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REMEDIAL ACTION WORK PLAN
BURNHAM CANAL SUPERFUND ALTERNATIVE SITE
MILWAUKEE, MILWAUKEE COUNTY, WISCONSIN
MILLER COMPRESSING COMPANY
WDNR BRRTS #: 02-41-552940
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REMEDIAL ACTION WORK PLAN BURNHAM CANAL SUPERFUND ALTERNATIVE SITE

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ACRONYMS AND ABBREVIATIONS

3H:1V	3 horizontal to 1 vertical
4H:1V	4 horizontal to 1 vertical
BCS	Broadcast Capping System™
BMP	best management practice
Cap	Remedial Subaqueous Aggregate Cap
cfs	cubic feet per second
CMD	City of Milwaukee datum
CS	Cleanup Standard, as defined in the project's Design and CQAPP
CSO	Combined sewer outfalls
COC	contaminant of concern
COMMPP	Cap Operations, Maintenance, and Monitoring Plan
CQA	Construction Quality Assurance
CQAPP	Construction Quality Assurance Project Plan
CQC	Construction Quality Control
CQCP	Construction Quality Control Plan
CY	cubic yard
DBPS	Dredge bucket positioning system
DNAPL	dense nonaqueous phase liquid
DOT	Department of Transportation
D50	median stone size
EPA	U.S. Environmental Protection Agency
ft	Feet, foot
fps	Feet per second
GNSS	Global Navigation Satellite System
GPS	global positioning system
gpm	gallons per minute
HARN	High accuracy reference network
HASP	Health and Safety Plan
in	inches
in-lb	inch-pound
ICIAP	Institutional Control Implementation and Assurance Plan
IGLD	International Great Lakes Datum
J.F. Brennan	J.F. Brennan Company, Inc.
KHz	Kilohertz
lb/day	pounds per day
LNAPL	light nonaqueous phase liquid
LOD	limit of detection
MMSD	Milwaukee Metropolitan Sewerage District
mg/L	milligrams per liter
mg/kg	milligrams per kilogram
NAPL	nonaqueous phase liquid
NAVD88	North American Vertical Datum of 1988

ng/L	nanograms per liter
NGS	National Geodetic Survey
NRT	Natural Resource Technology, Inc. (now O'Brien & Gere, Inc. of North America, Part of Ramboll)
OBG	O'Brien & Gere Engineers, Inc., Part of Ramboll
OC	organoclay
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PLC	programmable logic controller
PLS	Professional Land Surveyor
ppm	parts per million
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RA	remedial action
RD	remedial design
RTK	real-time kinematics
SBES	Single beam echo sounder
Select Crushed	Material meeting the Wisconsin DOT Specification Section 606 for Select Crushed Material
SU	standard units
TPH	tons per hour
TSS	total suspended solids
USACE	United States Army Corps of Engineers
VFD	variable frequency drive
WDNR	Wisconsin Department of Natural Resources

1. INTRODUCTION

The project will address contaminated soil and sediment and other improvements in the Burnham Canal Superfund Alternative Site (Canal) in the city of Milwaukee, Milwaukee County, Wisconsin (Figure 1). The selected Remedial Action (RA) for the Canal is set forth in the Record of Decision (USEPA, 2011 [ROD]) signed by the United States Environmental Protection Agency (USEPA) with concurrence from the Wisconsin Department of Natural Resources (WDNR).

Miller Compressing Company (Miller) is required to submit Work Plan(s) for the performance of the work to the WDNR in compliance with the ROD (USEPA, 2011), Remedial Design (NRT, 2017a), Wis. Admin. Code § NR 724 and the Chapter 30 Permit (WDNR, 2018b) as a single project. The Work Plan provides for construction and implementation of the Remedial Action set forth in the ROD (USEPA, 2011) and the Remedial Design (NRT, 2017a), construction of the Voluntary Betterment (Betterment), the imposition of continuing obligations under Wis. Stat. § 292.12 and/or institutional controls per the Institutional Control Implementation and Assurance Plan (ICIAP [NRT, 2017b]) and includes a schedule for obtaining all permits and approvals.

The 2016 Construction Quality Assurance Project Plan (CQAPP [NRT, 2016]) establishes requirements for managing and implementing the Quality Assurance (QA) and Quality Control (QC) elements for addressing soil and sediment remedial activities described in the ROD (USEPA, 2011). The Work Plan accounts for executing the project as a Design/Build integrated project. As such, certain roles and responsibilities in the CQAPP (NRT, 2016) have been modified. Roles are presented in the sections below to align with the contract for the work.

This Work Plan expands and provide details for executing work that has been developed since establishment of the 2016 CQAPP (NRT, 2016). The Work Plan and the CQAPP (NRT, 2016) will control the work, however this Work Plan addresses the activities in more detail. While not anticipated, occurrences of potential inconsistencies between the 2020 Work Plan and the 2016 CQAPP (NRT, 2016) will managed in accordance with this Work Plan.

1.1 Project Roles and Reporting Responsibilities

Miller has contracted with O'Brien & Gere, Inc. of North America, part of Ramboll (OBG) to complete the RA construction as a Design/Build integrated project. Under this approach, OBG has been assigned with completing Miller's RA obligations. Obligations generally include serving as the Project Coordinator, Engineering Consultant and the RA Contractor as identified in the 2016 CQAPP (NRT, 2016), the Remedial Design (NRT, 2017a), the ROD (USEPA, 2011) and other documents approved by the regulating agencies. OBG has contracted with J. F. Brennan (Brennan) to support the project as the Marine Contractor. The role assignments for the project are listed below. Changes to the project assignments will be submitted to the WDNR if required during the project. Appendix A provides the resumes for key personnel for the Project. Project assignments for the roles and responsibilities identified in the CQAPP (NRT, 2016) are provided below:

- **Project Owner:** Miller Compressing – Darren Engbring
- **Project Coordinator:** OBG – Mark Walter, PE
- **Engineering Consultant:** OBG – Mark Walter will be the project Engineer and lead the OBG technical team.

- **Project Manager:** OBG – Todd Lewis will be the project manager.
- **Project Engineer:** OBG – Mark Walter, PE

In addition to the responsibilities listed the CQAPP (NRT, 2016) the Project Engineer will draft, provide and certify the construction completion report following RA and Betterment construction completion. The construction completion report will meet the requirements of the Negotiated Agreement (WDNR, 2018c) between Miller and the WDNR.

- **Health & Safety Officer:** OBG – Steve Wiskes
- **On-Site Health & Safety Officers:** Brennan - Tim Butz and Joel Dahlby
- **Field Engineer:** OBG – Alex Bartelme
- **CQC Engineer:** OBG – Kyle Schaefer
- **Quality Manager:** OBG – Ernie Miyashita
- **Remedial Contractor:** OBG

OBG is the general contractor for completing the RA work. A significant majority of the work tasks involve marine construction and will be subcontracted to J. F. Brennan located in La Crosse, WI (Brennan)

- **Project Superintendent:** Brennan - Matt Wagner
- **Analytical Laboratory:** Pace Analytical
- **Geotechnical Laboratory:** GESTRA Engineering, Inc.

1.2 Design and Approval Background

The approved Final Design Report Revision 1 (Design [NRT, 2017a]) includes design and implementation considerations for the following RA components, which are included in this Work Plan:

- Maintaining the Paved Cap Area west of the Canal, at the historic location of the wire reclamation furnace
- Soil and sediment removal; and capping in the Unpaved Cover Area on the West End of the Canal, above the water line, including the 12-inch Scrape Area
- Placement of a stabilization layer and a Remedial Subaqueous Aggregate Cap (Cap) from the 11th Street Bridge to the west terminus of the Canal
- Confirm institutional controls during construction to minimize the potential for exposure to contamination and protect the integrity of the remedy

While not included in the Design (NRT, 2017a), Miller has elected to also include construction of the Betterment. The Betterment will serve as a base for a potential future urban wetland to be constructed by others. The Betterment consists of approximately five feet of aggregate fill material placed on top of the Cap.

The site will undergo several phases of construction. The first phase will excavate Canal sediment. The second construction phase will place the Cap over the sediment, as required by

the USEPA remedy for the site. The third construction phase will place additional material over the Cap.

The work will be conducted under the following permits that have been or will be secured for the work and will be in the project repository. Copies of these permits will also be maintained at OBG's on-site field office.

- WDNR Chapter 30 Individual Permit (WDNR, 2018b) – Permit IP-SE-2018-41-01442, 00631, 00635 was issued by WDNR on July 6, 2018 and extends through July 6, 2021. OBG sent a request for extension through December 31, 2022 to WDNR on July 10, 2020.
- WDNR NR 718.15 Low-Hazard Exemption to Manage Sediment within the Canal (WDNR, 2018a) – WDNR approval was issued on August 31, 2018 and extended through August 31, 2019. OBG notified WDNR of schedule update (sediment management activities planned to occur in 2020 and/or 2021) on July 8, 2020. On July 21, 2020, WDNR stated via email that they have no comments regarding the schedule change.
- USACE Nationwide Permit (USACE, 2019) – Permit No. MVP-2018-00625-ANM was issued by USACE on January 17, 2019 and extends through March 18, 2022.
- City of Milwaukee Floodplain Development Permit – OBG submitted a permit application on July 31, 2020.
- City of Milwaukee Erosion Control Permit – OBG submitted a permit application on August 27, 2020.

2. PRELIMINARY ACTIVITIES

2.1 Site Security and Controls

An existing fence marks the boundaries of the Miller facility (facility). Within the facility, new temporary fencing will be incorporated with existing fencing to segregate the east end construction staging/material storage area from the facility operations. The existing and temporary fencing will generally isolate the Canal and eastern portions of the facility from the other Miller operation areas. A project access gate will be established at the existing gate on the east fence at the north end of 11th Street, an additional project access gate will be installed in the temporary fencing to be constructed at the western portion of the east end construction staging/material storage area. The project fence will be maintained by the Brennan and will be checked weekly for deficiencies to inhibit public access to the work zone areas. A portion of the existing fence adjacent to the West End and north edge of the Canal at the east end construction staging/material storage area will be removed to achieve access to the work area. All removed facility fences will be restored before project completion. Figure 2 indicates the security fence and gate locations.

Signage will be placed along the 11th Street Bridge during construction activities in order to alert the public. Signage will also be placed east of the 11th Street Bridge in the Canal waterway during construction activities. In addition, a sheet pile wall, silt curtain, and buoys will be used to demarcate the construction area within the Canal.

All visitors will be required to sign a visitor's log when entering and exiting the site. Access to remedial action and Betterment areas will be limited to authorized personnel and they will be required to participate in a site-specific health and safety briefing by the site supervisor or health and safety officer prior to entry.

2.2 Surveying

During the preliminary activities, a benchmark(s) will be established in the project area to maintain survey control throughout the project. Survey methods are described further in Section 7.3.

At a minimum, the following items will be surveyed prior to construction at the site:

- Stake out of the proposed remedial action and Betterment areas
- Lateral extents of shallow soil excavations
- Locations and elevation of combined sewer outfalls (CSO)
- Pre-construction bathymetric survey
- Existing utilities
- Benchmark/control points
- Installation of Canal water level staff gage
- Photo documentation of the pre-construction conditions of the site

2.3 Site Preparation

Personnel and equipment will be mobilized to and from the Site as necessary to complete the phases of construction. Support facilities for coordination meetings, personnel break areas, sanitation, first aid, and equipment supplies will be staged near the work area.

Site preparation will include mobilization, establishment of truck routes, site access, staging areas, and exclusion zones, protection, removal, or relocation of utilities if needed, installation of a sheet pile wall, installation of turbidity controls, installation of erosion controls, clearing and grubbing of vegetation, and establishment of dust and noise control. Figures 2 and 3 identify items required for initial site preparation.

2.3.1 Mobilization

Water-based equipment and barges will be brought to the Site by truck. A mobile crane will be used to assemble and launch equipment into the water. Land-based equipment will be transported to the Site by truck. The equipment to be mobilized to the site to support remedial activities include:

- One 40 foot (ft) x 80 ft barge will be constructed in the Canal to form a floating work platform. The barge will serve as the excavation platform and the main marine equipment platform that will be transformed, as necessary, per each project task. The barge will include:
 - Spuds located at each end anchoring the barge
 - Generator for power supply for material handling equipment
- One hydrocrane
- Two material barges (40 ft x 50 ft)
- Two hoppers for material transport
- Small marine support vessels for transporting crew and fuel to the barge
- Two 130,000-lb excavators
- One 100-ton crane
- Contact water storage tanks and pump
- Broadcast Capping System (BCS) spreader
- Two office trailers to be located on land

All equipment used for the project including, but not limited to, tracked equipment/vehicles, barges, boats, hoses, sheet pile and pumps shall be de-contaminated, including for invasive and exotic viruses and species prior to use and after use. The following steps will be taken for all marine equipment arriving or departing the site to avoid transporting invasive and exotic viruses and species.

1. To the extent practicable, equipment and gear used on infested waters shall not be used on other non-infested waters.
2. Inspect and remove aquatic plants, animals, and mud from the equipment.
3. Drain all water from equipment that has contacted infested waters before arriving on site.

4. Properly dispose of aquatic plants and animals. Release or transfer aquatic plants, animals or water from one waterbody to another will be prevented.
5. Wash all equipment with hot (>140° F) and/or high-pressure water or allow equipment to dry thoroughly for 5 days.
6. The Field Engineer will be advised of arriving marine equipment at least three days in advance.
7. Brennan will provide a certificate of de-contamination for all equipment mobilized to the Site upon equipment arrival. The Field Engineer will review the certificate and equipment and approve the equipment for use on the project.

2.3.2 Haul Routes & Tracking Pad

The primary construction ingress and egress point will be through the existing fence on the property, adjacent to S. 11th Street on the east side of the site. OBG may also coordinate with the facility to allow limited ingress and egress for larger vehicles via the Site's existing driveway off S. Muskego Ave. on the west side of the site.

Appropriate signage will be posted to identify the construction entrances and exits. Traffic controls such as temporary fencing, barricades, and signage, will be used, as needed, to alert the public of potential hazards due to construction and/or other operations.

