The flow channel shall be stabilized as per the following criteria:

Type of Treatment	Channel Grade[1]	Flow Channel A (<5 Ac.)	Flow Channel B (5-10 Ac)
1	0.5-3.0%	Seed & Straw Mulch	Seed & Straw Mulch
2	3.1-5.0%	Seed & Straw Mulch	Seed and cover with RECP, Sod, or lined with plastic or 2 in. stone
3	5.1-8.0%	Seed and cover with RECP, Sod, or line with plastic or 2 in. stone	Line with 4-8 in. or stone or Recycled Concrete Equivalent[2] or geotextile
4	8.1-20%	Line with 4-8 in. stone or Recycled Concrete Equivalent[2] or geotextile	Site Specific Engineering Design

[1] In highly erodible soils, as defined by the local approving agency, refer to the next higher slope grade for type of stabilization.
[2] Recycled Concrete Equivalent shall be concrete broken into the required size, and shall contain no steel reinforcement.

Outlet

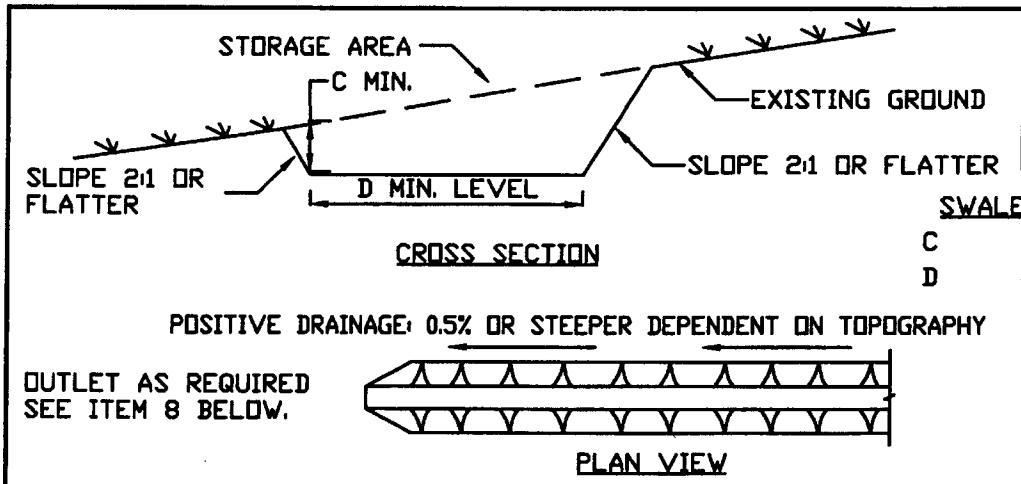
Swale shall have an outlet that functions with a minimum of erosion, and dissipates runoff velocity prior to discharge off the site.

Runoff shall be conveyed to a sediment trapping device such as a sediment trap or sediment basin until the drainage area above the swale is adequately stabilized.

The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet condition.

If a swale is used to divert clean water flows from entering a disturbed area, a sediment trapping device may not be needed.

Figure 5A.2
Temporary Swale



CONSTRUCTION SPECIFICATIONS

1. ALL TEMPORARY SWALES SHALL HAVE UNINTERUPTED POSITIVE GRADE TO AN OUTLET.
2. DIVERTED RUNOFF FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
3. DIVERTED RUNOFF FROM AN UNDISTURBED AREA SHALL OUTLET DIRECTLY INTO AN UNDISTURBED STABILIZED AREA AT NON-EROSIVE VELOCITY.
4. ALL TREES, BRUSH, STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONABLE MATERIAL SHALL BE REMOVED AND DISPOSED OF SO AS NOT TO INTERFERE WITH THE PROPER FUNCTIONING OF THE SWALE.
5. THE SWALE SHALL BE EXCAVATED OR SHAPED TO LINE, GRADE, AND CROSS SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED HEREIN AND BE FREE OF BANK PROJECTIONS OR OTHER IRREGULARITIES WHICH WILL IMPEDE NORMAL FLOW.
6. FILLS SHALL BE COMPACTED BY EARTH MOVING EQUIPMENT.
7. ALL EARTH REMOVED AND NOT NEEDED FOR CONSTRUCTION SHALL BE PLACED SO THAT IT WILL NOT INTERFERE WITH THE FUNCTIONING OF THE SWALE.
8. STABILIZATION SHALL BE AS PER THE FLOW CHANNEL STABILIZATION CHART BELOW:

TYPE OF TREATMENT	CHANNEL GRADE	A(5 AC. OR LESS)	B(5 AC -10AC)
1	0.5-3.0%	SEED AND STRAW MULCH	SEED AND STRAW MULCH
2	3.1-5.0%	SEED AND STRAW MULCH	SEED AND COVER USING RECP
3	5.1-8.0%	SEED AND COVER WITH RECP	LINED WITH 4-8" RIP-RAP OR GEOTEXTILE
4	8.1-20.%	LINED WITH 4-8" RIP-RAP OR GEOTEXTILE	ENGINEERED DESIGN

9. PERIODIC INSPECTION AND REQUIRED MAINTENANCE MUST BE PROVIDED AFTER EACH RAIN EVENT.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

TEMPORARY SWALE

STANDARD AND SPECIFICATIONS FOR PERIMETER DIKE/SWALE

Definition

A temporary ridge of soil excavated from an adjoining swale located along the perimeter of the site or disturbed area.

Purpose

The purpose of a perimeter dike/swale is to prevent off site storm runoff from entering a disturbed area and to prevent sediment laden storm runoff from leaving the construction site or disturbed area.

Conditions Where Practice Applies

Perimeter dike/swale is constructed to divert flows from entering a disturbed area, or along tops of slopes to prevent flows from eroding the slope, or along base of slopes to direct sediment laden flows to a trapping device.

The perimeter dike/swale shall remain in place until the disturbed areas are permanently stabilized.

Design Criteria

See Figure 5A.3 on page 5A.8 for details.

The perimeter dike/swale shall not be constructed outside the property lines without obtaining legal easements from affected adjacent property owners. A design is not required for perimeter dike/swale. The following criteria shall be used:

Drainage area – Less than 2 acres (for drainage areas larger than 2 acres but less than 10 acres, see earth dike or temporary swale; for drainage areas larger than 10 acres, see standard and specifications for diversion).

Height – 18 inches minimum from bottom of swale to top of dike evenly divided between dike height and swale depth.

Bottom width of dike – 2 feet minimum.

Width of swale – 2 feet minimum.

Grade – Dependent upon topography, but shall have positive drainage (sufficient grade to drain) to an adequate outlet. Maximum allowable grade not to exceed 8 percent.

Stabilization – The disturbed area of the dike and swale shall be stabilized within 7 days of installation, in accordance with the standard and specifications for temporary swales.

Outlet

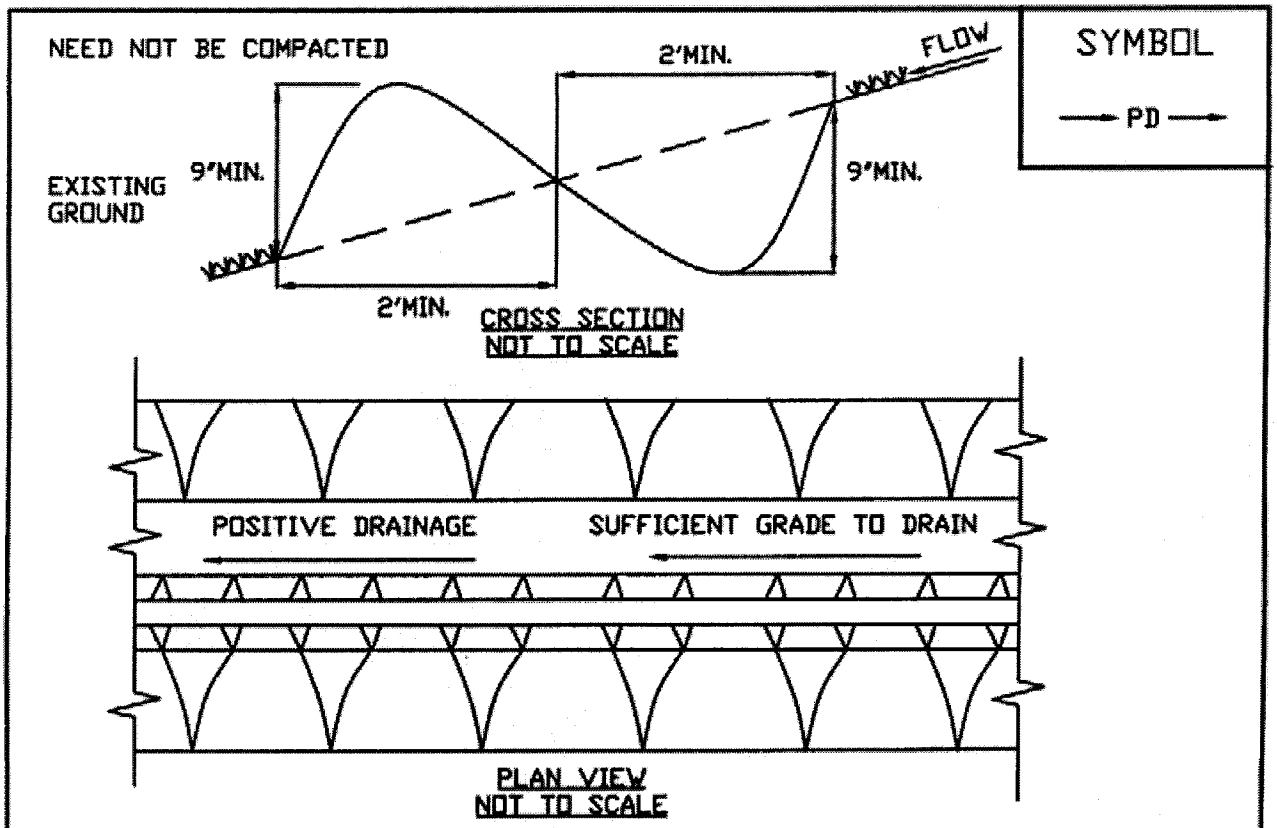
1. Perimeter dike/swale shall have a stabilized outlet.

2. Diverted runoff from a protected or stabilized upland area shall outlet directly onto an undisturbed stabilized area.

3. Diverted runoff from a disturbed or exposed upland area shall be conveyed to a sediment trapping device such as a sediment trap, sediment basin, or to an area protected by any of these practices.

4. The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet.

Figure 5A.3
Perimeter Dike/Swale



CONSTRUCTION SPECIFICATIONS

1. ALL PERIMETER DIKE/SWALE SHALL HAVE UNINTERRUPTED POSITIVE GRADE TO AN OUTLET.
2. DIVERTED RUNOFF FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
3. DIVERTED RUNOFF FROM AN UNDISTURBED AREA SHALL OUTLET INTO AN UNDISTURBED STABILIZED AREA AT NON-EROSION VELOCITY.
4. THE SWALE SHALL BE EXCAVATED OR SHAPED TO LINE GRADE, AND CROSS SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED IN THE STANDARD.
5. STABILIZATION OF THE AREA DISTURBED BY THE DIKE AND SWALE SHALL BE DONE IN ACCORDANCE WITH THE STANDARD AND SPECIFICATIONS FOR TEMPORARY SEEDING AND MULCHING, AND SHALL BE DONE WITHIN 10 DAYS.
6. PERIODIC INSPECTION AND REQUIRED MAINTENANCE MUST BE PROVIDED AFTER EACH RAIN EVENT.