The primary access point to the site for material delivery and shipping of waste material for disposal will be through the east gate on to 11th Street (Figure 2). Haul routes shall be maintained for truck traffic throughout the duration of excavation activities. Haul routes will be reviewed and approved by facility personnel during preconstruction meetings or submittals. The haul routes shall be cleared of debris and soil on a regular basis to prevent tracking of soils onto public roads. A minimum 15-foot wide route on site will be maintained.

A tracking pad shall be constructed with 3-inch clear stone atop a minimum 16 ounce per square yard nonwoven geotextile fabric on the west side of the site exit gate at 11th Street. The pad will be at least 3 inches (in) thick and shall be maintained for the duration of the work. Public rights-of-way, streets, and the site entrance and exit will be cleaned with commercial street sweepers as needed to remove debris or soil. Truck beds will be covered and securely fastened before leaving the property.

2.3.3 Site Access and Staging Areas

The project will require an upland staging area to offload soil, sediment, and debris and stockpile aggregate, general fill, and topsoil for stabilization, capping, Betterment placement, and site restoration. Construction considerations include geotechnical stability with respect to stockpile proximity to the Canal wall, protecting subsurface utilities, and improved surfaces where large quantities of material will be stockpiled. In addition, the upland staging area will be used for equipment storage and for the field offices. The upland staging area will have Canal access for transferring equipment and materials to the work area. Access will be along the north side of the Canal by removing the facility fence from approximately Station 13+50 to 16+50. The existing facility fence will be restored following construction.

Canal work areas will require sufficient berthing depth and length to accommodate floating equipment used for the remedial action and Betterment placement. The areas adjacent to (west and/or north of) the Canal on the Miller property will provide the following features:

- Sufficient upland area for stabilization/water treatment processes, stockpile, equipment storage, and transfer facilities
- Adequate accessibility for truck access to haul routes
- Surface area capable of supporting heavy equipment

Figure 2 shows the proposed contractor access gate, staging/laydown areas, aggregate stockpile area, and material management pad on the north side of the Canal on the Miller property. The locations of the sediment stabilization and laydown areas may be changed to accommodate facility operations and contractor access.

Sediment will be removed by water-based excavation equipment and placed in water-tight roll-off containers located on barges. The barges containing the sediment roll-offs will be repositioned to the northeastern portion of the Canal where sediment will be excavated from the roll-offs by land-based excavation equipment and placed into the material management/decontamination pad.

The material management/decontamination pad will be established on the southern end of the staging area located adjacent to 11th St., whereas the material stockpile areas are planned to be established in the northern portion of this staging area. The material management/decontamination pad will be constructed by placing a geotextile liner atop the existing pavement or gravel area and draping over concrete bin blocks placed atop the existing pavement around the pad's perimeter. Crushed stone will then be placed atop the geotextile liner within the pad's perimeter (Figure 4). Additional material management pad requirements are detailed in Section 02300 of the Plans and Specifications Attachment of the project's Chapter 30 Permit Applications (OBG, 2018 [Appendix B]).

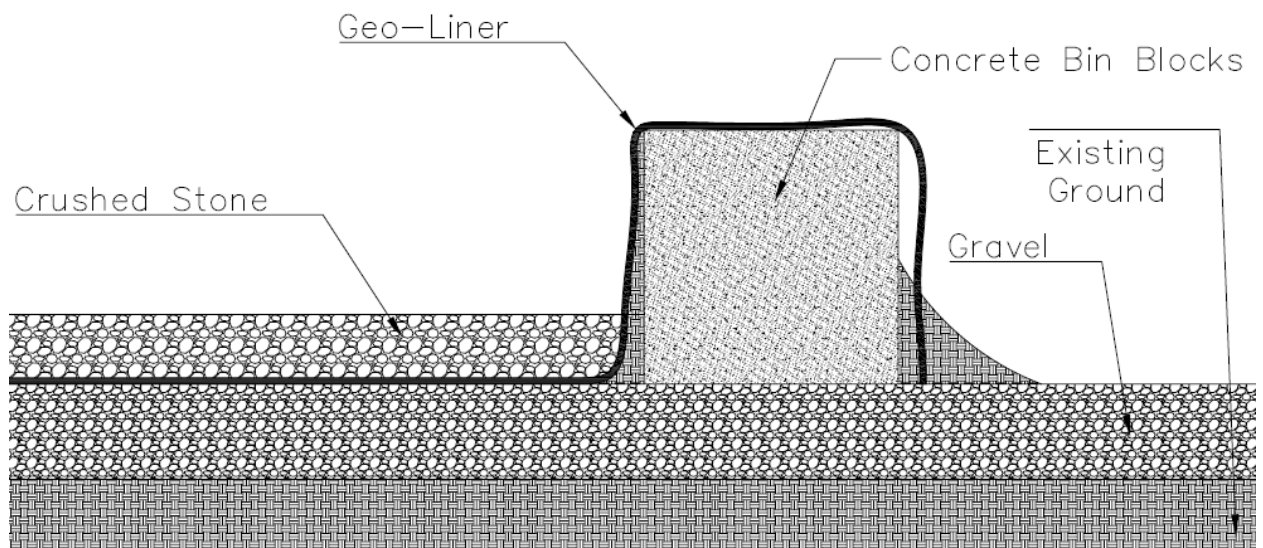


Figure 4 – Material Management/Decontamination Pad Cross-Section

2.3.4 Exclusion Zones

Exclusion zones in the Canal and on adjacent upland work areas will be established for excavation, capping, and Betterment operations. These exclusion zones will be clearly defined with appropriate signage and secured with respect to public/worker safety.

2.3.5 Protection of Utilities and Construction Utilities

Two Milwaukee Metropolitan Sewerage District (MMSD) combined sewer outfalls, CSO-193 (formerly CSO-210) and CSO-194 (formerly CSO-211), are located within the Canal project area. The CSOs have the following properties:

- CSO-193 is a 3-foot by 5-foot concrete box culvert located on the south side of the Canal north of 13th Street at Station 10+40 and has a maximum discharge capacity of approximately 247 cubic feet per second (cfs).
- CSO-194 is a 78-inch diameter corrugated metal pipe located on the West End of the Canal and has a maximum discharge capacity of approximately 430 cfs.

The drawing sheets included in the project's Chapter 30 Permit Applications (OBG, 2018 [Appendix B]) show the locations of the existing CSOs. Section 5.6 describes the riprap erosion or sediment disturbance protection proposed at CSO-194.

Other known utilities include a storm water collection trench along the north side of the Canal. The storm water collection trench serves as a best management practice (BMP) for the asphalt parking area used for trailer storage. The trench contains engineered fill to remove total suspended solids (TSS) prior to discharging to the Canal through several outlets along the seawall. The drawing sheets show the locations of the existing CSOs, BMP trench, outlets, and manhole structures.

Although not anticipated, if utility modifications are necessary, the utility provider will be contacted to coordinate modifications. Additionally, coordination with utility providers may occur to facilitate installation of utility services as necessary for construction operations. Construction operations may require electrical and/or communication services for field office trailers.

2.3.6 11th Street Remediation Boundary

To achieve a stable eastern terminus of Betterment fill material at the 11th Street Bridge, while still allowing the full Betterment fill thickness to be placed up to the eastern terminus, a sheet pile wall will be installed at the west side of the bridge prior to the RA, as shown on Figure 3. The wall will also be a component of turbidity management and control to minimize suspended solids migration.

The sheet pile wall will be PZ-27 sheeting (or equal as approved by the Project Engineer) and extend the width of the Canal (up to 150 linear feet). The sheets will be a minimum of 45 feet in length, driven approximately 27 to 28 feet into the sediment and underlying native materials, extend approximately 17 to 18 feet above the sediment surface, and extend above the water surface. Based on USACE's Great Lakes Water Level Outlook (USACE, 2020) the Lake Michigan (Lake) level is forecast to be approximately 581.0 feet International Great Lakes Datum 1985 (IGLD 85), approximately 0.93 feet City of Milwaukee Datum (CMD), in October 2020 when construction is expected to begin. To accommodate a potential 1-foot rise in Lake level and control the level of the Canal approximately 1 foot above the Lake level for turbidity control, the

top of the wall is planned to be set at, and/or equipped with removable weir gates to extend to, an elevation of approximately 583.0 IGLD 85 (2.93 CMD). Final sheet pile top and bottom elevations will be determined based on lake level at the time the piles are installed.

The sheet pile wall will contain the stabilization, Cap and Betterment materials from sloughing under the 11th street bridge, out of the remediation area. The sheet pile wall will also provide limited hydraulic control of the water flowing through the Canal. Flow control and turbidity migration minimalization is discussed further in Section 3.1. The sheet pile will not require coatings or interlock sealant on the joints. Sheeting will be installed up to the west side of each existing bulkhead on the north and south sides of the Canal.

The approximate bottom elevation of sheets will be 537.0 to 538.0 IGLD 85 (-43.07 to -42.07 CMD). If refusal is met prior to reaching full design depth of sheets, the Project Engineer will be notified, and sheets will be cut at the design top of sheet elevation (planned to be 582.0 to 583.0 IGLD 85 [1.93 to 2.93 CMD]) upon approval. Final sheet pile top and bottom elevations will be determined based on lake level at the time the piles are installed. Control valves will also be fabricated and installed near the top of the sheeting wall to allow water to pass through during precipitation events that will cause the Canal water level to rise above the control level.

The wall will elevate the water surface in the work area during construction activities and also serve as a turbidity control barrier. Following placement of materials in the Canal for RA construction, the wall will be cut off below the water surface, at the top of the Betterment, to restore regular flow through the Canal. The 11th Street Remediation Boundary system sheet pile layout is provided on Figure 5.

Installation of the sheet piles will be performed with the use of a crawler crane working atop the floating platform. Materials will be offloaded and stored in the stockpile area. From there, sheet pile sections will be transported from the shore using 40-foot by 50-foot deck barges. The sheet piles will be placed with the crane and driven to the design tip elevation using a vibratory hammer with a driving capacity of approximately 4,400 inch-pounds (in-lbs). If soil conditions impede the vibratory hammer driving capacity, a diesel impact hammer will be deployed to drive the sheet piles. The crews plan to work 12-hour shifts Monday through Friday with a goal of installing approximately 40 linear feet of wall per day.

2.3.7 Suspended Solids and Turbidity Control

During sediment removal and sediment relocation in the West End of the Canal, sediments may become suspended. Also, during placement of aggregate materials to construct the Cap and Betterment, a portion of the fill material may become temporarily suspended. To minimize conveyance of potentially suspended particles in the Canal work zone to downstream areas (east of the 11th Street bridge), certain measures will be implemented, namely:

- Turbidity monitoring as required in the CQAPP (NRT, 2016) and this Work Plan
- Silt curtains
- Temporary suspension of work during elevated Canal flow

2.3.7.1 Monitoring

The baseline turbidity level will be established prior to construction. 10 Surface water grab samples will be collected for laboratory analysis of turbidity (Nephelometric Turbidity Units [NTU])

and TSS (mg/L). The associated data points will be utilized to develop an equation to convert NTU to mg TSS/L. For consistency with monitoring to be performed during construction, baseline samples will be collected at the approximate middle of the Canal width at mid water depth.

During construction monitoring points will be established approximately 100 feet and 600 feet east of the 11th Street Bridge, as shown on Figure 3. The monitoring point 100 feet downstream will be the compliance point and the monitoring point 600 feet downstream will assess potential water quality influences not attributable to the RA and Betterment project. Hourly turbidity measurements will be collected during in-water dredging and turbidity measurements will be collected every two hours during stabilization, capping, and Betterment placement. Turbidity will be measured with a hand-held nephelometer and/or with sondes mounted on buoys.

Separate turbidity levels not to be exceeded during construction have been developed in separate controlling documents, as summarized in the chart presented below. Per the Specifications included in the project's Chapter 30 Permit Applications (OBG, 2018 [Appendix B]), turbidity downstream of erosion and sediment control features shall not exceed 70 NTU above baseline turbidity measurements. To determine compliance with this requirement, the average of the baseline sample NTU readings will be subtracted from the compliance point NTU reading. If this differential is greater than 70 NTU, the background point NTU reading will be subtracted from the compliance point NTU reading. If this differential is greater than 70 NTU, turbidity levels are not in compliance and work will be suspended and/or corrective action will be implemented.

Per the Final Design (NRT, 2017a) and CQAPP (NRT, 2016), TSS downstream of erosion and sediment control features and reasonably attributable to the project construction shall not exceed an average of 80 mg/L over four hours. To determine compliance with this requirement, background point NTU readings will be converted to TSS and subtracted from the compliance point NTU readings converted to TSS. These differentials will be averaged over running 4-hour periods. If a 4-hour average exceeds the 80 mg/L Action Level, turbidity levels are not in compliance and work will be suspended and/or corrective action will be implemented. If a 4-hour average is less than 80 mg/L, but exceeds the 40 mg/L Advisory Level, the Field Engineer will notify the Project Superintendent.

Work will be suspended and/or corrective action will be implemented if turbidity readings are not in compliance with all established requirements. Refer to Figure 6 for a summary of turbidity compliance monitoring.