MAX. DRAINAGE AREA LIMIT: 2 ACRES

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	PERIMETER DIKE OR SWALE

STANDARD AND SPECIFICATIONS FOR STRAW BALE DIKE

Definition

A temporary barrier of straw, or similar material, used to intercept sediment laden runoff from small drainage areas of disturbed soil.

Purpose

The purpose of a bale dike is to reduce runoff velocity and effect deposition of the transported sediment load. Straw bale dikes have an estimated design life of three (3) months.

Conditions Where Practice Applies

The straw bale dike is used where:

1. No other practice is feasible.
2. There is no concentration of water in a channel or other drainage way above the barrier.
3. Erosion would occur in the form of sheet erosion.
4. Length of slope above the straw bale dike does not exceed these limits.

Constructed Slope	Percent Slope	Slope Length (ft.)
2:1	50	25
3:1	33	50
4:1	25	75

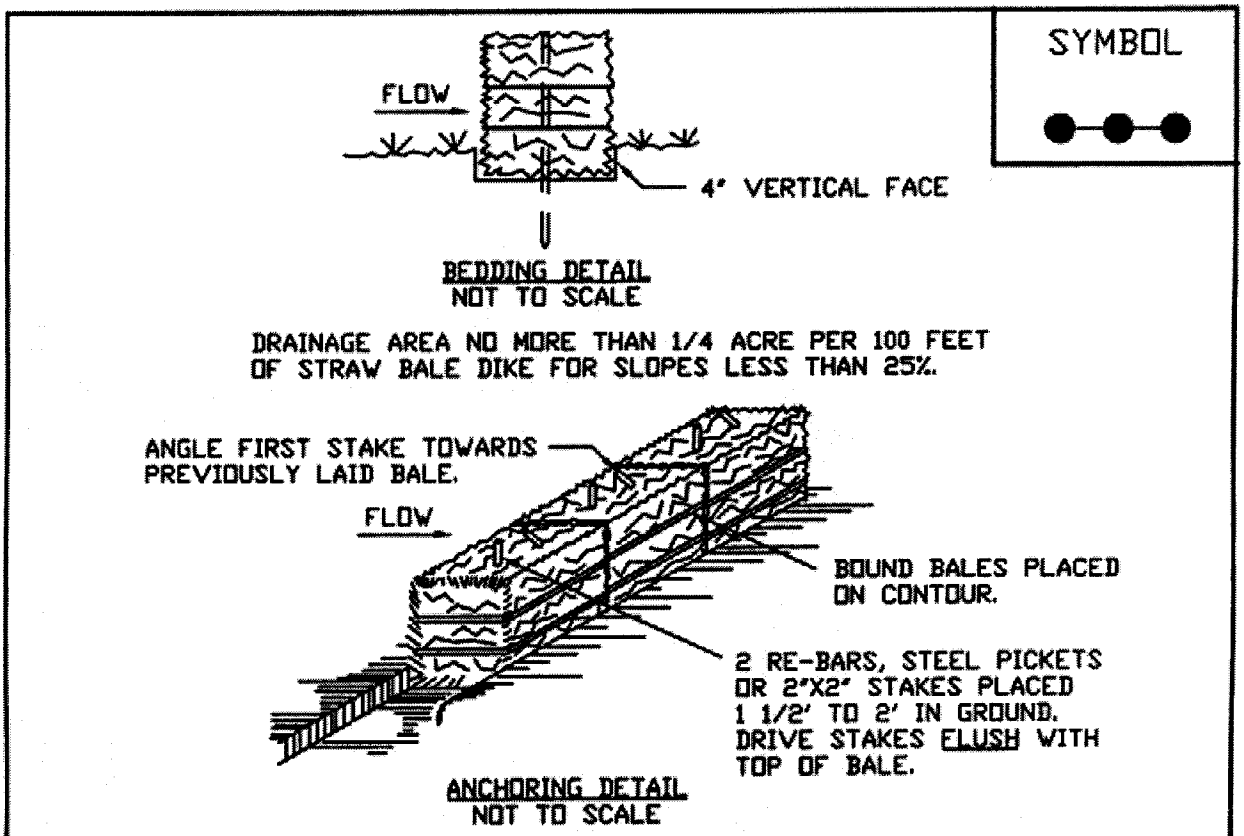
Where slope gradient changes through the drainage area, steepness refers to the steepest slope section contributing to the straw bale dike.

The practice may also be used for a single family lot if the slope is less than 15 percent. The contributing drainage areas in this instance shall be less than one quarter of an acre per 100 feet of fence and the length of slope above the dike shall be less than 200 feet.

Design Criteria

The above table is adequate, in general, for a one-inch rainfall event. Larger storms could cause failure of this practice. Use of this practice in sensitive areas for longer than one month should be specifically designed to store expected runoff. All bales shall be placed on the contour with cut edge of bale adhering to the ground. See Figure 5A.7 on page 5A.18 or details.

Figure 5A.7
Straw Bale Dike



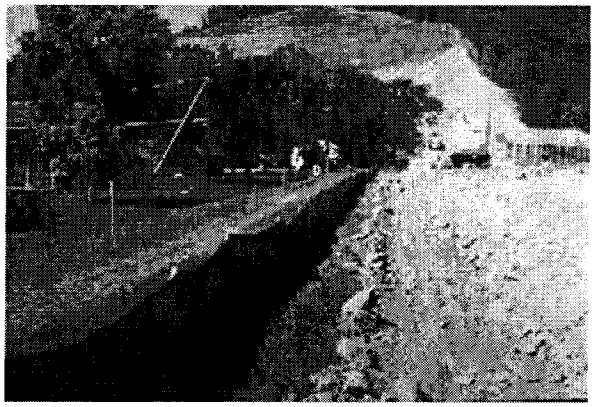
CONSTRUCTION SPECIFICATIONS

1. BALES SHALL BE PLACED AT THE TOE OF A SLOPE OR ON THE CONTOUR AND IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
2. EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF (4) INCHES, AND PLACED SO THE BINDINGS ARE HORIZONTAL.
3. BALES SHALL BE SECURELY ANCHORED IN PLACE BY EITHER TWO STAKES OR RE-BARS DRIVEN THROUGH THE BALE. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE BALE.
4. INSPECTION SHALL BE FREQUENT AND REPAIR REPLACEMENT SHALL BE MADE PROMTLY AS NEEDED.
5. BALES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFULLNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

STRAW BALE DIKE

STANDARD AND SPECIFICATIONS FOR SILT FENCE



Definition

A temporary barrier of geotextile fabric installed on the contours across a slope used to intercept sediment laden runoff from small drainage areas of disturbed soil.

Purpose

The purpose of a silt fence is to reduce runoff velocity and effect deposition of transported sediment load. Limits imposed by ultraviolet stability of the fabric will dictate the maximum period the silt fence may be used (approximately one year).

Conditions Where Practice Applies

A silt fence may be used subject to the following conditions:

1. Maximum allowable slope lengths contributing runoff to a silt fence placed on a slope are:

Slope Steepness	Maximum Length (ft.)
2:1	25
3:1	50
4:1	75
5:1 or flatter	100

2. Maximum drainage area for overland flow to a silt fence shall not exceed ¼ acre per 100 feet of fence, with maximum ponding depth of 1.5 feet behind the fence; and

3. Erosion would occur in the form of sheet erosion; and

4. There is no concentration of water flowing to the barrier.

Design Criteria

Design computations are not required for installations of 1 month or less. Longer installation periods should be designed for expected runoff. All silt fences shall be placed as close to the areas as possible, but at least 10 feet from the toe of a slope to allow for maintenance and roll down. The area beyond the fence must be undisturbed or stabilized.

Sensitive areas to be protected by silt fence may need to be reinforced by using heavy wire fencing for added support to prevent collapse.

Where ends of filter cloth come together, they shall be overlapped, folded and stapled to prevent sediment bypass. A detail of the silt fence shall be shown on the plan. See Figure 5A.8 on page 5A.21 for details.

Criteria for Silt Fence Materials

1. Silt Fence Fabric: The fabric shall meet the following specifications unless otherwise approved by the appropriate erosion and sediment control plan approval authority. Such approval shall not constitute statewide acceptance.

Fabric Properties	Minimum Acceptable Value	Test Method
Grab Tensile Strength (lbs)	90	ASTM D1682
Elongation at Failure (%)	50	ASTM D1682

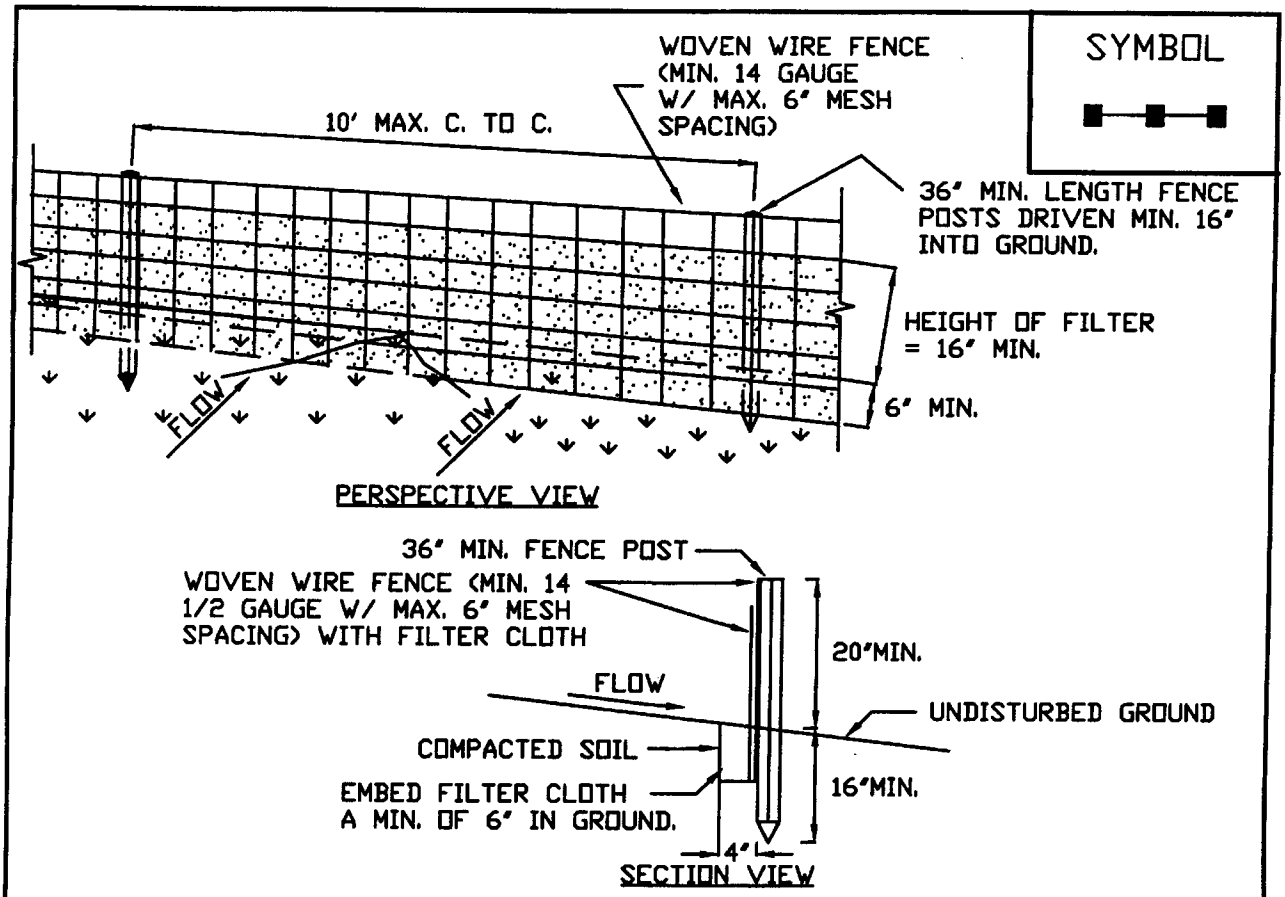
Mullen Burst Strength (PSI)	190	ASTM D3786
Puncture Strength (lbs)	40	ASTM D751 (modified)
Slurry Flow Rate (gal/min/sf)	0.3	
Equivalent Opening Size	40-80	US Std Sieve CW-02215
Ultraviolet Radiation Stability (%)	90	ASTM G-26

2. Fence Posts (for fabricated units): The length shall be a minimum of 36 inches long. Wood posts will be of sound quality hardwood with a minimum cross sectional area of 3.0 square inches. Steel posts will be standard T and U section weighing not less than 1.00 pound per linear foot.

3. Wire Fence (for fabricated units): Wire fencing shall be a minimum 14 gage with a maximum 6 in. mesh opening, or as approved.

4. Prefabricated Units: Envirofence, Geofab, or approved equal, may be used in lieu of the above method providing the unit is installed per details shown in Figure 5A.8.

Figure 5A.8
Silt Fence



CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUIVALENT.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	SILT FENCE

STANDARD AND SPECIFICATIONS FOR SEDIMENT TRAP

Definition

A temporary sediment control device formed by excavation and/or embankment to intercept sediment laden runoff and retain the sediment.

Purpose

The purpose of the structure is to intercept sediment-laden runoff and trap the sediment in order to protect drainage ways, properties, and rights-of-way below the sediment trap from sedimentation.

Conditions Where Practice Applies

A sediment trap is usually installed in a drainage way, at a storm drain inlet, or other points of collection from a disturbed area.

Sediment traps should be used to artificially break up the natural drainage area into smaller sections where a larger device (sediment basin) would be less effective.

Design Criteria

If any of the design criteria presented here cannot be met, see Standard and Specification for Sediment Basin on page 5A.49.

Drainage Area

The drainage area for sediment traps shall be in accordance with the specific type of sediment trap used (Type I through V).

Location

Sediment traps shall be located so that they can be installed prior to grading or filling in the drainage area they are to protect. Traps must not be located any closer than 20 feet from a proposed building foundation if the trap is to function during building construction. Locate traps to obtain maximum storage benefit from the terrain and for ease of cleanout and disposal of the trapped sediment.

Trap Size

The volume of a sediment trap as measured at the elevation of the crest of the outlet shall be at least 3,600 cubic feet per acre of drainage area. The volume of a constructed trap shall be calculated using standard mathematical procedures. The volume of a natural sediment trap may be approximated by the equation: Volume (cu.ft.) = 0.4 x surface area (sq.ft.) x maximum depth (ft.).

Trap Cleanout

Sediment shall be removed and the trap restored to the original dimensions when the sediment has accumulated to ½ of the design depth of the trap. Sediment removed from the trap shall be deposited in a protected area and in such a manner that it will not erode.

Embankment

All embankments for sediment traps shall not exceed five (5) feet in height as measured at the low point of the original ground along the centerline of the embankment. Embankments shall have a minimum four (4) foot wide top and side slopes of 2:1 or flatter. The embankment shall be compacted by traversing with equipment while it is being constructed. The embankment shall be stabilized with seed and mulch as soon as it is completed

The elevation of the top of any dike directing water to any sediment trap will equal or exceed the maximum height of the outlet structure along the entire length of the trap.

Excavation

All excavation operations shall be carried out in such a manner that erosion and water pollution shall be minimal. Excavated portions of sediment traps shall have 1:1 or flatter slopes.

Outlet

The outlet shall be designed, constructed, and maintained in such a manner that sediment does not leave the trap and that erosion at or below the outlet does not occur.

Sediment traps must outlet onto stabilized (preferable undisturbed) ground, into a watercourse, stabilized channel, or into a storm drain system. Distance between inlet and outlet should be maximized to the longest length practicable.

Trap Details Needed on Erosion and Sediment Control Plans

Each trap shall be delineated on the plans in such a manner that it will not be confused with any other features. Each trap on a plan shall indicate all the information necessary to properly construct and maintain the structure. If the drawings are such that this information cannot be delineated on the drawings, then a table shall be developed. If a table is developed, then each trap on a plan shall have a number and the numbers shall be consecutive.

The following information shall be shown for each trap in a summary table format on the plans.

1. Trap number
2. Type of trap
3. Drainage area
4. Storage required
5. Storage provided (if applicable)
6. Outlet length or pipe sizes
7. Storage depth below outlet or cleanout elevation
8. Embankment height and elevation (if applicable)

Type of Sediment Traps

There are five (5) specific types of sediment traps which vary according to their function, location, or drainage area.

I. Pipe Outlet Sediment Trap
II. Grass Outlet Sediment Trap
III. Catch Basin Sediment Trap
IV. Stone Outlet Sediment Trap
V. Riprap Outlet Sediment Trap

I. Pipe Outlet Sediment Trap

A Pipe Outlet Sediment Trap consists of a trap formed by embankment or excavation. The outlet for the trap is through a perforated riser and a pipe through the embankment. The outlet pipe and riser shall be made of steel, corrugated metal or other suitable material. The top of the embankment shall be at least 1 ½ feet above the crest of the riser. The top 2/3 of the riser shall be perforated with one (1) inch nominal diameter holes or slits spaced six (6) inches vertically and horizontally placed in the concave portion of the corrugated pipe.

No holes or slits will be allowed within six (6) inches of the top of the horizontal barrel. All pipe connections shall be watertight. The riser shall be wrapped with ½ to ¼ inch hardware cloth wire then wrapped with filter cloth with a sieve size between #40-80 and secured with strapping or connecting band at the top and bottom of the cloth. The cloth shall cover an area at least six (6) inches above the highest hole and six (6) inches below the lowest hole. The top of the riser pipe shall not be covered with filter cloth. The riser shall have a base with sufficient weight to prevent flotation of the riser. Two approved bases are:

1. A concrete base 12 in. thick with the riser embedded 9 in. into the concrete base, or

2. One quarter inch, minimum, thick steel plate attached to the riser by a continuous weld around the circumference of the riser to form a watertight connection. The plate shall have 2.5 feet of stone, gravel, or earth placed on it to prevent flotation. In either case, each side of the square base measurement shall be the riser diameter plus 24 inches.

Pipe outlet sediment traps shall be limited to a five (5) acre maximum drainage area. Pipe outlet sediment traps may be interchangeable in the field with stone outlet or riprap sediment traps provided that these sediment traps are constructed in accordance with the detail and specifications for that trap.

Select pipe diameter from the following table:

Minimum Sizes

Barrel Diameter[1] (in.)	Riser Diameter[1] (in.)	Maximum Drainage Area (ac.)
12	15	1
15	18	2
18	21	3
21	24	4
21	27	5

[1] Barrel diameter may be same size as riser diameter.

See details for Pipe Outlet Sediment Trap ST-I in Figure 5A.16 (1) and 5A.16 (2) on pages 5A.38 and 5A.39.

II. Grass Outlet Sediment Trap

A Grass Outlet Sediment Trap consists of a trap formed by excavating the earth to create a holding area. The trap has a discharge point over natural existing grass. The outlet crest width (feet) shall be equal to four (4) times the drainage area (acres) with a minimum width of four (4) feet. The outlet shall be free of any restrictions to flow. The outlet lip must remain undisturbed and level. The volume of this trap shall be computed at the elevation of the crest of the outlet. Grass outlet sediment traps shall be limited to a five (5) acre maximum drainage area.

See details for Grass Outlet Sediment Trap ST-II in Figure 5A.17 on page 5A.40.

III. Catch Basin Sediment Trap

A Catch Basin Sediment Trap consists of a basin formed by excavation on natural ground that discharges through an opening in a storm drain inlet structure. This opening can either be the inlet opening or a temporary opening made by omitting bricks or blocks in the inlet.

A yard drain inlet or an inlet in the median strip of a dual highway could use the inlet opening for the type outlet. The trap should be out of the roadway so as not to interfere with future compaction or construction. Placing the trap on the opposite side of the opening and diverting water from the roadway to the trap is one means of doing this. Catch basin sediment traps shall be limited to a three (3) acre maximum drainage area. The volume of this trap is measured at the elevation of the crest of the outlet (invert of the inlet opening).

See details for Catch Basin Sediment Trap ST-III in Figure 5A.18 on page 5A.41.

IV. Stone Outlet Sediment Trap

A Stone Outlet Sediment Trap consists of a trap formed by an embankment or excavation. The outlet of this trap is over a stone section placed on level ground. The minimum length (feet) of the outlet shall be equal to four (4) times the drainage area (acres).

Required storage shall be 3,600 cubic feet per acre of drainage area.

The outlet crest (top of stone in weir section) shall be level, at least one (1) foot below top of embankment and no more than one (1) foot above ground beneath the outlet. Stone used in the outlet shall be small riprap (4 in. x 8 in.). To provide more efficient trapping effect, a layer of filter cloth should be embedded one (1) foot back into the upstream face of the outlet stone or a one (1) foot thick layer of two (2) inch or finer aggregate shall be placed on the upstream face of the outlet.

Stone Outlet Sediment Traps may be interchangeable in the field with pipe or riprap outlet sediment traps provided they are constructed in accordance with the detail and specifications for those traps. Stone outlet sediment traps shall be limited to a five (5) acre maximum drainage area.

See details for Stone Outlet Sediment Trap ST-IV in Figure 5A.19 on page 5A.42.

V. Riprap Outlet Sediment Trap

A Riprap Outlet Sediment Trap consists of a trap formed by an excavation and embankment. The outlet for this trap shall be through a partially excavated channel lined with riprap. This outlet channel shall discharge onto a stabilized area or to a stable watercourse. The riprap outlet sediment trap may be used for drainage areas of up to a maximum of 15 acres.

Design Criteria for Riprap Outlet Sediment Trap

1. The total contributing drainage area (disturbed or undisturbed either on or off the developing property) shall not exceed 15 acres.
2. The storage needs for this trap shall be computed using 3600 cubic feet of required storage for each acre of drainage area. The storage volume provided can be figured by computing the volume of storage area available behind the outlet structure up to an elevation of one (1) foot below the level weir crest.
3. The maximum height of embankment shall not exceed five (5) feet.
4. The elevation of the top of any dike directing water to a riprap outlet sediment trap will equal or exceed the minimum elevation of the embankment along the entire length of this trap.

Riprap Outlet Sediment Trap ST-V
(for Stone Lined Channel)

Contributing Drainage Area (ac.)	Depth of Channel (a) (ft.)	Length of Weir (b) (ft.)
1	1.5	4.0
2	1.5	5.0
3	1.5	6.0
4	1.5	10.0
5	1.5	12.0
6	1.5	14.0
7	1.5	16.0
8	2.0	10.0
9	2.0	10.0
10	2.0	12.0
11	2.0	14.0
12	2.0	14.0
13	2.0	16.0
14	2.0	16.0
15	2.0	18.0

See details for Riprap Outlet Sediment Trap ST-V on Figures 5A.20(1) and 5A.20(2) on pages 5A.43 and 5A.44.

Optional Dewatering Methods

Optional dewatering devices may be designed for use with sediment traps. Included are two methods, which may be used. See Figure 5A.21 on page 5A.45 for details.