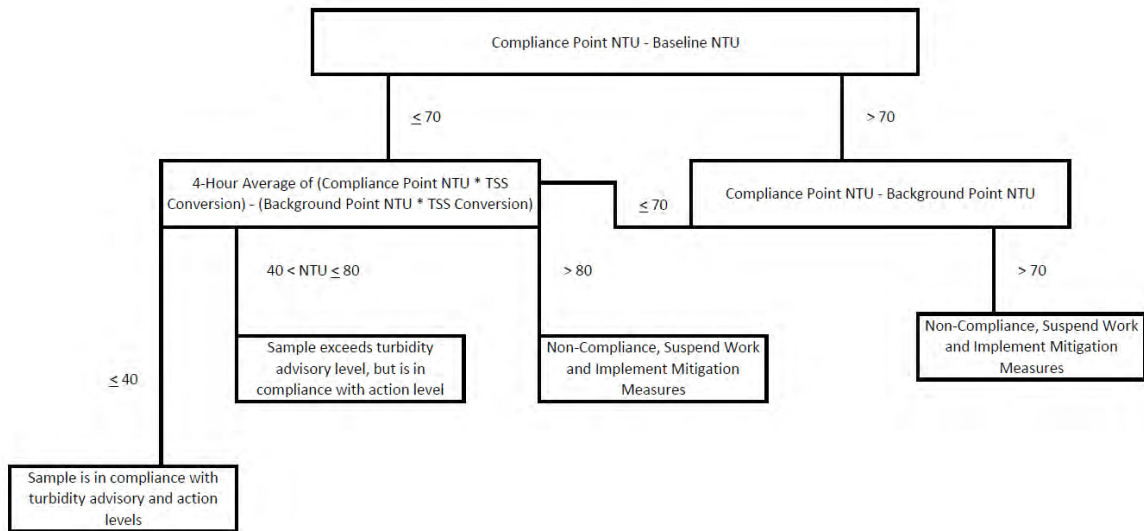


Figure 6 – Turbidity Compliance Monitoring

2.3.7.2 Silt Curtains

Temporary silt curtains consisting of permeable fabric are typically used in a waterway or water body to minimize sediment transport. A silt curtain typically does not extend to the bottom of the channel and is placed parallel or perpendicular to the direction of water flow. The proposed silt curtain configuration is shown in Detail 1 on Sheet C040 of the Plans and Specifications Attachment of the Chapter 30 Permit Application (OBG, 2018 [Appendix B]). Silt curtains will be installed on the downstream side of the dredge/sediment relocation areas and on the downstream side of the 11th Street Bridge and will either need to be anchored or moored to shore. If the silt curtains are anchored to shore, permission to anchor to shore will be obtained from the property owners along the south side of the Canal.

Silt curtains to be installed for the duration of the project include two, 22-ounce polyvinyl chloride (PVC)-coated polyester curtains used in parallel as part of the turbidity control system. Specifications for the curtain material will be submitted by the Brennan to the Project Engineer for approval. The curtains will extend from the surface of the water downward to a depth of approximately five feet. The curtains will have vertical travel and be able to float up and down to accommodate changing surface water elevation. If the established turbidity levels are exceeded, a localized silt curtain may be installed around an active work area to allow Canal flow to bypass the work zone.

2.3.8 Runoff and Erosion Control

Prior to beginning site work, the following minimum erosion control measures and activities will be implemented:

- A tracking pad of open graded stone will be placed at truck entrances/exits to minimize off-site tracking of material from truck tires
- Silt fence will be placed around unpaved construction areas
- Material management and decontamination areas will be bermed on all sides, as discussed in Section 2.3.3, to prevent sediment runoff

- Filter fabric will be placed over existing storm sewer catch basins, if any exist near the site, to prevent sediment from entering state waterways
- Street sweeping will be conducted, as necessary, to remove potentially tracked materials on public roads
- If necessary, additional measures will be taken to prevent run-on of surface water, particularly in upland soil excavation areas

Installation methods and maintenance procedures for silt fence, tracking pads, and inlet protection will follow WDNR best management practices technical standards. Erosion control measures will be maintained throughout construction activities until permanent erosion control measures are in place.

Brennan will be responsible for implementing the erosion controls and complying with all applicable requirements including conducting site inspections. At a minimum, inspections will satisfy the following requirements:

- Document the conditions and/or repair of silt curtains, silt fences, and/or catch basin filter fabric
- Document sediment accumulation amounts adjacent to fences and/or on catch basin filter fabric
- Evaluate eroded or potentially unstable soils

Inspections will be made weekly and within 24 hours after rainfall events of 0.5 in or greater, or as directed by the Field Engineer. Maintenance activities may include removal of sediment from fences and/or catch basin filter fabric, and repair as needed. Inspection logs will be maintained at the site.

2.3.9 Clearing and Grubbing

Clearing and grubbing of trees and brush will be performed following placement of temporary erosion control measures. It will include trimming and/or clearing of tree branches and bushes along the northern and southern banks of the Canal that may interfere with construction activities. Most of the trimming activity along the northern and southern Canal banks is expected to be performed from the Canal and will not require access to upland properties. The trimming along the sides of the Canal is intended to be performed utilizing a 40 ft x 80 ft sectional barge outfitted with a 130,000-lb excavator. Additional small equipment and jon boats will also be used along with 4 to 5 operators to perform the work. If trees greater than 6 in diameter are removed, they will be cut 12 in from ground level. Stumps will remain in place and be treated with an herbicide to prevent regrowth.

In upland soil excavation areas at the West End of the Canal, clearing and grubbing activities will also include the removal of trees, bushes, stumps, and root balls from within the Canal bank. Tree trunks, branches, stumps, roots, and root balls removed during clearing and grubbing will be transported off site for disposal as non-regulated waste vegetation. Additionally, clearing and grubbing will involve the removal of existing riprap along the west bank. The riprap will be temporarily stockpiled for later use during restoration activities.

2.3.10 Air Quality and Noise Control

Based on the short duration of the project, low volatility of copper, lead, and PAHs and the industrial/commercial nature of the project area, air monitoring will be limited to worker exposure for particulates. During site preparation, water storage for dust suppression of at least 500 gallons will be staged on site. Pumps, hoses and/or water trucks will be also be staged on site to distribute dust suppression water to minimize fugitive dust emissions.

Baseline dust conditions will be documented by the Field Engineer before excavation or stockpiling begins. The dust monitoring will be as specified in the Design (NRT, 2017a) and documented in a pre-construction conditions report. Dust monitoring will continue each day when excavation, stockpiling, and material movement begins. Real-time particulate measurements will be collected using portable hand-held air sampling and analysis devices at specified sampling intervals (e.g., every 15 minutes) over the entire workday and compared to the action levels, as presented in the Health and Safety Plan (HASP [Appendix C]). Any exceedance of an action level will require specific response measures by the Brennan to reduce the particulate phase emissions. Dust suppression water will be applied to roads, excavated soil and stockpiled material, as needed, to control dust below the action levels specified in the HASP (Appendix C).

Heavy equipment and trucks associated with the recycling operations on the Miller property near the Canal will be operating during the proposed remedial activities. Remedial activities are anticipated to occur during the recycling facility operational hours and therefore noise levels are expected to be within normal conditions for the area. If necessary, a variance to the Milwaukee City Ordinance will be obtained and/or Miller's existing Planned Development Plan will be modified prior to commencing construction operations between the hours of 9:00 PM and 7:00 AM.

3. SOIL AND SEDIMENT EXCAVATION (WEST END)

Excavation of soil and sediment on the West End of the Canal for the agency-approved remedy will extend from the edge of the Paved Upland Area approximately 75 feet into the Canal. Soil and sediment excavation limits are shown in the drawing sheets included in the project's Chapter 30 Permit Applications (OBG, 2018 [Appendix B]). The soil and sediment excavation limits were defined based on physical features, such as existing pavement, and analytical results for copper concentrations. An estimated 180 cubic yards (CY) of unsaturated soil and 900 CY of sediment will be excavated from the West End of the Canal.

Brennan will provide the labor, equipment and materials needed to perform the excavation work. Construction personnel on site during the work is anticipated to be:

- Key Personnel:
 - The on-site health and safety officer
 - Field Engineer
 - Project Superintendent (Brennan)
 - CQC Engineer
 - Project Engineer (part time)
 - Project Manager (part time)
- Other Personnel:
 - 6 to 8 equipment operators

Resumes for the project key personnel are provided in Appendix A.

Equipment to be used for the sediment removal (dredging) includes:

- One 40 ft x 80 ft barge with Spuds located at each end for anchoring and a Generator for power supply for material handling equipment
- Two material barges (40 ft x 50 ft)
- Two hoppers for material transport
- Small marine support vessels for transporting crew and fuel to the excavation platform
- Two 130,000-lb excavators
- Transfer trucks

Figure 7 below illustrates the planned marine plant schematic.

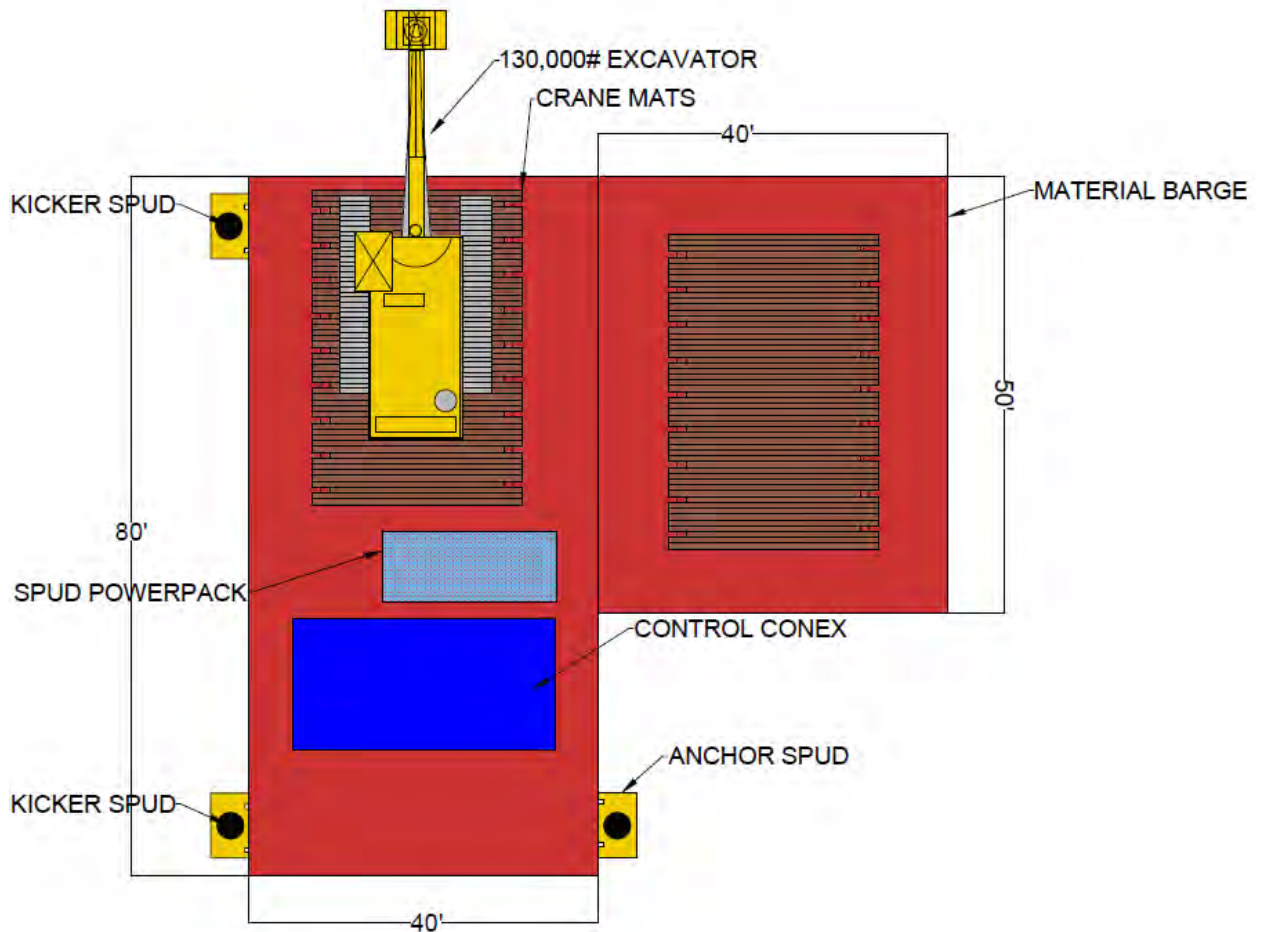


Figure 7 - Dredging Marine Platform – Plan View

Before sediment excavation begins, the marine platform will be used to install the boundary wall at the 11th Street end of the project area. Following installation of the boundary wall, the equipment on the floating platform will be replaced with the excavation equipment needed to perform the sediment removal work.

Staging areas and truck routes established during site preparation will be utilized during sediment excavation activity. The staging areas and truck routes are shown on Figure 2.

Utilities are not expected to be in the area of excavation, except for CSO-194. The limits of the outfall pipe will be staked before excavation begins to avoid contact with the outfall pipe. To the extent practicable, heavy equipment use will be limited to off-pavement areas to protect paved areas. If use on paved areas is necessary, heavy equipment will be placed on pads or equipped with rubber tracks.

The sequence of the sediment excavation work is indicated in the project schedule in Appendix D. The excavation work to remove the sediment and soil from the West End area is anticipated to be completed in 4 weeks. In summary, the sediment excavation work will proceed in the following order:

- Documentation of preconstruction conditions and marking of outfall structure
- Marking of the excavation limits and calibration of the excavation equipment global positioning system (GPS). Produce and load software maps of the excavation area in the excavation equipment GPS. The GPS position controls will be checked in each day of operation using site benchmarks to confirm proper operation and ensure the dredging depths have been achieved within the specified tolerances. The GPS position control will allow for precise bucket positioning to control the excavation.
- Excavate the soil and sediment using the marine platform-located excavator, place excavated materials in water-tight roll-off containers located on material barges. Material barges will be moved to the material management pad located along the Canal's north wall (in construction staging area) and excavated material will be offloaded from barge-based roll-off containers to the material management pad with a land-based excavator. Any debris encountered will be removed with the excavation equipment and managed with the excavated materials.
- If the material is acceptable for disposal, the land-based excavator may directly load trucks for hauling to the off-site disposal facility. Otherwise, excavated materials will remain in the material management pad for stabilization prior to off-site disposal.
- Materials stored on the material management pad will be stabilized as addressed in Section 2.3.3. Excavated sediment from the canal may be mixed with upland soil as part of the stabilization process.
- In the areas excavated to the target grade, implement the sampling and documentation requirements detailed in the CQAPP (NRT, 2016).
- If sampling and analysis indicate additional sediment removal is necessary, repeat once the sediment excavation and sampling steps.
- After completing the sediment and soil excavation, the excavation areas will be restored. Restoration activities, including Cap installation, are presented in Section 6.