Figure 5A.16(1)
Pipe Outlet Sediment Trap: ST-I

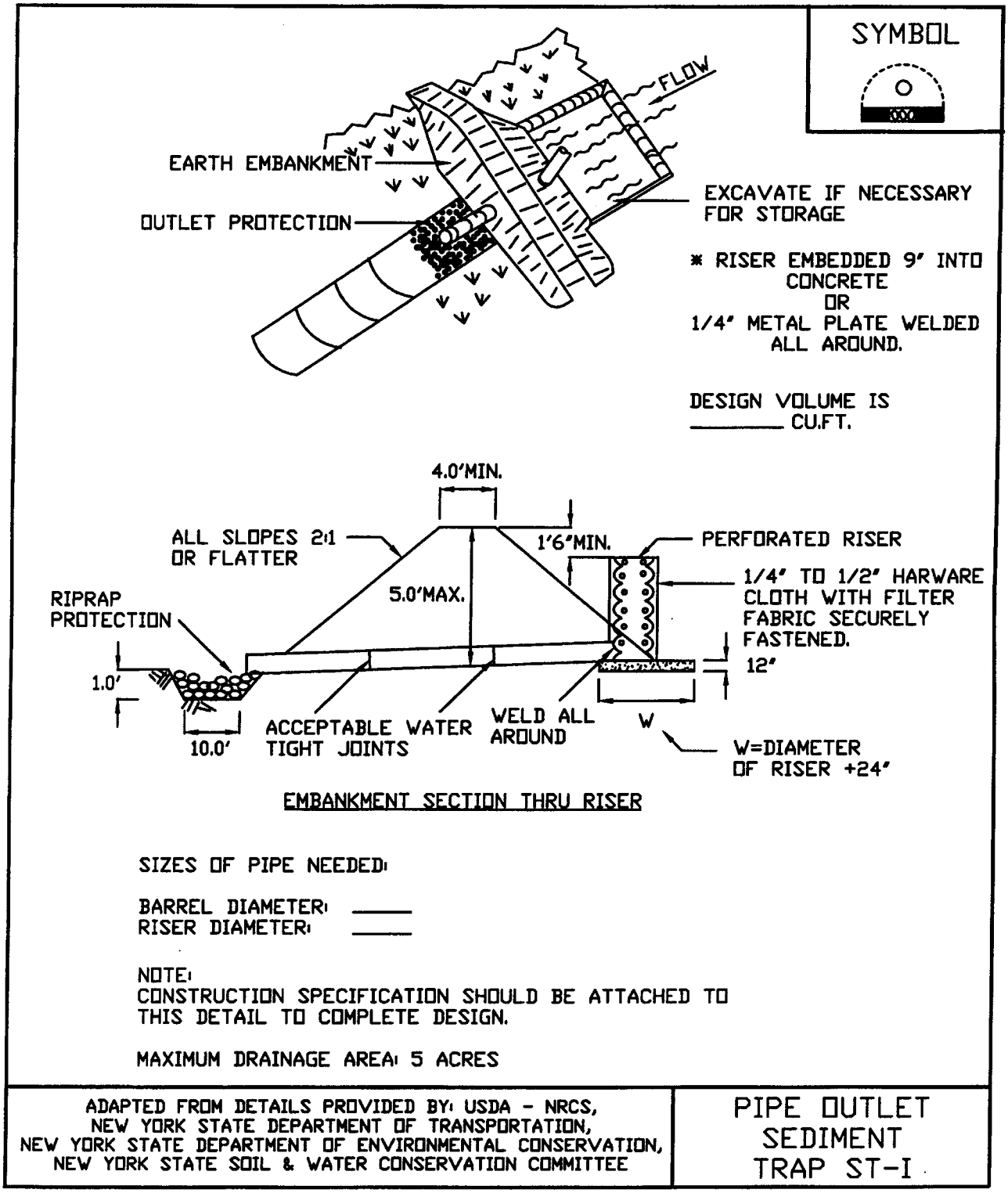


Figure 5A.16(2)
Pipe Outlet Sediment Trap: ST-I—Construction Specifications

SYMBOL

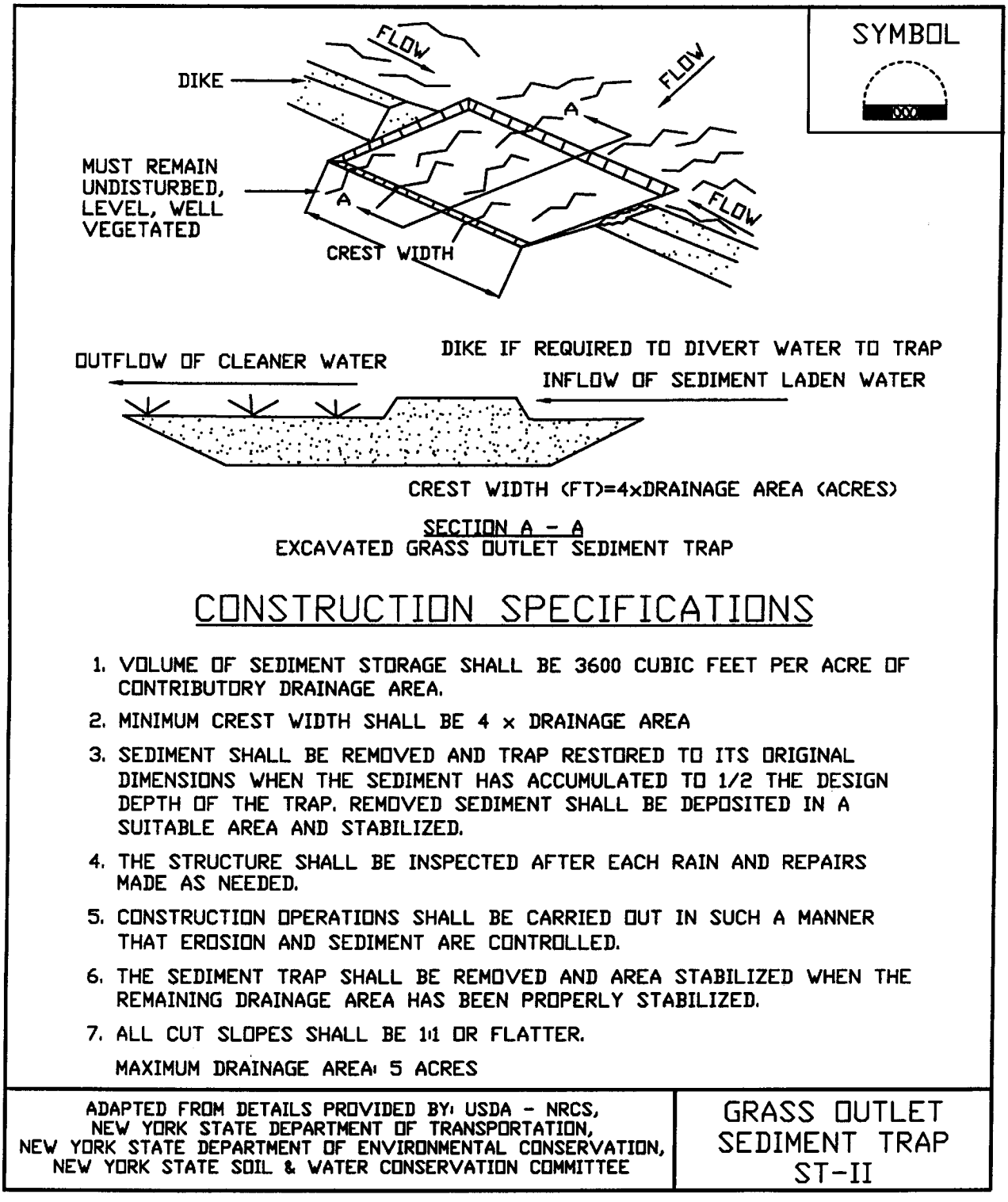
CONSTRUCTION SPECIFICATIONS

1. AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, ROCKS, ORGANIC MATERIAL, OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
3. VOLUME OF SEDIMENT STORAGE SHALL BE 3600 CUBIC FEET PER ACRE OF CONTRIBUTORY DRAINAGE.
4. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND STABILIZED.
5. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
6. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND SEDIMENT ARE CONTROLLED.
7. THE STRUCTURE SHALL BE REMOVED AND AREA STABILIZED WHEN THE DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
8. ALL FILL SLOPES SHALL BE 2:1 OR FLATTER; CUT SLOPES 1:1 OR FLATTER.
9. ALL PIPE CONNECTIONS SHALL BE WATERTIGHT.
10. THE TOP 2/3 OF THE RISER SHALL BE PERFORATED WITH ONE (1) INCH DIAMETER HOLES OR SLITS SPACED SIX (6) INCHES VERTICALLY AND HORIZONTALLY AND PLACED IN THE CONCAVE PORTION OF PIPE. NO HOLES WILL BE ALLOWED WITHIN SIX (6) INCHES OF THE HORIZONTAL BARREL.
11. THE RISER SHALL BE WRAPPED WITH 1/4 TO 1/2 INCH HARDWARE CLOTH WIRE THEN WRAPPED WITH FILTER CLOTH (HAVING AN EQUIVALENT SIEVE SIZE OF 40-80). THE FILTER CLOTH SHALL EXTEND SIX (6) INCHES ABOVE THE HIGHEST HOLE AND SIX (6) INCHES BELOW THE LOWEST HOLE. WHERE ENDS OF THE FILTER CLOTH COME TOGETHER, THEY SHALL BE OVER-LAPPED, FOLDED AND STAPLED TO PREVENT BYPASS.
12. STRAPS OR CONNECTING BANDS SHALL BE USED TO HOLD THE FILTER CLOTH AND WIRE FABRIC IN PLACE. THEY SHALL BE PLACED AT THE TOP AND BOTTOM OF THE CLOTH.
13. FILL MATERIAL AROUND THE PIPE SPILLWAY SHALL BE HAND COMPACTED IN FOUR (4) INCH LAYERS. A MINIMUM OF TWO (2) FEET OF HAND COMPACTED BACKFILL SHALL BE PLACED OVER THE PIPE SPILLWAY BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.
14. THE RISER SHALL BE ANCHORED WITH EITHER A CONCRETE BASE OR STEEL PLATE BASE TO PREVENT FLOTATION. FOR CONCRETE BASED THE DEPTH SHALL BE TWELVE (12) INCHES WITH THE RISER EMBEDDED NINE (9) INCHES. A 1/4 INCH MINIMUM THICKNESS STEEL PLATE SHALL BE ATTACHED TO THE RISER BY A CONTINUOUS WELD AROUND THE BOTTOM TO FORM A WATERTIGHT CONNECTION AND THEN PLACE TWO (2) FEET OF STONE, GRAVEL, OR TAMPED EARTH ON THE PLATE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

PIPE OUTLET
SEDIMENT TRAP
ST-I

Figure 5A.17
Grass Outlet Sediment Trap: ST-II



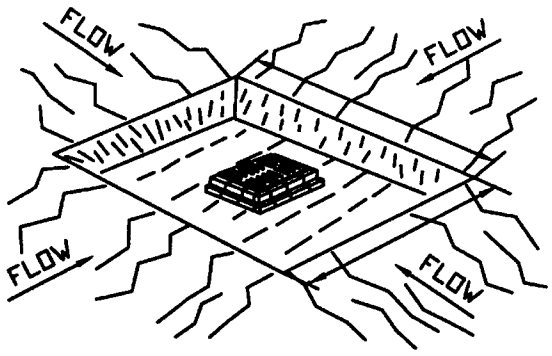
CONSTRUCTION SPECIFICATIONS

1. VOLUME OF SEDIMENT STORAGE SHALL BE 3600 CUBIC FEET PER ACRE OF CONTRIBUTORY DRAINAGE AREA.
2. MINIMUM CREST WIDTH SHALL BE 4 x DRAINAGE AREA
3. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND STABILIZED.
4. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
5. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND SEDIMENT ARE CONTROLLED.
6. THE SEDIMENT TRAP SHALL BE REMOVED AND AREA STABILIZED WHEN THE REMAINING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
7. ALL CUT SLOPES SHALL BE 1:1 OR FLATTER.

MAXIMUM DRAINAGE AREA: 5 ACRES

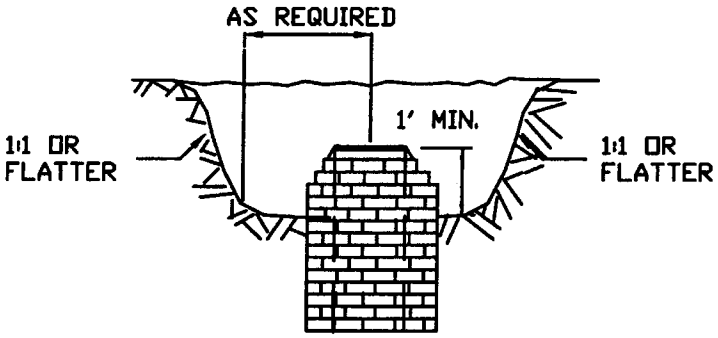
ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	GRASS OUTLET SEDIMENT TRAP ST-II

Figure 5A.18
Catch Basin Sediment Trap: ST-III



YARD DRAIN

SYMBOL



CROSS SECTION

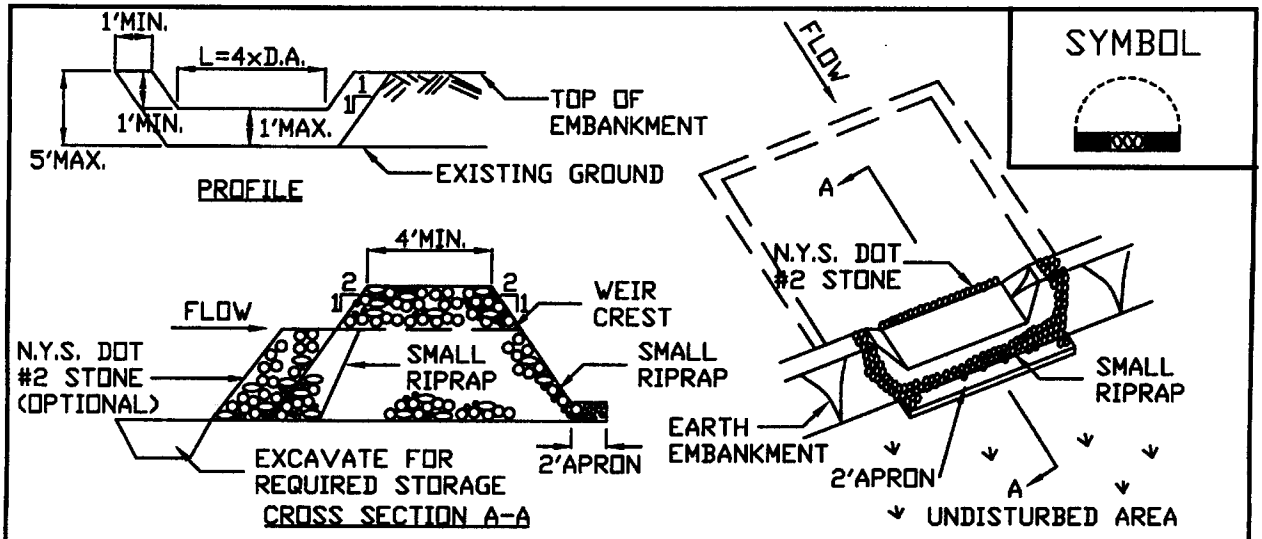
CONSTRUCTION SPECIFICATIONS

1. SEDIMENT SHALL BE REMOVED AND THE TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND STABILIZED.
2. THE VOLUME OF SEDIMENT STORAGE SHALL BE 3600 CUBIC FEET PER ACRE OF CONTRIBUTORY DRAINAGE.
3. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
4. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND SEDIMENT ARE CONTROLLED.
5. THE SEDIMENT TRAP SHALL BE REMOVED AND THE AREA STABILIZED WHEN THE CONSTRUCTED DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
6. ALL CUT SLOPES SHALL BE 1:1 OR FLATTER.

MAXIMUM DRAINAGE AREA: 3 ACRES

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	CATCH BASIN SEDIMENT TRAP ST-III

Figure 5A.19
Stone Outlet Sediment Trap: ST-IV



OPTION: A ONE FOOT LAYER OF N.Y.S. DOT #2 STONE MAY BE PLACED ON THE UPSTREAM SIDE OF THE RIPRAP INPLACE OF THE EMBEDDED FILTER CLOTH.

CONSTRUCTION SPECIFICATIONS

1. AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS AND OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, ROCKS, ORGANIC MATERIAL OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
3. ALL CUT AND FILL SLOPES SHALL BE 2:1 OR FLATTER.
4. THE STONE USED IN THE OUTLET SHALL BE SMALL RIPRAP 4"-8" ALONG WITH A 1' THICKNESS OF 2" AGGREGATE PLACED ON THE UP-GRADE SIDE ON THE SMALL RIPRAP OR EMBEDDED FILTER CLOTH IN THE RIPRAP.
5. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. IT SHALL BE PLACED ON SITE AND STABILIZED.
6. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
7. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND SEDIMENT ARE CONTROLLED.
8. THE STRUCTURE SHALL BE REMOVED AND THE AREA STABILIZED WHEN THE DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

MAXIMUM DRAINAGE AREA 5 ACRES

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STONE OUTLET SEDIMENT TRAP ST-IV