If site conditions allow, upland soil may be excavated using an upland-located excavator. This excavated soil would then be placed in transport trucks to proceed to the material management pad to be utilized in the sediment stabilization process, or off-site for disposal. Trucks will have liquid-tight end-gates to prevent potential liquid leakage.

To prevent obstruction of CSO flow and erosion of fill materials, the sediment removal will need to be deep enough to allow fill to be placed beneath the invert of CSO-194. Based on the October 6, 2017 United States Army Corps of Engineers (USACE) Design Documentation Report (USACE, 2017 [USACE Report]), the elevation of the pipe invert is -8.01 CMD. As such, the area of the CSO-194 riprap apron (Section 5.6) will be dredged to an approximate elevation of -11 CMD to accommodate the Cap and Betterment.

The West End construction will include a Cap layer, followed by Betterment materials to reach the finished grades of the Design (NRT, 2017a). Potential increases to the finished elevation need to be controlled to maintain the hydraulic capacity of CSO-194. To prevent potential finished height increases, the actual invert of CSO-194 and the sediment surface at the design sub-grade will be assessed during the sediment removal to determine if the surface will support cap placement without restricting CSO-194 flow. If the Project Engineer determines that excess stabilization aggregates will be needed to create a stable surface for cap placement or the actual elevation of

CSO-194 is lower than -8.01 CMD, the target sub-grades for sediment removal may be lowered. Lowering of the design grade will allow for placement of stabilization materials, followed by the cap and Betterment materials, without causing an increase of the finished height of the West End construction.

3.1 Implementation and Sampling

To minimize the potential of suspended sediment migration from the excavation areas, a silt curtain will be installed at approximately Station 16+00. The silt curtain will be maintained throughout the soil and sediment removal and sediment relocation activities (Section 4). Following these activities, the silt curtain will be removed or redeployed at a separate location.

The facility fence in the West End area will be temporarily removed to access the upland areas. Following vegetation clearing, earthwork equipment may enter the upland area to excavate or transfer impacted soil and sediment. However, soil and sediment excavation are planned to be performed by a barge-based excavator and placed in roll-off containers located on barges, as described in Section 3.

In the upland excavation area, the top 12 inches of soil in the 80-square yard area of soil boring SB1 (12-inch Scrape Area) will be excavated (approximately 30 CY). Below the top 12 in of soil depth, contaminants of concern (COC) do not exceed screening levels. Soil west of the Canal up to the pavement (Unsaturated Soil Excavation Area) will be excavated (approximately 150 CY) to the water surface at a 3H: 1V slope (approximate excavation depths range from 1 to 2 feet).

Once the unsaturated soil area at the West End is excavated to the line and grades indicated in the drawing sheets, the top 6 inches of the exposed soil surface will be sampled for copper, lead, and PAHs to document soil quality to be left in place. Soil samples will be collected approximately every 500 ft² using a hand auger, as outlined in the CQAPP (NRT, 2016).

Sediment excavation will continue below the water line into the Canal (West End Dredge Area) at a 3H: 1V slope to the Canal bed. Sediment excavation will be performed methodically to minimize re-suspension. Dredging activities will be sequenced and carefully monitored to contain sediment materials during stabilization, staging, and transport. The area furthest from the excavator will be removed first to avoid residue deposits from further excavation. For sediment excavation by the marine-based excavator, the material transfer barge will be in the excavation zone to prevent spillage from impacting areas outside of the West End Dredge Area.

The Canal bed will be dredged to approximately 12 inches below the 2008 Canal bed surface. The lateral limits of dredging are based on elevated copper concentrations in shallow sediment defined from Pre-Design analytical data. Locations of representative samples of material to be removed and associated laboratory analytical data are included in the project's Chapter 30 Permit Applications (OBG, 2018).

The following process will be used to confirm achieving the sediment removal objective:

- The top 6 in of the dredged surface will be sampled for copper every 500 ft² in accordance with the CQAPP (NRT, 2016). Post-dredge sediment samples will be collected using a push-core. Quick turnaround on laboratory analysis for copper may be necessary due to the small volume, short duration and desire to move the dredging process along in an efficient manner.

Other parameters outlined in the CQAPP (NRT, 2016) will be analyzed for documentation purposes only.

- A target average concentration of 2,100 mg/kg copper has been established to accomplish a 50% reduction below the average concentration of the surficial samples previously collected in the West End Dredge Area. If average concentrations, as determined by surface averaging over the West End Dredge Area, exceed 2,100 mg/kg copper, the need for additional sampling and/or dredging will be further evaluated.
- If, following consultation with the WDNR, additional dredging is determined necessary, an additional 6 to 12 in of sediment (including allowance for over-dredge) will be removed in the area exceeding the copper average surface concentration of 2,100 mg/kg. If a second pass is needed in the dredged area, it will be the final pass given the likelihood of meeting objectives based on existing data and that a significant portion of the capped area at the West End will have riprap placed over the Cap.
- The top 6 in of the potential re-dredged surface will be re-sampled for copper every 500 ft² in accordance with the CQAPP (NRT, 2016) to document in-place conditions prior to stabilization layer and Cap placement.
- After sampling the final dredge surface, a bathymetric survey will be conducted to document the excavated grade. The survey will be completed in accordance with the USACE Manual No. 1110-2-1003 (USACE, 2013). The documented grade will be approved by the Project Engineer as indicating the excavation is complete and the area is prepared to receive stabilization and Cap material.

3.2 Dewatering, Water Treatment, and Soil/Sediment Disposal Operations

The project requires that sediment removed from the Canal be properly managed. To properly manage the sediment, the sediment will need to be stabilized and hauled off site for landfilling. Contact water management will also be required.

The Brennan will provide the labor, equipment and materials needed to manage the sediment material, condition the sediment, load and dispose of the sediment at an off-site landfill. Construction personnel supporting the sediment management work is anticipated to be:

- Key Personnel:
 - The on-site health and safety officer
 - Field Engineer
 - Project Superintendent (Brennan)
 - QC Manager (part time)
 - Project Engineer (part time)
 - Project Manager (part time)
- Other Personnel:
 - 1 to 2 equipment operators
 - 1 to 2 laborers

Resumes for the project key personnel and provided in Appendix A.

Equipment to be used for the sediment management activities includes:

- One 13,000-lb excavator (or larger)
- Water-tight roll-off containers
- Contact water storage frac tanks and associated pumps
- Transfer trucks

During sediment management, the staging areas and truck routes established during site preparation will be utilized to support the work. The staging areas and truck routes are shown on Figure 2.

Utilities are not expected to be in the area of the sediment management work. Utility locations will be verified with the facility operating personnel and work will not proceed until it is verified the sediment management activities will not damage any site utilities. To the extent practicable, heavy equipment use will be limited to off-pavement areas to protect paved areas. If use on paved areas is necessary, heavy equipment will be placed on pads or equipped with rubber tracks.

The sequence of the sediment management work is indicated in the project schedule in Appendix D. The sediment management work is anticipated to begin in the winter, based on the current project schedule for the work. It is anticipated the stockpile materials may freeze in the winter conditions, resulting in non-compliance with disposal requirements. Due to the freezing conditions, sediment treatment and disposal may be delayed until more favorable weather conditions are present. In summary, the sediment management will proceed in the following order:

- Construction of a material management pad during the preconstruction activities.
- Transfer of excavated / dredged materials to trucks for hauling to the off-site disposal facility or to the material management pad for temporary storage, and/or stabilization prior to off-site disposal.
- Management of the material management pad. Management includes protecting the pad by covering and ensuring contact water is contained.
- Sampling of the materials for analysis and landfill disposal approval.
- Coordinate approval to dispose of materials at Waste Management's Metro Landfill located at 10712 S. 124th St., Franklin, WI 53132 (Metro).
- Receive and store sediment stabilization amendments, to include Calciment and/or Portland cement, in the construction staging/material storage areas.
- Weather permitting, mix upland soil, Calciment, and/or Portland cement with the excavated sediment until the sediment meets Metro's disposal requirements.
- Transport the stabilized sediment to Metro.
- Restoration of the material management pad will be performed following construction completion, as detailed in Section 6.

3.2.1 Contact Water Management

Wastewater will be generated from the following sources:

- Dredge water and interstitial water released from the sediment.

- Storm water runoff contained within stabilization pad, as needed.

Management and staging operations for sediment excavated from the Canal will include a material management pad, stabilization materials (upland soil, Calciment, and/or Portland cement), and mixing equipment. Use of a portable water treatment system is not anticipated and, if necessary, would be appropriately permitted prior to use.

If the amount of water released from the sediment within the management pad is greater than can feasibly be stabilized with stabilization materials, water will be pumped to tanks and then into tanker trucks to be transported off site to a licensed treatment facility. Treatment and discharge of the water at the licensed treatment facility will be performed in compliance with the treatment facility's WPDES permit and any other applicable permits. Notice to the WDNR will be submitted 15 days in advance of off-site liquid disposal indicating the disposal facility and permit applicable for the waste disposal.

Water is not anticipated to be discharged to the Canal. If discharge of water to the Canal is required, applicable permits will be obtained prior to discharge.

3.2.2 Sediment Stabilization & Disposal

In lieu of stabilizing sediment in the material management pad, sediment stabilization could be performed within the roll-off containers located on the barges before off-loading. Additionally, some of the materials in the West End excavation area may be high in aggregate consistency and suitable for direct hauling to Metro once transferred to land. Otherwise, the excavated soil and sediment will be stored within the material management pad.

The excavated materials in the material management pad will be stabilized with the excavated unsaturated soils or other suitable material until the sediment has no remaining free liquids and can pass a paint filter test. If the stockpiled material requires stabilization with Calciment and/or Portland cement, a site trial will be conducted to estimate the quantity of the material needed to treat all of the sediment. Following the trial, the Calciment and/or Portland cement will be received and staged on the site.

After receiving the Calciment and/or Portland cement, an excavator will be used to mix the excavated materials with the Calciment and/or Portland cement until the materials meet Metro's disposal requirements.

Stabilized excavated material will be loaded into transport trucks, equipped with tarps and leak-proof end gates, for hauling to Metro. If Metro cannot accommodate the project's disposal needs, alternative facilities engineered to contain and minimize the migration of leachate from these and other wastes to the extent required by Chapter NR 500 of the Wisconsin Administrative Code (Wis. Adm. Code) may be utilized. If an alternate landfill is needed, this Work Plan will be amended to advise the WDNR of the landfill and request approval before proceeding.

Two potential alternate NR 500, Wis. Adm. Code, Subtitle D landfill disposal sites to be considered during the proposed remedial activities include:

- Waste Management Orchard Ridge RDF located at W124 N9355 Boundary Rd., Menomonee Falls, WI 53051

- Advanced Disposal Emerald Park Landfill located at W124 S10629 124th St., Muskego, WI 53150

4. SEDIMENT RELOCATION (CHANNEL CONSTRUCTION)

In addition to sediment and soil removal for the approved remedy, sediment will also be relocated within the Canal to establish subgrades needed for Betterment construction and maintain the hydraulic capacity of the Canal. Since this portion of the excavation is not part of the USEPA-approved remedy and is outside of the required West End sediment excavation, sediment samples will not be collected for laboratory analysis. Consistent with the USACE design for a constructed wetland supplied by MMSD (USACE, 2017), a conveyance channel will be integrated into the Cap and Betterment. The sediment relocation work is associated with the Betterment and will be completed prior to capping of the area. The approximate volume of material to be reused is 1,400 CY.

Brennan will provide the labor, equipment and materials needed to perform the sediment relocation work. Construction personnel on site during the work is anticipated to be:

- Key Personnel:
 - The on-site health and safety officer
 - Field Engineer
 - Project Superintendent (Brennan)
 - QC Manager (part time)
 - Project Engineer (part time)
 - Project Manager (part time)
- Other Personnel:
 - 6 to 8 equipment operators

Resumes for the project key personnel and provided in Appendix A.

Equipment to be used for the sediment relocation includes:

- One 40 ft X 80 ft barge with Spuds located at each end for anchoring and a Generator for power supply for material handling equipment
- Small marine support vessels for transporting crew and fuel to the excavation platform
- One 130,000 lb excavator

See Section 3, Figure 7 for layout of the marine floating platform and position of equipment.

The sediment relocation will take place in the Canal. For sediment relocation, the staging areas and truck routes established during site preparation will be not be needed to complete the work.

Utilities are not in the area of sediment relocation, except for CSO-194. The limits of the outfall pipe will be staked before excavation begins to avoid contact with the outfall pipe. For this activity, heavy equipment use will be limited to the marine platform and will not be in paved areas of the site.

The sequence of the sediment relocation is indicated in the project schedule in Appendix D. The West End sediment relocation is anticipated to be completed in 5 days. In summary, the sediment relocation will proceed in the following order:

- Documentation of preconstruction conditions and marking of outfall structure
- Marking of the relocation limits and calibration of the excavation equipment GPS position control system. Produce and load software maps of the relocation area in the GPS control systems.
- Following completion of the West End Dredge Area sediment excavation work, move the sediment in the channel area, below the water surface, using the marine platform-located excavator.
- After completing the sediment relocation, the area will be restored. Restoration activities, including Cap installation, are presented in Section 6.

4.1 Implementation

The submerged conveyance channel construction will begin on the West End of the channel area at approximately Station 2+25. The floating platform will be initially located near Station 2+75 and will grade the sediment that is above the contours of the channel sub-grade design, generally moving sediment east across the channel footprint. Once the design sub-grades are achieved from Station 2+25 to 2+75, the floating platform will be repositioned to repeat the grading in the next section. Material removed to meet the design sub-grade will be reused in sections of the channel that require additional fill to meet the design sub-grade. The grading and repositioning will be repeated until the channel sub-grade is achieved along the entire length of the submerged channel, to approximately Station 4+50.

The complete channel construction will include stabilizing the newly established sediment surface and placing the Cap layer, followed by Betterment materials, to reach the finish grades of the Design (NRT, 2017a), as supplemented by the project's Chapter 30 Permit Application for the Betterment (OBG, 2018). Potential increases to the finished channel elevation need to be controlled to maintain the hydraulic capacity of the finished channel. To prevent potential finished height increases, the sediment surface at the design sub-grade will be assessed during the regrading of the channel sediment to determine if the surface will support Cap placement. If the Project Engineer determines that excess stabilization aggregates will be needed to create a stable surface for the Cap placement, the target sub-grades for channel sediment relocation may be lowered. Lowering of the design grade will allow for placement of stabilization materials, follow by the Cap and Betterment materials without causing an increase of finished height of the channel.

Sediment is planned to be excavated to an elevation of approximately -11 CMD for the length and width of the channel base. Considering a trapezoidal channel base width equal to that of the CSO-194 riprap apron (41.2 feet) and stable 4H:1V channel side slopes results in a conveyance channel dredge volume of approximately 1,400 CY to be relocated.

Sediment relocation will be conducted pursuant to Wis. Admin. Code ch. NR 718. WDNR approved relocation of sediment associated with subaqueous conveyance channel construction in an August 31, 2018 letter to Miller, extending through August 31, 2019 (WDNR, 2018a [Appendix E]). OBG notified WDNR of schedule updates (sediment management activities planned to occur

in 2020 and/or 2021) on July 8, 2020. On July 21, 2020, WDNR stated via email that they have no comments regarding the schedule change.

Relocated sediment will be capped during channel construction to meet the RA Construction requirements. Plan and profile views of the excavation and fill are provided on drawing sheets included in the project's Chapter 30 Permit Application for the Betterment (OBG, 2018 [Appendix B]) and the project's NR 718 Low-Hazard Exemption Request (Appendix E).

At the completion of sediment relocation and leveling, Brennan will decontaminate the equipment that was in contact with the sediment. This equipment will be placed in the material management/decontamination pad and rinsed. The equipment will be visually inspected to confirm that it is free of sediment before being utilized for other work. Decontamination water will be collected in the material management/decontamination pad and disposed of as discussed in Section 3.2.

5. STABILIZATION LAYER, CAP, AND BETTERMENT INSTALLATION

A Cap will be placed over the Canal sediment as specified in the ROD (USEPA, 2011) and Design (NRT, 2017a). To construct the Cap, clean aggregate materials will be imported and stockpiled in the material management area shown on Figure 2. Heavy equipment and specialized equipment will be used to move the aggregate from the stockpiles into the Canal in a controlled, layering process. Controls for material placement will include GPS-enabled equipment for accurate placement and real-time material weight tracking.

For quality control, the Canal has been divided into 22 Approval Units for measurement and documentation. Approval Units are indicated in Figure 8 and included in the COAPP (NRT, 2016). All Approval Units will receive a layer of stabilization material, Cap layer and Betterment layer. Although not planned, work progress in a given Approval Unit may proceed independently of work progress in other Approval Units.

OBG will secure and provide the aggregate materials needed for the stabilization, Cap and Betterment layers. Brennan will provide the labor, equipment and non-fill materials needed to perform the Canal filling work. Construction personnel on-site during the work is anticipated to be:

- Key Personnel:
 - The on-site health and safety officer
 - Field Engineer
 - Project Superintendent (Brennan)
 - QC Manager (part time)
 - Project Engineer (part time)
 - Project Manager (part time)
- Other Personnel:
 - 6 to 8 equipment operators

Resumes for the project key personnel and provided in Appendix A.

Equipment to be used for placement of the stabilization, Cap and Betterment layers includes:

- One 40 ft X 80 ft barge with Spuds located at each end for anchoring and a generator for power supply for material handling equipment
- Two material barges (40 ft X 50 ft)
- Two hoppers for material transport
- Small marine support vessels for transporting crew and fuel to the excavation platform
- Two 130,000-lb. excavators
- Spreader system
- Transfer trucks

During fill placement activities, the staging areas and truck routes established during site preparation will be utilized to support the work. To the extent practicable, heavy equipment use will be limited to off-pavement areas to protect paved areas. If use on paved areas is necessary, heavy equipment will be placed on pads or equipped with rubber tracks.

Utilities are not expected to be in the area of construction, except for outfalls CSO-194 and CSO-193. The limits of the outfall pipes will be staked before material placement begins to avoid contact with the outfall pipes.

The sequence of the construction work is indicated in the project schedule in Appendix D. Work to be completed before the Cap and Betterment construction includes sediment removal from the West End and relocation of sediment to establish the channel subgrades. If potential adverse winter conditions prevent the Cap and Betterment construction, the work may be delayed to early spring of 2021 as indicated in the project schedule. During the potential winter break, the majority of the construction equipment, including the floating platform, would remain at the site. The Cap and Betterment construction are anticipated to be completed in 7 months once work begins. In summary, the Cap and Betterment construction will proceed in the following order:

- Documentation of preconstruction conditions and marking of outfall structures
- Calibration of the fill placement equipment GPS position control system. Produce and load software maps of the fill area in the GPS control systems.
- Receive and stockpile aggregate materials for the Cap and Betterment construction.
- Transfer stockpiled aggregates to the Canal and utilize the spreader systems to layer stabilization materials onto the Canal sediment surface.
- Confirm the sediment surface has been stabilized and document the surface elevation.
- Transfer stockpiled aggregates to the Canal and utilize the spreader systems to layer the Cap materials onto the stabilized Canal sediment surface.
- Confirm the Cap materials have been placed to the required thickness and document the surface elevation.
- In select areas of reduced Betterment profiles (e.g. the channel area and outfall areas), place geotextile fabric on the Cap surface.
- Transfer stockpiled aggregates to the Canal and utilize the spreader systems to layer Betterment materials onto the Cap.
- Confirm Betterment materials have been placed to the required thickness and document the surface elevation.

5.1 Geotextile

Geotextile to be placed on the west bank beneath the Medium Riprap and on the riprap apron and conveyance channel subbase beneath the lining must be of 16 ounce per square yard nonwoven polyester, polypropylene, stabilized nylon, polyethylene, or polyvinyl chloride. Geotextile must be needle punched, heat bonded, and/or resin bonded, and resistant to ultraviolet degradation and biological and chemical environments normally found in soils and sediments. Additional specifications, including testing methods and associated strength

requirements, are provided in Section 02415 of the Specifications included in the project's Chapter 30 Permit Applications (OBG, 2018 [Appendix B]).

5.2 Aggregate Material Import and Stockpiling

To construct the stabilization, Cap and Betterment layers, an estimated 70,000 to 100,000 tons of aggregate materials will be imported to the site and placed in the Canal. Borrow sources for imported aggregate materials to be used for the stabilization layer, Cap, and Betterment are:

- Franklin Aggregate, Inc. located at 6211 W. Rawson Ave., Franklin, WI 53132
- Lannon Stone Products located at N52 W23096 Lisbon Rd., Sussex, WI 53089
- Halquist Stone located at N51 W23563 Lisbon Road, Sussex, WI 53089
- Johnson Sand & Gravel, Inc. located at 20685 W. National Ave., New Berlin, WI 53146

The materials are continuously produced from virgin rock quarries near the project area. Preliminary screening of the aggregate sources listed has been completed indicating materials meeting the project requirements are available. Because the materials are manufactured and exported continuously from the quarries, sampling and analysis of the actual materials to be used will take place approximately 20 days before receiving the materials on the project site. Aggregate samples will be collected from the quarry stockpiles and the CQC Engineer will periodically inspect the quarry operation shipping the materials to the site to assure the qualified quarry stockpile is utilized. Re-verification of the quality of the aggregate materials will be completed as indicated in the CQAPP (NRT, 2016).

During the project, additional sources of aggregate materials may be identified to support the construction. Notice will be provided to Miller and the WDNR of additional aggregate providers. All providers of aggregate materials will be evaluated, and materials will meet the requirements of the Design (NRT, 2017a) and this Work Plan. The Project Engineer will direct sampling and analysis of aggregate materials. The Project Engineer will confirm the materials provided meet the project requirements and can be used for construction. All material tests and analytical results will be reported in the Construction Completion Report to document that construction was performed in accordance with the governing documents.

Section 4.3 of the approved Design (NRT, 2017a) indicates the overall purpose of the aggregate material, and Specification 02300 (Earthwork) of the project's Chapter 30 Permit Applications (OBG, 2018 [Appendix B]) indicates the aggregate material properties. The imported aggregate materials to be used for the construction, as selected by the Project Engineer to meet the project requirements, are:

- General backfill soil groups GW, GP, GM, SW, SP and SM; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, vegetation, and other deleterious matter.
- Stabilization layer, Cap, and full-thickness Betterment material will be virgin, quarried limestone or sand passing a 1.5-inch sieve. Sources of available stockpiled aggregate in local quarries may have fines (grains passing the No. 200 sieve) of up to 18%. The total percentage of coal, clay lumps, shale, and other deleterious substances shall not exceed 3.0 percent by weight. The aggregate shall not contain frozen material or foreign material like wood, hay, burlap, paper, or dirt.

- Full-thickness Betterment topping material – Wisconsin DOT Specification Section 606 for Select Crushed Material (Select Crushed)
- Riprap – Wisconsin DOT Specification Section 606 for medium riprap
- Topsoil – natural loam, sandy loam, silt loam, silty clay loam or clay loam (ASTM D2487) or as approved by the Project Engineer.

As provided in the approved Design (NRT, 2017a), the Project Engineer has determined the available material for the stabilization, Cap, and Betterment layers meets the project requirements and is suitable for the intended purpose. However, the available material contains variable quantiles of fines up to 18%. Section 02300 of the specifications (OBG, 2018 [Appendix B]) indicates up to 15% fines to be acceptable, which is amended to indicate up to 18% fines is acceptable by this Work Plan.

As indicated in the COAPP (NRT, 2016), fill aggregates will be sampled at a rate of one sample per 5,000 CY, with a minimum number of three samples per source. Samples will be analyzed for grain size, priority pollutant metals, PAHs, and polychlorinated biphenyl (PCBs) to document that the material meets the project specific acceptance criteria identified in Figure 5 in the COAPP (NRT, 2016).

Aggregate fill materials will be delivered to the site using over the road dump trucks. Each material delivery will be logged by the Field Engineer and inspected for compliance with the accepted material analysis. Delivered materials will be dumped in a stockpile area located in the northern portion of the construction staging area adjacent to 11th St. shown on Figure 2. The stockpile area will be located outside (north) of the material management pad and at least 30 feet from the Canal bulkhead wall to protect the bulkhead wall stability.

Stockpiles will be managed by shaping and grading with heavy equipment. Materials of different types will be segregated. Stockpiles will be managed in a way that minimizes erosion. Excess materials remaining at the conclusion of the project will be removed from the site.

5.3 Sediment Stabilization

Before constructing the Cap in the sediment removal area (West End), the channel, and on existing surface sediment in other areas of the Canal, the sub-base will need to be stabilized. To stabilize the sub-base in these areas, aggregate materials will be placed in layers in a controlled manner to prevent bearing capacity failure of the Canal sediment. Sediment stabilization procedures will include:

1. Mobilizing a BCS on the floating platform that will place materials in a low-impact method. The spreader system is further described below.
2. Placement of materials in thin lifts as necessary to stabilize the sediment surface. The BCS can be operated to place lifts as thin as 3 in.
3. The initial lift shall be no greater than 6 in. Subsequent lift thickness may be increased with approval from the Project Engineer.
4. During placement of materials, monitor conditions and confirm the material placement is stabilizing the sediment or accumulating on the stabilized sediment surface in a controlled fashion. Placement techniques, or material selection, will be modified based on observations in each area of work.

5. The stabilization layer will provide a Cap support layer and minimize Canal sediment from reaching the aggregate cap. Placement of the stabilization layer will be complete when the stabilization layer adequately prevents the upward migration of Canal sediment as determined by the Project Engineer. Some areas of the stabilization layer may be thicker than others due to variability in sediment softness.

Fill materials will be managed by utilizing a land-based excavator or loader to transfer the aggregate materials from the upland stockpiles to a hopper and conveyor system, which transfers Cap and Betterment materials to a 40 ft X 50 ft material barge. The material barge will deliver the material to the 40 ft X 80 ft marine platform for placement. An excavator on the marine platform will remove material from the material barge and place it into a metering hopper which will supply material to the BCS as shown in Figure 9. With the exception of the riprap, all Canal fill materials will be placed using the BCS.