Figure 5A.20(1)
Riprap Outlet Sediment Trap: ST-V

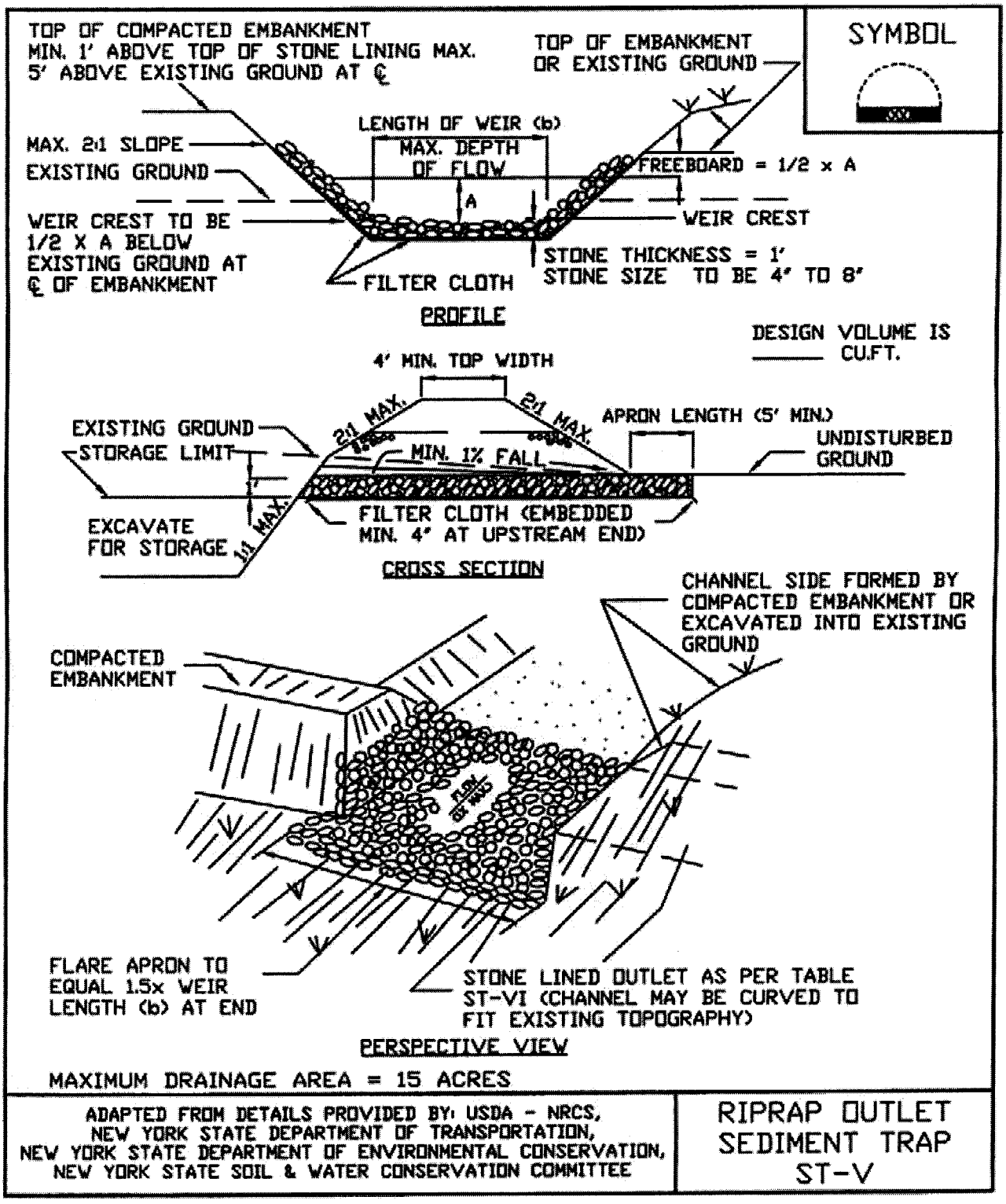


Figure 5A.202)
Riprap Outlet Sediment Trap: ST-V—Construction Specifications

SYMBOL

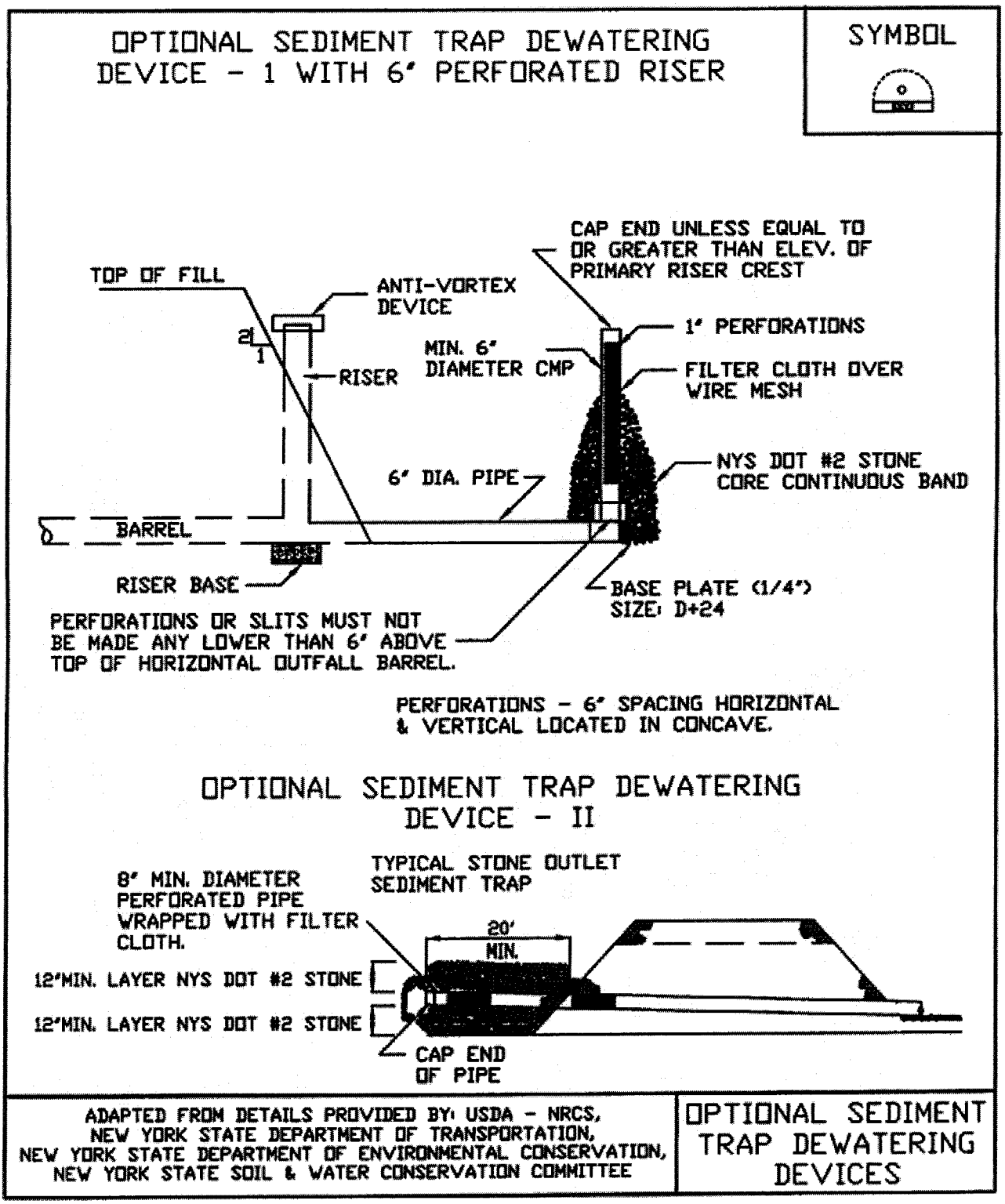
CONSTRUCTION SPECIFICATIONS

1. THE AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, ROCKS, ORGANIC MATERIAL OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED. MAXIMUM HEIGHT OF OF EMBANKMENT SHALL BE FIVE (5) FEET, MEASURED AT CENTERLINE OF EMBANKMENT.
3. ALL FILL SLOPES SHALL BE 2:1 OR FLATTER, CUT SLOPES 1:1 OR FLATTER.
4. ELEVATION OF THE TOP OF ANY DIKE DIRECTING WATER INTO TRAP MUST EQUAL OR EXCEED THE HEIGHT OF EMBANKMENT.
5. STORAGE AREA PROVIDED SHALL BE FIGURED BY COMPUTING THE VOLUME AVAILABLE BEHIND THE OUTLET CHANNEL UP TO AN ELEVATION OF ONE (1) FOOT BELOW THE LEVEL WEIR CREST.
6. FILTER CLOTH SHALL BE PLACED OVER THE BOTTOM AND SIDES OF THE OUTLET CHANNEL PRIOR TO PLACEMENT OF STONE. SECTIONS OF FABRIC MUST OVERLAP AT LEAST ONE (1) FOOT WITH SECTION NEAREST THE ENTRANCE PLACED ON TOP. FABRIC SHALL BE EMBEDDED AT LEAST SIX (6) INCHES INTO EXISTING GROUND AT ENTRANCE OUTLET CHANNEL.
7. STONE USED IN THE OUTLET CHANNEL SHALL BE FOUR (4) TO EIGHT (8) INCH RIPRAP. TO PROVIDE A FILTERING EFFECT, A LAYER OF FILTER CLOTH SHALL BE EMBEDDED ONE (1) FOOT WITH SECTION NEAREST ENTRANCE PLACED ON TOP. FABRIC SHALL BE EMBEDDED AT LEAST SIX (6) INCHES INTO EXISTING GROUND AT ENTRANCE OF OUTLET CHANNEL.
8. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.
9. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRED AS NEEDED.
10. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND WATER POLLUTION ARE MINIMIZED.
11. THE STRUCTURE SHALL BE REMOVED AND THE AREA STABILIZED WHEN DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
12. DRAINAGE AREA FOR THIS PRACTICE IS LIMITED TO 15 ACRES OR LESS.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

RIPRAP OUTLET SEDIMENT TRAP ST-V

Figure 5A.21
Optional Sediment Trap Dewatering Devices



APPENDIX A-2

INSPECTION AND MAINTENANCE REPORT FORM

Inspection and Maintenance Report Form

To be completed every 7 days and within 24 hours of a rainfall event of 0.5 inches or more

Regular Inspector:_____Rainfall Event Inspector:_____Rainfall (inches):_____

Contractor Activities	OK	NO	N/A	Notes
Are construction onsite traffic routes, parking, and storage of equipment and supplies restricted to areas specifically designated for those uses?				
Are locations of temporary soil stock piles of construction materials in approved areas?				
Is there any evidence of spills and resulting cleanup procedures?				
General Erosion & Sediment Controls				
Are sediment and erosion BMPs installed in the proper location and according to the specifications set out in the SWM & ECP?				
Are all operational storm drain inlets protected from sediment inflow?				
Do any seeded or landscaped areas require maintenance, irrigation, fertilization, seeding or mulching?				
Is there any evidence that sediment is leaving the site?				
Is there any evidence of erosion or cut fill slopes?				
Perimeter Road Use				
Does much sediment get tracked on to the perimeter road? Is the gravel clean or is it filled with sediment? Does all traffic use the perimeter road to leave the site? Is maintenance or repair required for the perimeter road?				

_____ _____

Inspected by (Signature) Date

Inspection and Maintenance Report Form

To be completed every 7 days and within 24 hours of a rainfall event of 0.5 inches or more

Inspector:_____

STABILIZATION MEASURES					
Area	Date Since Last Disturbed	Date of Next Disturbance	Stabilized? Yes/No	Stabilized with	Condition

Stabilization Required:_____

_____

_____

_____

_____

_____

To be performed by:_____ On or before:_____

APPENDIX B

COMMUNITY AIR MONITORING REQUIREMENTS

APPENDIX B

New York State Department of Health
Generic Community Air Monitoring Plan [1]

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

---

[1] Taken from Appendix 1A of the Draft DER-10 Technical Guidance for Site Investigation and Remediation, December 2002.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring

particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 $\mu g/m^3$ above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 $\mu g/m^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

PART III

ENVIRONMENTAL EASEMENT

James K. Griffith
CATTARAUGUS COUNTY CLERK
Cattaraugus County Center 303 Court Street
Little Valley, NY 14755
(716) 938-9111
Fax: (716) 938-2773

Instrument Number
123509-001

No. of Pages: 13
not including this one

Delivered By: MICHAEL JOY

Receipt No. 123509

Return To:
MICHAEL JOY
333 INTERNATIONAL DR
STE B4
WILLIAMSVILLE, NY 14221

DATE: 06/30/2009

Time: 04:24 PM

Document Type: EASEMENT/RIGHT OF WAY

Parties To Transaction: PALMER STREET TO WILHELM ENTERPRISE

Town/City: PE - Persia

Deed Information

Taxable Consideration: $0.00

Transfer Tax: $0.00

RETT No: 03035

Mortgage Information

Taxable Mortgage Amount

Basic Mtge. Tax:

Special Mtge. Tax:

Additional Mtge. Tax:

State of New York
Cattaraugus County Clerk

Mortgage Serial No.:

This sheet constitutes the Clerk endorsement required by Section 316-A(5) & Section 319 of the Real Property Law of the State of New York.

James K. Griffith

Cattaraugus County Clerk

Please do not remove this page.

123509-001

ENVIRONMENTAL PROTECTION EASEMENT
AND
DECLARATION OF RESTRICTIVE COVENANTS

This Environmental Protection Easement and Declaration of Restrictive Covenants is made this 26th day of June, 2009, by and between Palmer Street Gowanda 2007, Inc. ("Grantor"), a New York corporation, having an address at 333 International Drive Ste B-4 Williamsville, NY 14221, and Wilhelm Enterprises Corporation ("Wilhelm"), a New York corporation having an address at 333 International Drive Ste B-4 Williamsville, NY 14221; New York State Electric & Gas Corporation, being a subsidiary of Energy East Corporation, a New York Corporation having an address at P.O. Box 5224, 18 Link Drive, Binghamton, NY 13902; Prime Tanning Company, Inc., a corporation organized and existing under the laws of the State of Maine having an address at 20 Sullivan St., Berwick, ME 03901; Seton Company, a Pennsylvania corporation having an address at 30445 Northwestern Hwy., Suite 225, Farmington Hills, MI 48334; Viad Corp, a Delaware corporation having an address at 1850 North Central Avenue, Suite 800, Phoenix, AZ 85004-4545; GST AutoLeather, a Michigan corporation having an address at 20 Oak Hollow Drive, Suite 300, Southfield, MI 48033; Brown Shoe Company, Inc., a Missouri corporation having an address at 8300 Maryland Avenue, P.O. Box 29, St. Louis, MO 63166-0029; Con Agra Grocery Products Company, Inc., a Nebraska corporation having an address at One ConAgra Drive Omaha, NE 68102; Beggs & Cobb Corporation, a Delaware corporation having an address at 139 Lynnfield St., Peabody, MA 01960; Genesco, Inc., a Tennessee corporation having an address at P.O. Box 731, Suite 490 Nashville, TN 37202-0731; Leucadia National Corporation, a New York corporation having an address at 315 Park Avenue South, New York, NY 10010; S.B. Foot Tanning Company, a Minnesota corporation having an address at 805 Bench Street, Red Wing, MN 55066; and Horween Leather Company, a Illinois corporation having an address at 2015 Elston Avenue, Chicago, IL 60614, (collectively the "Grantees"); acting on their own behalf and for the benefit of third-party beneficiaries the United States of America, acting through the United States Environmental Protection Agency ("EPA"), and the State of New York, acting through the New York State Department of Environmental Conservation ("Department") and the Village of Gowanda ("Village") (collectively, "Third-Party Beneficiaries").

WITNESSETH:

WHEREAS, Grantor is the owner of **ALL THAT TRACT OR PARCEL OF LAND** situate in the Village of Gowanda, Town of Persia, County of Cattaraugus and State of New York and conveyed to Jimcar Development Inc. by Warranty Deed dated April 14, 1988 from Peter Cooper Corporations, recorded in the Cattaraugus County Clerk's Office in Liber 879 of Deeds at Page 59 on April 19, 1988 as more particularly described in the ~~attached~~ Schedule A together with any buildings and improvements thereon and appurtenances thereto (the "Property"); and WHEREAS, the Property is part of the Peter Cooper (Gowanda) Superfund Site ("Site"), which

5.00
110.00

the EPA, pursuant to Section 105 of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C.§ 9605, placed on the National Priorities List, as set forth in Appendix B of the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300, by publication in the Federal Register on February 3, 2000; and

WHEREAS, in a Record of Decision dated September 30, 2005 (the "ROD"), the EPA selected a "response action" for the Site, which provides, in part, for the following actions at the Site:

(1) excavation of impacted soil/fill from sub-areas on site and consolidation into an onsite landfill;

(2) covering an existing 5-acre on-site landfill with a low-permeability cap;

(3) installation of a passive gas venting system in conjunction with the cap system;

(4) collection of groundwater and leachate, subject to potential pre-treatment if necessary, and discharge of same to the Village of Gowanda Sewage Treatment Plant ("GSTP");

(5) stabilizing the bank of Cattaraugus Creek adjacent to the Site;

(6) establishing through this instrument certain institutional controls including deed restrictions, environmental easements and restrictive covenants on future uses of the Site to:

(a) prevent use of groundwater on the Site for potable purposes, disruption, excavation or alteration of the cover system over the on-site landfill, or damage to or interference with the operation of the passive gas venting system,

(b) facilitate the performance of:

(i) long-term operation and maintenance of the cap, gas venting, and groundwater/leachate systems;

(ii) air, surface, and groundwater quality monitoring; and

(iii) Site condition evaluations as necessary to determine if a modification to the selected remedial action is necessary for protection of human health and the environment; and

(c) prevent the disturbance, destruction, interference with or obstruction of any aspects of the remedy or access provided herein as necessary to operate, maintain, monitor and/or repair the remedy at the Site.

WHEREAS, the Grantor herein grants a permanent easement: a) providing the right of unobstructed access over the Property to the Grantees for purposes of facilitating, implementing, and monitoring, maintaining, and the performance of other obligations that may arise and are necessary to, the response action for the Site; and b) imposing on the Property restrictive covenants that will run with the land for the purpose of protecting human health and the environment; and

WHEREAS, Grantor has and assumes no liability to the Grantees or the Third-Party Beneficiaries for any conditions existing at the Site but wishes to facilitate though this Environmental Protection Easement and Declaration of Restrictive Covenants the full cooperation of the Grantees with the EPA, and to provide access to the Site for implementation of all response actions at the Site as required pursuant to the Consent Decree in United States v. Wilhelm Enterprises Corporation, et al. (Civil Action No. 40 JA), W.D.N.Y.)("Consent Decree");

NOW, THEREFORE:

1. Grant: Grantor, on behalf of itself, its heirs, successors and assigns, in consideration of the sum of Ten Dollars and no more, paid by Grantees, and other good and valuable consideration the receipt and sufficiency of which is hereby acknowledged, does:

   (a) give, grant, covenant and declare in favor of the Grantees and Third-Party Beneficiaries that the Property shall be subject to the restrictions on use and rights of access set forth below, and

   (b) give, grant, devise and convey to the Grantees and the Third Party Beneficiaries the perpetual right to enforce said restrictions and rights, which restrictions and rights shall be of the nature and character, and for the purposes, hereinafter set forth.

2. Purpose: It is the purpose of this instrument to convey to the Grantees real property rights, as covenants to run with the land, in order to:

   (a) facilitate the remediation of past environmental contamination and to protect human health and the environment by reducing the risk of exposure to contaminants and to,

(b) provide the EPA, and, if necessary, the Department with rights as third-party beneficiaries with the same rights as the Grantees may have under this instrument for purposes of taking action to protect human health and the environment as provided for herein.

3. Restrictions on use: The following restrictions apply to the use of the Property, as Restrictive Covenants that run with the land, are binding on the Grantor and its heirs, successors and assigns, and the Grantees and their heirs, successors and assigns, and all who take title to and possession of the Property hereafter.

(a) The following activities are prohibited: the extraction of groundwater; any activities that would interfere with, or adversely affect, the integrity or protectiveness of the barrier cap covering the on-site landfill; any activities which would interfere with, or adversely affect, the integrity, protectiveness or function of the passive gas venting system; any activities which would interfere with, or adversely affect, the integrity or protectiveness of the surface/groundwater leachate collection system; the importation of backfill or soil fill cover which is inconsistent with the Soil/Fill Management Plan developed for the Site pursuant to the Consent Decree; and except as provided in subparagraphs (b - c) hereof, digging into or disturbing the subsurface, except in areas specifically designated for the placement of utilities necessary to support anticipated future use of the Property for recreational use; and except as provided in subparagraphs (b - c) hereof, constructing commercial buildings or appurtenant facilities not required pursuant to the remedial action plan for the Site; or the construction of residential facilities or any kind or character whatsoever.

(b) The Property is zoned industrial and the future use of the Property shall be restricted as set forth herein with contingency changes to commercial and restricted residential use but only if the following long-term engineering controls are employed and the land use restrictions specified below are adhered to:

i) If a change is made to allow for commercial use, a one-foot thick soil cover of clean soil shall be placed over all vegetated area prior to such use change. The top six inches of soil would be of sufficient quality to support vegetation. Clean soil would constitute soil that meets the Department's Division of Environmental Remediation's criteria under 6 NYCRR Part 375. Non-vegetated areas would be covered by a paving system or concrete at least 6 inches thick.

ii) For restricted residential use, a two-foot thick cover will be required with the same details as for commercial use.

iii) Adherence to a Soil Fill Management Plan as provided in, or in conjunction with, a Site Management Plan, to be entered into by and between the successor in interest to the Grantor herein and the Department, and such Site Management

Plan necessary to change the zoning classification must be filed in the Office of the Clerk of Cattaraugus County, New York.

iv) Compliance with all elements of the Site Management Plan identified in subparagraph (iii) above.

v) The parties hereto acknowledge that passive recreational use is permitted in commercial use areas and active recreational use is permitted in restricted residential areas, as contemplated by subparagraph 3(f), below.

(c) Grantor's successors and assigns who shall propose a change in zoning use must provide a periodic certification of institutional and engineering controls, every three (3) years, prepared and submitted by a professional engineer or such other expert acceptable to the Department, until the Department notifies the property owner in writing that this certification is no longer needed. The certification submittal would: (i) contain certification that the institutional controls and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with Department-approved modifications; (ii) allow the Department access to the site; and (iii) state that nothing has occurred that would impair the ability of the control to protect public health or the environment, or to constitute a violation or failure to comply with the Site Management Plan unless otherwise approved by the Department.

(d) Grantor's successors and assigns who shall propose any change in zoning to use the Property shall provide Notice to all persons who thereafter acquire any interest in the Property of the Site Management Plan that the Department has approved and all Department approved amendments to that Site Management Plan.

(e) The above-stated engineering controls may not be discontinued without an amendment or termination of this Environmental Easement.

(f) Upon completion of the response action as set forth in the ROD by the Grantees hereto, and compliance with subparagraphs (b)-(e) of this section by any successor in interest to the Grantor, the Property may be used only, and for no other purpose than, as a recreational area, whether improved by appurtenant facilities such that the property can be used as and becomes an active public park, or left in a more or less natural condition for use as a passive recreational area, but in no case or event shall the Property be disturbed by construction to improve it for use, or allow it to be improved for use, for residential, commercial, or industrial purposes, it being the intention of Grantor that this Property become a public park, whether active or passive, and be used for no other purpose.

(g) Public use of the Property is not authorized until there has been full compliance with all requirements of law applicable to its designated recreational use.

4. Modification or termination of restrictions: The Restrictive Covenants on use specified in the preceding paragraph of this instrument may only be modified, or terminated in whole or in part, in writing, by the Grantees or their successors and assigns, with the prior written consent of EPA and the Department, provided, however, that any modification or termination of said restrictions shall not adversely affect the remedy selected by EPA for the Site.

5. Right of access: A right of access to the Property is hereby imposed upon the Property, being a Covenant to run with the land and surviving for perpetuity, from and binding on Grantor and its heirs, successors and assigns, and on the Grantees and their heirs, successors and assigns, and inuring to the benefit of the Grantees and their heirs, successors and assigns and the Third-Party Beneficiaries. Such right of access shall be allowed at all reasonable times, provided prior written notification has been provided to the Village at least 3 days prior to access, except, in the case of an emergency, such notice may be provided telephonically and shall be provided at the earliest reasonable opportunity. The access provided herein allows the following activities:

a) Excavation of impacted soil/fill from sub-areas on site and consolidation into an on-site landfill;

b) Covering an existing 5-acre on site landfill with a low-permeability equivalent design barrier cap, including seeding with a mixture to foster natural habitat;

c) Installation of a passive gas venting system in conjunction with a final cover system for the onsite landfill;

d) Construction, operation, maintenance (including if necessary potential leachate pre-treatment) and repairs of a groundwater/leachate collection system, and facilities necessary to discharge groundwater/leachate into the Gowanda Sewage Treatment Plant, and the construction of appurtenant buildings or facilities as necessary for the groundwater/leachate collection system;

e) Stabilization of the bank of Cattaraugus Creek adjacent to the Site;

f) Verifying any data or information relating to the environmental conditions of the Site;

g) Verifying that no action is being taken on the Property in violation of the terms of this instrument or of any federal or state environmental laws or regulations;

h) Conducting investigations under CERCLA relating to contamination on or near the Site, including, without limitation, sampling of air, water, sediments, soils;

and

i) Implementing additional or new response actions under CERCLA.

6. Federal authority: Nothing in this document shall limit or otherwise affect EPA's rights of entry and access or EPA's authority to take response actions under CERCLA, the NCP, or other federal law.

7. No public access and use: No right of access or use by the general public to any portion of the Property is conveyed by this instrument.

8. Public notice: Grantor and its heirs, successors and assigns agree to include in each instrument conveying any interest in any portion of the Property, including but not limited to deeds, leases and mortgages, a notice which is in substantially the following form:

NOTICE: THE INTEREST CONVEYED HEREBY IS SUBJECT TO AN ENVIRONMENTAL PROTECTION EASEMENT AND DECLARATION OF RESTRICTIVE COVENANTS, DATED June 29 **, 2009, RECORDED IN THE CLERK'S OFFICE, COUNTY OF CATTARAUGUS, ON** June 30 **, 2009 ,** ~~**IN BOOK _____, PAGE _____, IN**~~ **FAVOR OF, AND ENFORCEABLE BY, GRANTEES, AND BY THE UNITED STATES OF AMERICA, AND BY THE STATE OF NEW YORK AS THIRD-PARTY BENEFICIARIES.**

As Instrument No. 123508-001

Within thirty (30) days of the date any such instrument of conveyance is executed, Grantor or its heirs, successors and assigns agree to provide Grantees and the EPA with a certified true copy of said instrument and, if it has been recorded in the public land records, its recording reference.

9. Enforcement: The Grantees and the Third-Party Beneficiaries shall be entitled to enforce the terms of this instrument by resort to specific performance. Such remedy shall be in addition to any and all other remedies available at law or in equity, including pursuant to CERCLA. Any forbearance, delay or omission to exercise Grantees' rights under this instrument in the event of a breach of any term of this instrument shall not be deemed to be a waiver by the Grantees of such term or of any of the rights of the Grantees under this instrument.

10. Additional Covenants: Grantor hereby covenants to Grantees and their heirs, successors and assigns, and to Third-Party Beneficiaries, that the Grantor is lawfully seized in fee simple of the Property, that the Grantor has a good and lawful right and power to sell and convey the Property or any interest therein, and that the Property is free and clear of

encumbrances except as otherwise disclosed to Grantees.