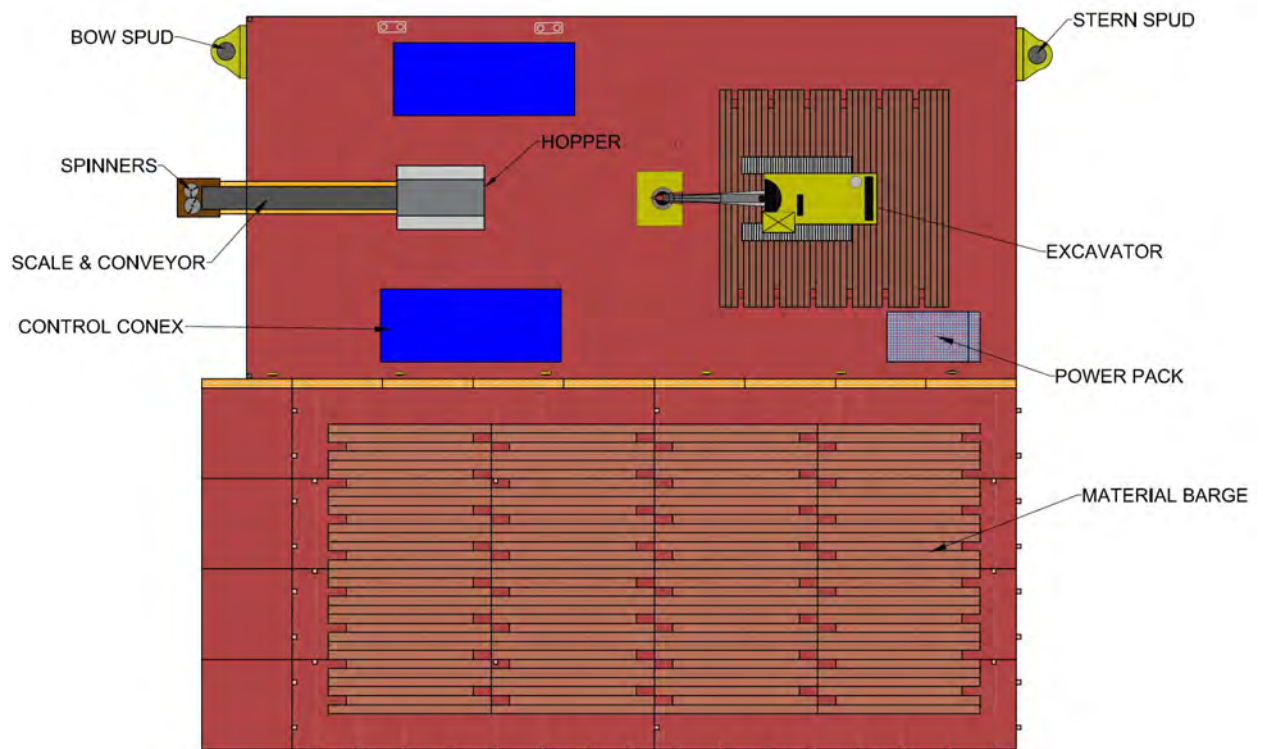


Figure 9 - Spreader Marine Platform – Top View

The metering hopper precisely places an even layer of material onto a variable frequency drive (VFD)-controlled conveyor belt. A belt scale continually monitors the tons per hour (TPH) of material passing over the conveyor belt sending an analog signal to a scale controller. The scale controller integrates the TPH value and provides an electrical pulse for every 0.01 tons that passes over the scale. A Programmable Logic Controller (PLC) in the BCS control module monitors the pulses and calculates the total tonnage being spread. Material from the conveyor is then deposited onto dual spinners which broadcast the material out in an overlapping pattern. The material then falls through the water column and builds up on the Canal bottom.

5.4 Cap Construction

Once the sediment surfaces are stabilized, the Cap will be placed in all areas of the Canal including the sediment removal area, the channel, and sediment surface up to the 11th Street boundary wall. The procedures used for placement of the stabilization materials will be repeated to construct the Cap.

The average aggregate cap thickness will be a minimum 12 inches with each individual measurement no less than 9 inches and will be verified as part of the QC/QA program documented in Section 7. Cap thickness will be recorded on the Subaqueous Aggregate Cap Thickness Sampling Form provided in Appendix F, or similar. Sheet C040 of the drawings included in the project's Chapter 30 Permit Applications (OBG, 2018 [Appendix B]) shows the aggregate Cap profile approximating the stabilization and aggregate Cap layers. Sheet C035 shows the general configuration of the aggregate Cap in the profile view. Approximately 7,000 CY of aggregate material will be placed to construct the Cap.

5.5 Geotextile Fabric Installation

Select areas in the Canal receive stormwater flow discharges from drainage pipes and require scour protection. In these areas, larger rock (riprap) will be installed and integrated with the Betterment. In the scour protection areas, which include the channel area, geotextile fabric will be installed before placing the Betterment materials.

The areas where the geotextile fabric will be installed will be staked by the field team and verified by the Field Engineer. The geotextile fabric sheets will be rolled out on land and 3/8 in-diameter rebar will be sequentially placed every 20 feet and secured for weight. The fabric will be rolled back up and placed on the floating platform along with riprap and/or Select Crushed (≤ 5 in rock). The floating platform will be positioned adjacent to the area receiving the geotextile and the fabric will be unrolled over the area and positioned with tag lines from the shore and work boats. Once the fabric is in position, an excavator on the floating platform will place rock on the fabric at select locations to anchor the fabric in place. Seams between geotextile sections will be overlapped by a minimum of 24 in (2 feet) where multiple sections are needed.

If positioning cannot be accomplished by the floating platform and taglines, a dive team will then install the fabric with rebar layer on the bottom of the conveyance channel. Following geotextile placement, Betterment materials will be placed on top of the fabric sheet.

5.6 Voluntary Betterment Construction

Following the Cap placement and documentation, construction of the Betterment can proceed in accordance with the approved Chapter 30 Permit (WDNR, 2018b).

In the area of CSO-194, the Betterment will consist of a riprap apron that is approximately 19.5-foot wide at the outfall, extends 36 feet from the outlet, and widens to approximately 41 feet (136-foot perimeter, 1,100 square-foot area, Sheet C040). The 2-foot thick apron, underlain by nonwoven geotextile is anticipated to require approximately 80 CY of medium riprap. In the base of the channel section, sediment is planned to be excavated to an elevation of approximately -11 CMD. The channel base and 4H:1V sideslopes will be covered with geotextile and approximately 2 feet (1,700 CY) of riprap. Riprap is planned to be direct-placed by a marine-based excavator located on a barge.

The procedures used for placement of the stabilization and Cap materials will be repeated to construct the full thickness Betterment, which is anticipated to require approximately 25,000 CY of material placed over the Cap to achieve a layer of 4.5-foot thickness. The top layer of full-thickness Betterment aggregate interfacing with the gently flowing Canal water will be an armor layer consisting of 2- to 3-in clear stone, which will meet the Select Crushed specification, to minimize future disturbance of the placed materials. To achieve a Betterment topping layer of 6-inch thickness, approximately 3,000 CY of this material will be placed. Upon installation of the Betterment, a final bathymetric survey will be performed by Brennan within 5 days' notice of approval by the Project Engineer.

5.7 Subaqueous Aggregate and Riprap Placement Quality Control

The Brennan shall place aggregate material in a controlled manner to prevent bearing capacity failure of the Canal sediments. The placement of aggregate to achieve the Cap and Betterment will be done in layers or lifts of between 3 inches and 24 inches, depending on the observed site conditions.

5.7.1 Stabilization Layer

Placement of the stabilization layer is anticipated to require up to 36 inches of aggregate to stabilize the sediment. During stabilization layer placement, QC samples will be taken periodically using sampler or bucket for every one-foot thickness of stabilization layer placed, unless the frequency is increased by the Field Engineer. The QC samples will be used to verify material placement and to determine when stabilization layer placement is complete in accordance with the Technical Specifications (Appendix B). For the stabilization layer, the 22 Approval Units will be subdivided in to 4 subunits each, 88 subunits total, for documenting the completion of the stabilization layer and meeting the required conditions to begin the Cap construction. Random samples will be collected from applicable sub-units as shown on Figure 8 and checked for visual presence of Canal sediment and returned to the Canal. Placement of the stabilization layer will meet the design intent when additional aggregate is no longer improving the stability of the sediment or the sediment surface will support Cap material placement (e.g., aggregate no longer mixing with sediment, minimal consolidation is observed). The Cap and Betterment will be placed over the stabilization layer and extend from the 11th Street Bridge to the west terminus of the Canal, to include the sediment excavation and relocation areas. Following placement of the stabilization layer, a single or multi-beam bathymetric survey will be performed to collect data for compiling a contour map of the finished stabilization layer surface.

5.7.2 Cap layer

During placement of the Cap, the thickness of the Cap will be monitored through physical measurements. Due to the difficulty in collecting a representative core sample of gravel-size aggregate, and the potential for consolidation of the stabilization layer, Cap thickness will be measured with graduated catch pans or cylinders and documented. The process for documenting the proper placement and thickness of the Cap layer is provided below:

- The canal has been divided into 22 approval units as indicated in Figure 8 and included in the COAPP (NRT, 2016). Each Approval Unit will be further subdivided into 4 sub-units, 88 subunits total, for documentation of Cap placement. Subdividing the Approval Units will result in quality control areas that are approximately 30 feet by 75 feet.

- The broadcast spreader system will be positioned at one end of the subunit. The system will be anchored into position and the material placement location will be recorded using an on-board GPS receiver.
- Material will be transferred to the spreader unit using an excavator mounted on a barge and the spreader will evenly broadcast the material over the water into an approximate 30-foot by 30-foot area.
- The spreader system will move and re-anchor though the subunit in steps controlled by the GPS receiver.
- A random location in each subunit will be selected for placement of a QC graduated catch cylinder. The QC catch cylinder will be submerged and placed on the bottom surface before starting Cap material placement in each sub-unit. The QC catch cylinder will be weighted to stay in place during material placement. As material is broadcast over the water, the material will descend through the water at a low velocity and be uniformly deposited over the canal bottom and into the QC catch cylinder.
- Other construction monitoring catch pans or cylinders may also be placed to monitor material placement progress, but not used for verification.
- The weight of the material placed by the spreader will be measured and reported by the spreader placement system using a continuous conveyor belt weight scale. Belt weight data will be reported in the daily logs provided by the Brennan. All areas of the sub-unit will be covered with Cap materials using the continuous belt scale to minimize variations in placement rates as practical.
- After the construction monitoring, weight totals and probing indicate the full Cap thickness has been placed over the entire sub-unit, the QC catch cylinder will be retrieved from the canal bottom. The QC catch cylinder will represent and document the Cap material placement thickness for the sub-unit area (approximately 30 feet by 75 feet).
- Filled QC catch cylinders will be set on the work deck in the presence of the Field Engineer. Water in the QC catch cylinder will be removed (returned to the canal) until the aggregate surface is observed. The QC catch cylinders will have gradation marks indicating the depth of the material deposited in the QC catch cylinder, which will be recorded by the Field Engineer.
- Provided the QA catch cylinder indicates a minimum of 9 inches of material placement, the sub-unit will be documented as complete. If the QA catch cylinder indicates less than 9 inches of Cap material placement, the QC catch cylinder will be returned to the canal bottom and additional material will be broadcast over the full area of the sub-unit until the QC catch cylinder indicates a cumulative minimum of 9 inches of Cap material placement.
- It is anticipated that 88 QA catch cylinders will document the placement thickness of the Cap material (22 Approval Units with 4 subunits). The full thickness indicated by each QA catch cylinder will be recorded and averaged. Cap materials will be placed until the average of the 88 subunits is 12 inches or greater.
- Cap thickness will be recorded on the Subaqueous Aggregate Cap Thickness Sampling Form provided in Appendix F, or similar.

Following completion of the Cap placement, a single or multi-beam bathymetric survey will be performed to collect data for compiling a contour map of the Cap.

In addition to the survey, post-placement analytical grab samples will be collected from the Cap. A minimum of four analytical samples will be collected and analyzed to document concentrations of copper and PAHs in the placed Cap.

In the unlikely event post-placement aggregate Cap samples indicate COC concentrations exceed Cleanup Standards (CS), as defined in the project's Design (NRT, 2017a) and CQAPP (NRT, 2016), Cap failure due to improper placement techniques will be assumed. Extents of Cap failure will be bound by analytical samples with COC concentrations less than the CSs. Additional sampling and analysis may be used to define the limits of CS concentration exceedances requiring additional Cap material placement.

5.7.3 Betterment Layer

During placement of the Betterment materials, the thickness of the Cap will be monitored through physical measurements. Due to the difficulty in collecting a representative core sample of gravel-size aggregate, and the potential for underlying material consolidation, except for riprap, documentation of the Betterment thickness will be with graduated catch pans or cylinders. The process for documenting the proper placement and thickness of the Cap layer will be:

- The canal has been divided into 22 approval units as indicated in Figure 8 and included in the CQAPP (NRT, 2016). Each Approval Unit will be further subdivided into 4 sub-units for documentation of Betterment placement. Subdividing the Approval Units will result in 88 Quality Control areas that are approximately 30 feet by 75 feet.
- The broadcast spreader system will be positioned at one end of the subunit. The system will record the placement location using a GPS receiver and be anchored into position.
- Material will be transferred to the spreader unit using an excavator mounted on a barge and the spreader will evenly broadcast the material over the water into an approximate 30-foot by 30-foot area.
- The Betterment will be placed in lifts of approximately 12 inches. Material layers will be recorded, and the cumulative thickness of the recorded layer depths will indicate the total placed thickness.
- The spreader system will move and re-anchor though the approximately 30 feet by 75 feet subunit in steps controlled by the GPS.
- Each lift which will be documented by a QC catch cylinder. A random location in each subunit will be selected for a QC graduated catch cylinder. The QC catch cylinder will be submerged and placed on the bottom surface before starting Betterment material placement. The QC catch cylinder will be weighted to stay in place during material placement. As material is broadcast over the water, it will descend through the water at low velocity and be deposited over the canal bottom and into the QC catch cylinder.
- Other construction monitoring catch pans or cylinders will also be placed to monitor material placement progress, but not used for verification.
- The weight of the material placed by the spreader will be measured and reported by the spreader placement system using a continuous conveyor belt weight scale. Belt weight data will be reported in the daily logs provided by the Brennan. All areas of the subunit will be covered with Betterment materials using the continuous belt scale to minimize variations in placement rates as is practical.

- After the construction monitoring, weight totals and probing indicate a completed Betterment lift of 10 to 16 inches. the QC catch cylinder will be retrieved from the canal bottom. The QC catch cylinder will represent and document the Betterment material placement thickness of the lift for the subunit area (approximately 30 feet by 75 feet).
- Filled QC catch cylinders retrieved from the canal bottom will be set on the work deck in the presence of the Field Engineer. Water in the QC catch cylinder will be removed (returned to the canal) until the aggregate surface is observed. The QC catch cylinders will have gradation marks indicating the depth of the material deposited in the QC catch cylinder, which will be recorded by the Field Engineer.
- Following documentation of a lift of Betterment placement in a subunit, the system will be relocated to an adjacent sub-unit for the process to be repeated until the Betterment lift has been installed across the entire Canal. The process will be repeated in each sub-unit for each lift until the sum of the thickness of the Betterment lifts in each sub-unit meet the design thickness of the Betterment, which is generally five feet including the top 6 in of coarser Betterment topping as described in the project's Chapter 30 Permit Application for the Betterment (OBG, 2018).
- Betterment thickness will be recorded on the Subaqueous Aggregate Cap Thickness Sampling Form provided in Appendix F, or similar.