11. Notices: Any notice, demand, request, consent, approval, or communication under this instrument that any party desires or is required to give to any other party shall be in writing and shall either be served personally or sent by first class mail, postage prepaid, addressed as follows:

To Grantor:

Palmer Street Gowanda 2007, Inc.
c/o Lipman & Biltekoff, LLP
333 International Drive Suite B-4
Williamsville, New York 14221

To Grantees:

Wilhelm Enterprises Corporation
c/o Lipman & Biltekoff, LLP
333 International Drive Suite B-4
Williamsville, New York 14221

New York State Electric & Gas Corporation
c/o Elias Group
411 Theodore Fremd Avenue
Suite 102
Rye, NY 10580

Prime Tanning Company, Seton Company, Viad Corp, GST AutoLeather, Brown Shoe Company, Inc., Con Agra Grocery Products Company, Beggs & Cobb Corporation, Genesco, Inc., Leucadia National Corporation, S.B. Foot Tanning Company, and Horween Leather Company.
c/o Kelley Drye and Warren, LLP
3050 K Street NW Suite 400
Washington, DC 20007

A copy of each such communication shall also be sent to the following:

To EPA:

United States Environmental Protection Agency
Office of Regional Counsel
New York/Caribbean Superfund Branch
290 Broadway

New York, NY 10007
Attn: Peter Cooper Landfill Site Attorney

United States Environmental Protection Agency
Emergency and Remedial Response Division
NY Remediation Branch - Western NY Remediation Section
290 Broadway, New York, NY 10007
Attn: Peter Cooper Landfill Remedial Project Manager

Department of Environmental Enforcement
Office of General Counsel
NYSDEC
625 Broadway
Albany, NY 12233-5500

with copies to:

Attn: Martin Doster
Department of Environmental Remediation
NYSDEC
Region - 9
270 Michigan Avenue
Buffallo, NY 14203-2915

To the Village:

Village Clerk
Village of Gowanda
27 East Main Street
Gowanda, New York 14070

Deborah J. Chadsey, Esq.
Kavinoky Cook LLP
726 Exchange Street, Ste. 800
Buffalo, New York 14210

12. General provisions:

a) Controlling law: The interpretation and performance of this instrument shall be governed by the laws of the State of New York and, if applicable, the United States. Any claim brought pursuant to this agreement shall be brought in the Eighth Judicial District of New York State Supreme Court or, the United States District Court for the Western District of New York, as applicable.

b) Liberal construction: Any general rule of construction to the contrary notwithstanding, this instrument shall be liberally construed in favor of the grant to effectuate the purpose of this instrument and the policy and purpose of CERCLA. If any provision of this instrument is found to be ambiguous, an interpretation consistent with the purpose of this instrument that would render the provision valid shall be favored over any interpretation that would render it invalid.

c) Severability: If any provision of this instrument, or the application of it to any person or circumstance, is found to be invalid, the remainder of the provisions of this instrument, or the application of such provisions to persons or circumstances other than those to which it is found to be invalid, as the case may be, shall not be affected thereby.

d) Entire agreement: This instrument sets forth the entire grant of rights and obligations, including rights of access, easements and restrictive covenants to run with the land and inure to the benefit of Third-Party Beneficiaries and supersedes all prior discussions, negotiations, understandings, or agreements relating thereto, all of which are merged herein; provided that nothing in this instrument shall be deemed to alter or modify the Consent Decree.

e) No forfeiture: Nothing contained herein will result in a forfeiture or reversion of Grantor's title in any respect. Further, no violation of the rights and obligations, including rights of access, easements and restrictive covenants set forth herein by any heir, successor or assign of the Grantor shall result in a forfeiture of title or revision of any interest from such heir, successor or assign to the Grantor.

f) Successors: The covenants, easements, terms, conditions, and restrictions of this instrument shall be binding upon, and inure to the benefit of, the parties hereto and their heirs, successors, and assigns and shall continue as a servitude running in perpetuity with the Property. The term "Grantor," wherever used herein, and any pronouns used in place thereof, shall include the persons and/or entities named at the beginning of this document, identified as "Grantor" and their heirs, successors, and assigns. The term "Grantees," wherever used herein, and any pronouns used in place thereof, shall include the persons and/or entities named at the beginning of this document, identified as "Grantee" and their heirs, successors, and assigns. The Third-Party Beneficiaries are agencies and/or instrumentalities of the State of New York or the United States of America and wherever used herein, and any pronouns used in place thereof, shall include the entities named at the beginning of this document.

h) Captions: The captions in this instrument have been inserted solely for convenience of reference and are not a part of this instrument and shall have no effect upon construction or interpretation.

i) Counterparts: The parties may execute this instrument in two or more

counterparts, which shall, in the aggregate, be signed by all parties; each counterpart shall be deemed an original instrument as against any party who has signed it. In the event of any disparity between the counterparts produced, the recorded counterpart shall be controlling.

TO HAVE AND TO HOLD unto the Grantees and their heirs, successors and assigns forever.

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

Palmer Street Gowanda 2007, Inc.

By: Michael P. Joy Its
Authorized Agency and Legal Counsel
Date: 6/29/09

Grantor's acknowledgment
STATE OF New York)
COUNTY OF ERIE) : ss

On the 29th day of June in the year 2009, before me, the undersigned personally appeared Michael P. Joy, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity, and that by his signature on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Barbara A. Wojcinski
Notary Public - State of New York
My Commission Expires: 3/30/2010

BARBARA A. WOJCINSKI
NOTARY PUBLIC, NY STATE
QUALIFIED IN ERIE COUNTY
COMMISSION EXPIRES 3/30/2010

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY:

Wilhelm Enterprises Corporation

By: _____
By: Michael P. Joy Its
Authorized Agent and Legal Counsel

Date: 6/29/09

Grantee's Acknowledgment

STATE OF NEW YORK)
COUNTY OF ERIE) : ss

On the 29th day of June in the year 2009, before me, the undersigned personally appeared Michael P. Joy, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity, and that by his signatureon the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Barbara A. Wojcinski
Notary Public - State of New York
My Commission Expires: 3/30/2010

BARBARA A. WOJCINSKI
NOTARY PUBLIC, NY STATE
QUALIFIED IN ERIE COUNTY
COMMISSION EXPIRES 3/30/2010

Schedule A

36.

CONVEYS: . ALL THAT TRACT OR PARCE OF LAND situate in the Village of Gowanda, Town of Persia, County of Cattaraugus and State of New York being part of Lots 16 and 26, Township 6, Range 8 of the Holland Land Company's Survey being more particularly bounded and described as follows:

Beginning at a point in the westerly line of Lot 16 which point is distant northerly 185 feet from the center line of Palmer Street and which point is in the northwesterly boundary line of lands conveyed to Eastern Tanners Glue Company by deed recorded in the Cattaraugus County Clerk's Office in Liber 207 of Deeds at Page 429; running thence southwesterly along said northwesterly boundary line 30 feet more or less to the southwesterly line of lands conveyed to Eastern Tanners Glue Company by deed aforesaid; thence southeasterly along said southwesterly line 37 feet more or less to the said westerly line of Lot No. 16; thence southerly along the said westerly line of Lot No. 16 a distance of 130 feet more or less to the center line of Palmer Street; thence southeasterly along the center line of Palmer Street 764.75 feet to its intersection with the continuation northerly of the easterly line of lands conveyed to Peter Copper Corporations by Deed recorded in Cattaraugus County Clerk's Office in Liber 556 of Deeds at Page 317; thence along said continuation and easterly and southerly boundaries of the lands so conveyed to Peter Cooper Corporations

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the following two courses and distances: (a) southwesterly 292.53 feet and (b) northwesterly 52.50 feet to the northeasterly corner of lands conveyed to Louis Sipple by Deed Recorded in Cattaraugus County Clerk's Office in Liber 240 of Deeds at Page 585; thence southwesterly along the southeast line of said lands so conveyed to Sipple, 122 feet more or less to the intersection of said line of lands so conveyed to Sipple with the west line of lands conveyed to Albert M. Taft by Deed recorded in Cattaraugus County Clerk's Office in Liber 60 Deeds, Page 146; thence southerly along the westerly line of lands so conveyed to Albert M. Taft by Deed aforesaid a distance of 205.14 feet more or less to a point in the center line of Miller Street which point is 6.14 chains more or less easterly from the west bounds of said Lot 16; thence easterly, southeasterly and southerly on the center line of Miller Street 1340 feet more or less to the northwest corner of lands conveyed to Harold Cook and wife by Deed recorded in Cattaraugus County Clerk's Office in Liber 759 of Deeds at Page 1112, said corner being 200 feet northerly of the center line of Beech Street measured along the center line of Miller Street; thence along boundaries of the lands so conveyed to Cook the following two courses and distances: (a) easterly 193.53 feet and (b) southwesterly 259.72 feet to the center line of Beech Street; thence southeasterly along said center line of Beech Street following its various angles and courses 618 feet to a westerly corner of lands conveyed to Robert Goodwill and wife by Deed recorded in Cattaraugus County Clerk's Office in Liber 767 of Deeds at Page 730; thence along westerly, northerly and easterly boundaries of lands so conveyed to Goodwill, the following five courses and distances: (a) northerly or northeasterly 25.57 feet; (b) northeasterly at an exterior angle of 114° 40' a distance of 97.0 feet; (c) northerly at an interior angle of 104° 00' a distance of 116.0 feet; (d) easterly at an exterior angle of 87° 40' a distance of 262.0 feet and (e) southerly at right angles

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169.84 feet to the center line of Beech Street and southeasterly corner of lands conveyed to Goodwill by Deed aforesaid; thence southeasterly along the center line of Beech Street 286.02 feet more or less to the southeasterly corner of lands conveyed to Nathaniel Whitcomb by Deed recorded in Cattaraugus County Clerk's Office in Liber 44 of Deeds at Page 317; Thence northeasterly along the southeasterly line of lands so conveyed to Nathaniel Whitcomb a distance of 357.8 feet more or less to the southerly corner of lands conveyed to Donald Steele by Deed Recorded in Cattaraugus County Clerk's Office in Liber 766 of Deeds at page 807; thence along boundaries of the lands so conveyed to Steele the following two courses and distances: (a) northwesterly 131.15 feet; and (b) northeasterly 162.0 feet to the center line of Palmer Street; thence in a general northwesterly direction along the center line of Palmer Street following its various angles and courses 449.37 feet more or less to the southeast corner of lands conveyed to Eastern Tanners Glue Company by Deed recorded in Cattaraugus County Clerk's Office in Liber 205 of Deeds at Page 364; thence northeasterly along the southeasterly line of lands so conveyed 224.40 feet running into Cattaraugus Creek; thence northwesterly along the northeasterly lines of said lands so conveyed to Eastern Tanners Glue Company 323.4 feet to the northwest corner of said lands; thence southwesterly along the northwesterly line of lands so conveyed to Eastern Tanners Glue Company a distance of 50 feet more or less to the northeasterly line of lands conveyed to Eastern Tanners Glue Company by Deed recorded in Cattaraugus County Clerk's Office in Liber 193 of Deeds at Page 589; thence northwesterly along the northeasterly line of lands conveyed to Eastern Tanners Glue Company by Deed last aforesaid and the northeasterly line of lands conveyed to Ansel F. Conger by Deed recorded in Cattaraugus County Clerk's Office in Liber 81 of Deeds at Page 496 and the

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northeasterly line of lands conveyd to Ansel F. Conger by Deed recorded in Cattaraugus County Clerk's Office in Liber 66 of Deeds at Page 133 a distance of 2560 feet more or less to the northwesterly line of lands conveyed to Eastern Tanners Glue Company by Deed recorded in Cattaraugus County Clerk's Office in Liber 207 of Deeds at Page 429; thence southwesterly along the northwesterly line of lands conveyed to Eastern Tanners Glue Company by Deed last aforesaid, a distance of 300 feet more or less to the point and place of beginning.

Together with all interest of the party of the first part in any land not included in the foregoing description lying between the northerly line of Beech Street as originally laid out or proposed and the center line of Beech Street as it now exists and in the land lying between the center line of Miller Street and the southerly, southwesterly and westerly line thereof.

Excepting from the above described lands all that portion thereof conveyed to Charles Strnisha and wife by Deed recorded in Cattaraugus County Clerk's Office in Liber 228 of Deeds at Page 154.

Subject to the rights of others in any land included in the foregoing description lying between the northerly line of Beech Street as oringinally laid out or proposed and the center line of Beech Street as it now exists.

Subject to the rights of the public and governmental authorities in those portions of the above described premises lying within the bounds of Palmer, Miller and Beech Streets.

Further subject to easement granted to Erie Railroad Company as set out in instrument Recorded in Cattaraugus County Clerk's Office in Liber 352 of Deeds at Page 258 and trackage rights in connection therewith and to other easements, rights-of-way and oil and/or gas leases of record.

NOTE: Above exception in Liber 228 of Deeds at page 154 is located south of Palmer Street.

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