Riprap will be placed over the Cap at the outlet of CSO-194 and as lining in the adjacent subaqueous conveyance channel as shown on the drawings included in the project's Chapter 30 Permit Submittals (OBG, 2018 [Appendix B]). All riprap areas will have underlying geotextile reinforcement fabric. The riprap will be carefully placed with a marine-based excavator to the minimum thickness specified in the design. The volume of riprap necessary to complete this task will be calculated by the Field Engineer and placement will be verified by using sediment poling rods (minimum diameter of 1-1/2 inches) to "feel" for the presence of the riprap. If riprap is not adequately present within the design location, additional riprap will be placed by the Brennan.

Following completion of Betterment aggregate material placement, a single or multi-beam bathymetric survey will be performed to collect data for compiling a contour map of the finished Betterment layer surface.

6. SITE RESTORATION ACTIVITIES

6.1 Upland and West Bank Restoration

Following excavation of the 80-square yard 12-inch Scrape Area, as shown in the project's Chapter 30 Permit Applications (OBG, 2018), a six-inch layer (14 CY) of topsoil will be placed and seeded. Following excavation of the Unsaturated Soil Excavation Area, a volume of clean backfill material approximately equal to the volume of soil removed (approximately 150 CY) will be placed, compacted, and graded to restore the grade to preconstruction conditions and Cap residual contaminated soil. A riprap layer of minimum 18 in thickness, underlain by nonwoven geotextile, will then be placed on the reconstructed west bank of the Canal, at a final slope of 4H:1V, to prevent future erosion. The existing riprap will be salvaged and reused once the excavation activities are complete on the West End of the Canal. If needed, supplemental riprap with the same gradation as the CSO-194 apron will be used to restore the Canal bank. Upland backfill materials are planned to be placed by a water-based excavator located on a barge but may be placed by land-based excavators depending on site conditions. Sheet C042 provides plan and profile views of the proposed excavation and backfill.

Fence removed for access to the West End construction area will be restored to pre-construction conditions.

6.2 Restoration - 11th Street Remediation Boundary

After completion of the Cap and Betterment layers in the Canal, the turbidity control systems will be removed. At the 11th Street Boundary wall, steel sheet pile installed during site preparation will be modified.

To complete sheet pile modification, the following activities will be completed:

- The floating work platform containing an excavator will be moved to the boundary wall.
- Individual steel sheet pile sheets will be rigged to the excavator. Divers will cut the sheeting wall sheets below the water surface at the approximate elevation of the top of the Betterment material (approximately elevation -9 CMD).
- Cut sheet sections will be lifted and staged on the floating platform.
- Excess sheeting material will be the property of the Brennan and will be transported off site for reuse, recycling, or disposal.

7. MONITORING AND VERIFICATION ACTIVITIES

Several activities will take place to verify that the RA and Betterment are being performed as planned and that environmental controls are adequate. These activities include BMPs implementation during dredging, surveying, sampling and analysis of soil and sediment, Cap and Betterment placement, and QA/QC activities that are specified in the CQAPP (NRT, 2016) and this Work Plan.

A complete set of drawings and technical specifications, including Division 1 and Division 2 specifications, and detailed drawings addressing each phase of work were prepared for the remedial and Betterment design (Appendix B). Specifically, the drawings and technical specifications address the following key areas, considered critical performance factors:

- Environmental and site management requirements
- Management of surface water
- Management of excavated sediment
- Surveying and documentation of completed excavation areas

Chemical and geotechnical data accompany the specifications to indicate the nature and extent of contamination and the physical properties of the sediment and soil.

Detailed construction (short-term) and post-construction (long-term) monitoring and maintenance plans have been prepared. Construction monitoring activities, including water quality monitoring and sediment confirmation sampling, are specified in the CQAPP (NRT, 2016) and this Work Plan. Post-construction, pre-WDNR Site closure monitoring activities are identified in the Revised Cap Operations, Maintenance, and Monitoring Plan (COMMP), posted to the project repository as may be amended and approved by the WDNR.

7.1 Best Management Practices

Throughout the project, adaptive management practices will be employed as necessary, incorporating the following BMPs:

7.1.1 Sediment Removal (Dredging) Operations and Processes BMPs

- Pre-planning – Dredge approach, sequence, dredge lanes and bucket pattern
- Utilize onboard navigation, profile, and plan views in order to have full buckets
- Based on available face (cut thickness) of material, use an excavator with an appropriately sized bucket which will ensure a full bucket of sediment with less movement through the cut.
- Control the speed while raising the bucket through the water column.
- Proper bucket positioning to prevent release of sediment and water
- Custom dredge platform for efficient movement thus mitigating the effect of prop wash while using boats for barge movements
- Utilize watertight sectional hopper barges for sediment transport
- Perform QC surveys daily to determine the accuracy of dredge operations

- Provide clear direction regarding chain-of-command for actions if/when emergencies occur
- Use shallow draft boats to assist with hopper barge maneuvers. These smaller boats will reduce potential propeller wash.

7.1.2 Resuspension Control BMPs

- The rate of the excavation will be performed in a controlled manner to reduce suspended sediment.
- The number of dredge cycles will be optimized, to the extent practical, to achieve target dredge depth and increase sediment capture.
- The rate of excavation, including the speed of raising of the bucket through the water, will be performed in a steady and controlled manner to reduce the chance for turbidity caused sediment release.
- The dredge bucket will not perform excessive or rapid movements, such as dragging the bucket on the bottom or re-opening the bucket after initial closure.

7.1.3 Stockpiling Operations BMPs

- Use backup alarms on wheel loader and all dump trucks.
- Stockpiles will be labeled and routinely maintained so operations do not intermix materials between stockpiles.
- Haul roads and stockpiles will be wetted, as needed, to prevent dust generation and migration.
- Dump trucks hauling materials will be covered.
- Delivery of materials by truck to the Staging Area will occur normally during day light hours. If necessary and if approved by the Project Manager, additional material imports may occur on Sundays or several hours prior to or after the end of the daytime work shift.
- Perform QC visual inspections daily to ensure material gradation meets specification.
- Maintain accurate logs and reports of stabilization, capping, and Betterment material deliveries.
- Provide clear direction regarding chain-of-command procedures for actions when emergencies occur.
- Establish strict operating procedures for start-up, operation, and shutdown of the material transport and stockpiling operation.
- Use adaptive management practices.

7.1.4 Loading Operations BMPs

- Install guards around all moving belt components.
- Detailed documentation and recordkeeping of all materials loaded.
- Calibrate conveyor belt scales as necessary.
- Cover material barge decks with wooden crane mats to protect the barge deck and to mitigate potential noise concerns during loading.

- Haul roads and stockpiles will be wetted, as necessary, to prevent dust generation and migration.
- Loading of materials onto barges will only occur during daylight hours/day shift operations.
- Restrict access to stockpiling area to only wheel loader, excavator, and delivery trucks.
- Post and enforce speed limits when navigating around stockpiles.
- Use adaptive management practices.

7.1.5 Broadcast Spreader Placement Operations BMPs

- Perform QC surveys/samples on a frequent basis to determine the accuracy of placement.
- The BCS system will be calibrated as necessary.
- Operate vessels in a controlled manner to minimize potential resuspension and prevent disturbance of previously placed Cap layers due to vessel propeller wash.
- Maintain accurate logs and reports of operations.
- Provide clear direction regarding chain-of-command for actions when emergencies occur.
- Establish strict operating procedures for start-up, operation, and shutdown of the spreader and land plant system.
- Use adaptive management practices.

7.1.6 Mechanical Capping and Betterment Placement BMPs

- Mechanical placement of Cap and Betterment material will only occur during normal operating hours.
- Maintain accurate logs and reports of capping and Betterment progress and volume placed each day.
- Provide clear direction regarding chain-of-command procedures for actions when emergencies occur.
- Demarcate swing radius of placement excavator.
- Maintain a minimum of 1 ft of water between the hull and the Canal bottom for all material barges, and vessels.
- Operate vessels in a controlled manner to minimize potential resuspension and prevent disturbance of previously placed Cap and Betterment layers due to vessel propeller wash.
- Establish strict operating procedures for start-up, operation, and shutdown of the capping and Betterment placement plant.
- Use adaptive management practices.

7.2 Positioning Control of Equipment

For sediment removal or sediment re-location activities, the excavator on the marine platform and in the upland area will be equipped with real time kinematics (RTK)-GPS systems to give precise, real-time location of the excavator with its movements. The RTK-GPS will be paired with eTrac angular sensors interfacing into Dredgepack software to give a precise location of the

bucket. The software relies on input from eTrac angular sensors and RTK-GPS to detail the position of the dredge bucket in relation to the top of sediment and the desired grade line. The sensors are located on the excavator to consider the variables of an excavator's operation, including real-time adjustments for water level fluctuations, angle of the stick and the boom, rotation of the bucket, as well as, the pitch and roll of the machine itself. The excavator RTK-GPS systems will check in at benchmarks at least once per day of use to verify proper calibration.

The marine platform will be set up with its own barge RTK-GPS system. This system will display on the Dredgepack software within the excavator to show where the marine platform is positioned at all times. This will help the operators line the barge up for the most efficient approach. QC checks of locations for all positioning equipment and survey equipment will be performed daily to verify that it is operating within its error range.

The buckets of the dredging excavator will be visually monitored by the operators throughout dredging operations. Through the excavator RTK-GPS and the use of the eTrac sensors, the exact location and position of the bucket will be displayed with relation to the top of sediment and the grade line that is set for target elevation. This is monitored, and dredge elevations are targeted, through Dredgepack software by Hypack, Inc. This method of dredge bucket positioning system (DBPS) using the Dredgepack software will help ensure that the design target elevations are met within the overdredge tolerances.

A project team member that is qualified to troubleshoot and provide technical support for the DBPS will be on site during all dredging activities. Many of the field team and project management team members have extensive training with Dredgepack and Hypack software and have in the field experience with the system. Refer to Appendix A for key personnel resumes.

7.3 Surveying

Pre-construction surveys will be conducted before construction begins. Means and methods to achieve adequate area coverage are as follows. Two types of survey techniques will be utilized to measure the surface of the project area. Underwater portions of the project will be measured using a 200 kilohertz (KHz) single-beam echo-sounder (SBES) survey system. Upland work as well as areas too shallow for vessel clearance and maneuverability will be collected using traditional Global Navigation Satellite System (GNSS) topographic methods.

SBES data collection will consist of running planned lines perpendicular to the shoreline (Cross Section). These lines will be run at 15-ft intervals or shorter depending on Canal alignment. Extra lines will be added and ran to help delineate tops and toes of slopes within construction design areas. All topographic survey data associated with in-water activities will be collected along the same 15-ft transects utilized for SBES data collection. Topographic data points will be collected along these transects with a spacing goal of 5 ft between shots, with spacing not to exceed 10 ft. Extra topographic data will be collected in areas which require further coverage. All QA SBES, and topographic verification surveys and survey lines will be extended 15 ft beyond the perimeter of the unit to provide adequate coverage of the unit.

An experienced hydrographer will be deployed for review and approval of all hydrographic and topographic in water work associated with dredging and capping operations. This includes all QA, QC surveys, as well as machine setup and calibrations. The experienced hydrographer will check all work before datasets are submitted or used for construction purposes. The engineer will be informed of upcoming QA surveys at a minimum of 24 hours prior to data collection. All

documentation (QA) surveys will be supplied to the engineer no greater than four days of their collection. All documentation surveys regarding non-Canal dredging, capping, and Betterment work will be conducted or overseen by a Wisconsin State Professional Land Surveyor (PLS).

In accordance with the CQAPP (NRT, 2016), dredge stabilization, Cap, and Betterment layers will be surveyed to verify completion of remedial action within a reasonable timeframe. In this way, the potential for deposition or erosion causing discrepancies between the contractor's daily progress surveys and the post-construction verification survey or thickness measurements can be limited. However, the areas need to be large enough to not require excessive verification events. The post-construction verification is typically used for measurement and payment purposes and documentation of successful completion of remedial actions. Contractor progress surveys will be conducted on a more frequent basis to control the work.

7.3.1 Single-Beam Hydrographic Surveys

One bathymetric survey vessel will be operated and maintained during in-Canal dredging, capping, and Betterment work. This shallow draft SBES vessel will be equipped with a bow mounted 200 kHz single-beam echo-sounder and an RTK GNSS receiver with associated antenna positioned directly in line with the sonar head. This vessel will be used for all data collection up to approximately >1 ft water depth. QC SBES data will be conducted at frequencies to best assist on-site crews to complete work in an efficient manner. QC surveys will be performed daily for each piece of equipment. The frequency of these surveys will fluctuate as safety and construction progress requires or allows.

Once collected, the single-beam soundings will be cleaned and combined through a hydrographic software suite for surface modeling and other project deliverables. Ancillary equipment will include a sound velocity probe for measurement of sound velocity throughout the water column, poling rods for depth verification, bar check devices for sonar depth confirmation, and a laptop computer loaded with a hydrographic software suite for navigation, data recording, and device integration. Ancillary off-site and on-site calibrations are as follows. Sound velocity probes are sent to the manufacturer for annual testing and calibration during months when not in use. On-site calibrations consist of bar check calibration speed-of-sound vs probe speed of sound to verify consistency. These checks should show average differences no greater than 10 feet per second (fps). This test will be performed at the start of the project. Further frequencies will be determined by consistency of this test. Poling rods and bar check devices will be tested at the start of the project by use of an independent tape measurer reading in tenths of a foot. Any discrepancy between measurements will be investigated and the outlier removed and replaced. Recalibration/ measurement will be conducted with the replacement piece of equipment before use in the field.

Quality control procedures for the SBES system are based on guidelines from the USACE EM 1110-2-1003 (USACE, 2013) and are described below. These procedures are recorded in a field book kept by the surveyor. Throughout the QA process, the surveyor will document the results of each quality control procedure. Prior to and after QA SBES data collection, the positioning system is verified by observing a known control monument and comparing the record value to that of the observation. These tolerances include a horizontal offset of +/- 0.1 ft and a vertical offset of +/- 0.1 ft. Any observed (check) shots which do not fall within these tolerances will be investigated. If these discrepancies are small e.g. 0.11-0.13 the check-in process over that particular control point will be redone. If larger discrepancies or further attempts to reconcile the

smaller errors fail, further investigation is required. First, check shots will be conducted on different monuments within the project umbrella to verify whether there is an issue with the project's base station or stability issues with the first control monument. If findings show issues with that particular monument it will be "flagged" and no longer used. A local WI-licensed PLS will be contacted to either correct or completely decommission that particular monument. If necessary, a new monument will then be placed, and checked before record values are published and the monument is used for horizontal and vertical verification. If issues are found to reside within the project RTK base station, a recalibration will be conducted. Once this is complete, all project monuments will be shot and verified with the above tolerances.

Sound velocity casts throughout the water column are taken in the deepest portion of the survey area, at a minimum before and after the survey event, and recorded for use in post processing. To confirm the draft of the sonar head and ensure proper operation of the sonar, a bar check procedure is performed by lowering a flat plate to a known distance from the water surface and placing it under the sonar head. The recorded sound velocity corrected sonar depth is compared to the known depth of the bar check device for confirmation of proper system performance. Bar checks are conducted at the start of a new project and performed before and after all QA surveys of record. A final elevation check procedure is performed to check the SBES system. A bar is lowered beneath the sonar to a known elevation and checked against the hydrographic software's observed final elevation value to ensure system accuracy. For QA surveys, a minimum of two cross lines will be collected perpendicular to the planned survey lines, one before and one after survey completion. Data from the cross lines will be statistically compared to the planned lines to analyze system performance.

7.3.2 Traditional Survey Methods

Areas that are too shallow to collect data with a survey vessel will be surveyed by more traditional means. An RTK-GNSS rover pole will be kept on site to conduct hydrographic surveys and gather data points in shallow water. This apparatus is capable of gathering data points that can be integrated in the data software used to process the bathymetric surveys. The rover pole falls within USACE specifications to collect submarine data points in shallow areas. This will be accomplished using a 6 in-diameter aluminum plate that attaches to the bottom of the pole. Data points of the shallow water surveys will be collected on the same 15-ft lines which the single-beam data is collected on. In the case of overhead obstruction in which satellite signals are not available, a total station will be used to collect data points in these areas. These data will also be integrated into the data collected through bathymetric surveys. Q45 control procedures for the GNSS rover will involve comparing differences of measured values of project control monuments versus record values to achieve a difference of 0.1 ft or better. A series of on-site control monuments will be established to assist in construction. These control points will be established by an in-house PLS and will be created utilizing local National Geodetic Survey (NGS) monuments. There will be at a minimum 2 points which will be placed at strategic locations on the project. Using the Engineering Control guidelines from Wisconsin DOT Facilities Development Manual, Chapter 9, Section 30, accuracies of H: 0.05ft and V: 0.066 ft are anticipated.

All vessels and RTK positioned systems on the project will be receiving a correction from an RTK GNSS base station. This base station will be setup and calibrated using known project control which will be verified by an in-house PLS from the state of WI. All other topographic work requiring a Wisconsin PLS will be overseen by a PLS.

7.3.3 QA/QC Procedures

Two types of bathymetric surveys will be conducted during the project: QC and QA. The QC bathymetric survey will be conducted daily during ongoing construction progress in project work units. These surveys provide frequent project operational data for routine evaluation of all in Canal operations. The QC bathymetric survey data will be compiled and reported as often as possible each day throughout the project. The results of the QC surveys will be utilized as operational data to assess overall project progress and refine the accuracy and consistency of operations.

Before in river operations begin, a QA bathymetric survey will be conducted in the areas to establish baseline conditions. Post QA (as built) bathymetric surveys will be performed in areas that have attained target elevation and/or target thicknesses. The post QA (as built) bathymetric surveys will be performed after an area is deemed complete based on its QC surveys. Both the QC and the QA surveys will use the same equipment as stated above. The QA bathymetric survey will be used to measure overall project performance compared to target elevations, and subsequent volumes for payment purposes. During QA bathymetric surveys, the methods described in above sections will be used to conduct the surveys. Equipment calibration, survey check-in to benchmarks, and hydrographic surveying procedures will be observed and documented.

7.3.4 QA Survey Deliverables

At the completion of each QA survey, a survey package will be provided to designated parties via email, CD, or other acceptable method. Deliverables will include raw data along with edited point data sorted to present a 1 ft x 1 ft grid containing an elevation within each grid cell using cell center as the position of the sounding. The ASCII point file will be in easting, northing, and elevation format. Topographic and hydrographic data will be collected and reported in the datums that are in accordance with the project specifications. The horizontal datum will be in the Wisconsin State Plane Coordinate System of 1983, South Zone, North American Datum 1983, high accuracy reference network (HARN), U.S. Survey Feet. The vertical datum will be in CMD, U.S. Survey Feet. Printable pdf charts, AutoCAD contours files, and interactive 3D surface models will be submitted upon request. Deliverables will be compiled with Hypack and AutoCAD. All documentation surveys will be submitted to the Project Engineer within 4 days of collection. All survey deliverables including; Raw survey, edited 1 ft x 1 ft gridded data, charts, and AutoCAD contours will be provided on a flash drive or external hard drive.

Weekly update charts and survey xyz data will be supplied to the engineer to show progress.

The following charts will be created once the surveys have been completed:

- A modeled surface of post-construction elevations using post-construction QA survey data for the area being evaluated.
- An isopach surface model of the post-construction QA survey versus design elevations.

An isopach figure showing the Cap and Betterment layer thickness based on a comparison of pre-placement and post-placement surveys.

7.3.5 Record Keeping

All surveys will be saved within a network directory. Surveys are sorted by area and type (QA QC) of survey. This allows for efficient navigation between types and areas for retrieval of information. All survey data will be sorted and retained. This network is backed up onto an external hard drive once a month.

A survey log will be used to track date, time, surveyor, and miles surveyed of every survey conducted on the project. All in-field QA surveys, machine setup and calibration, and other surveys are logged in a bound field book. These field notes will be submitted with all QA surveys and can be submitted for other items at request.

8. REPORTING AND DOCUMENTATION

8.1 Pre-Construction Meeting

At least 30 days prior to the start of in-water work activities, the Project Engineer will conduct a preconstruction meeting. Brennan shall provide the required support documentation to OBG prior to the project start. The meeting shall be held at the Site unless otherwise announced. The purpose of the pre-construction meeting is to review responsibilities and personnel assignments. Meeting attendees shall include authorized representatives of Miller, OBG, the WDNR, and owners of property located adjacent to the Canal. Notice of the preconstruction meeting will be provided to potential participants at least 10 days prior to the preconstruction meeting. Participants at the conference shall be familiar with the project. An agenda of items to be discussed that could affect progress is provided in Section 01310 of the Specifications (Appendix B). The Project Engineer will record and distribute meeting minutes to all parties in attendance and other necessary parties following the pre-construction meeting.

8.2 Monthly Progress Meetings

During the RA and Betterment activities, the Project Engineer will conduct monthly progress meetings. All authorized Miller, OBG, and WDNR representatives at the pre-construction meeting shall agree upon a day of week and hour of day for progress meetings that shall be held at the site unless announced otherwise. The purpose of the monthly process meetings is to review progress of work and coordinate future work. Meeting attendees shall include OBG, Miller's Site Representative, and the WDNR. An agenda of items to be discussed is provided in Section 01310 of the Specifications (Attachment I). The Project Engineer will record and distribute meeting minutes to all parties in attendance and other parties requiring information.

8.3 Burnham Canal Superfund Alternative Site Construction Documentation Report

A Construction Documentation Report (Report), consistent with Wis. Admin. Code ch. NR 724 and prepared pursuant to Section XI of the Negotiated Agreement (WDNR, 2018c) will be submitted to WDNR and EPA within 90 days following completion of the RA and Betterment Activities. The Report, to be certified by a Wisconsin registered professional engineer, shall state that the construction related work was completed in full satisfaction of the requirements of the Negotiated Agreement (WDNR, 2018c) and the Chapter 30 Permit (WDNR, 2018b). The Report shall include a description of the project background, construction activities, chronology of events, performance standards and construction quality control, final inspection and certifications, operation & maintenance activities, contact information, and appropriate supplemental information, including as-built drawings.

9. SCHEDULE / SEQUENCING AND ASSUMPTIONS

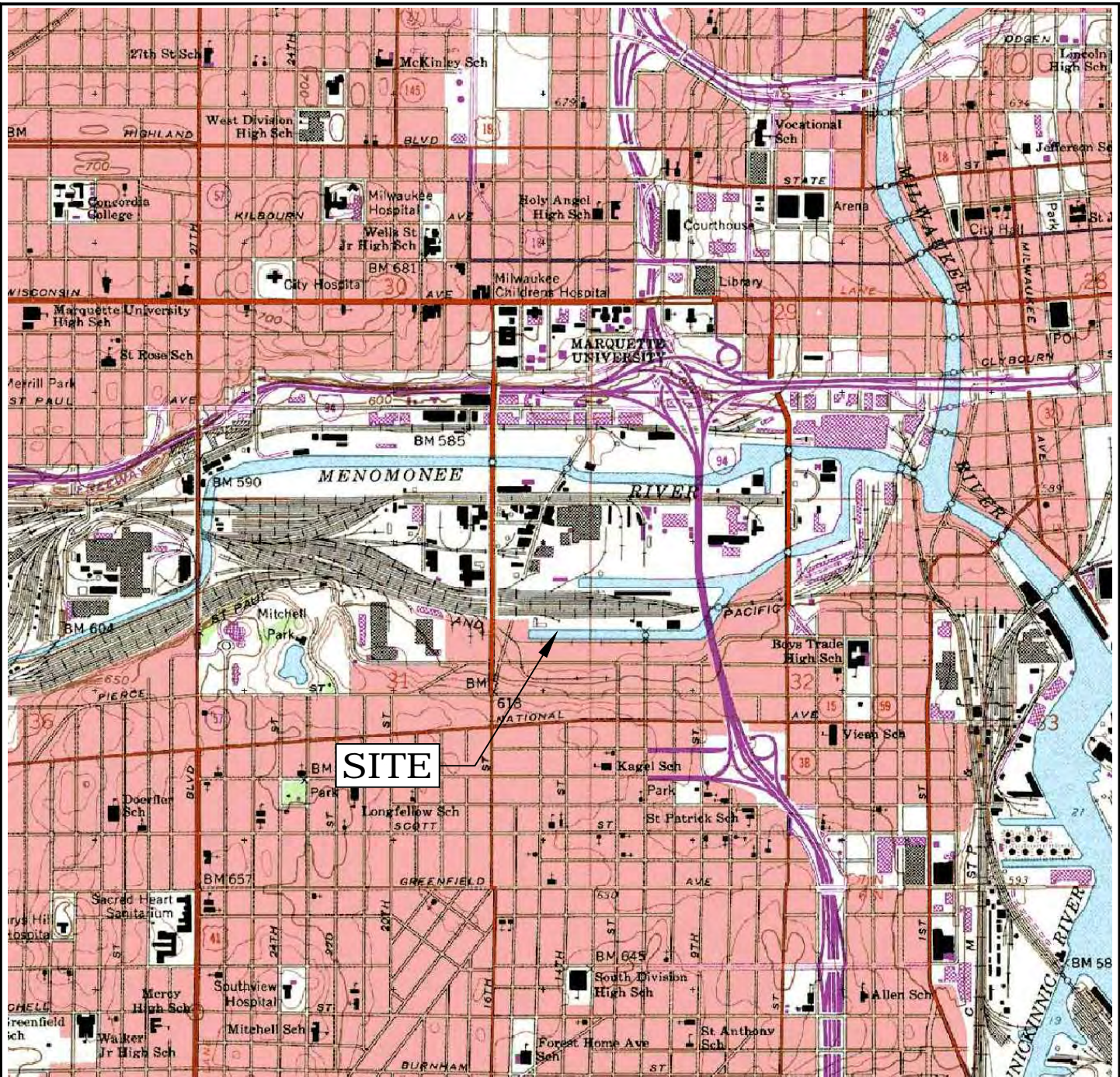
A construction schedule, including construction activities and anticipated sequence of operations planned, is shown in Appendix D. The anticipated duration of excavation, sediment stabilization, Cap placement, Betterment placement, and upland backfill and restoration is approximately 27 weeks of active construction (approximately 7 months). Construction activity shutdown may occur during inclement weather conditions, adding to the overall duration of the project.

The actual construction schedule is subject to change based on the actual project start date and other project variables. Successful completion of RA and Betterment construction will be the start of the Cap operation monitoring and maintenance program, outlined in the COMMP, posted to the project repository as may be amended and approved by the WDNR.

10. REFERENCES

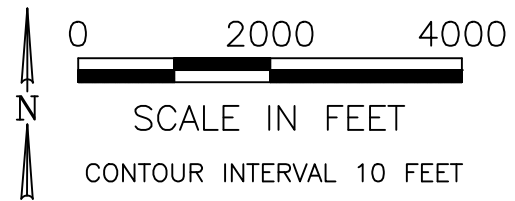
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- Wisconsin Department of Natural Resources. August 31, 2018a. *Approval to Manage Contaminated Material under Wis. Admin. Code § NR 718.15, Miller Compressing (Burnham Canal) (ALT SF), 1640 West Bruce Street, Milwaukee, WI.*
- Wisconsin Department of Natural Resources. July 6, 2018b. *Miscellaneous Structures & Dredging PERMITS. IP-SE-2018-41-00631 (Dredging), IP-SE-2018-41-00635 (Stabilization Layer and Cap), IP-SE-2018-41-01442 (Betterment Fill).*
- Wisconsin Department of Natural Resources. November 27, 2018c. *Negotiated Agreement, In the Matter of: Miller Compressing Company, 1640 West Bruce Street, Milwaukee, WI 53204.*

FIGURES



SITE

SOURCE: EARTHVISIONS U.S. TERRAIN SERIES,
 © EARTHVISIONS, INC. 603-433-8500.
 USGS 7.5 MINUTE QUADRANGLE,
 MILWAUKEE. DATED 1958.
 PHOTOREVISED 1971.



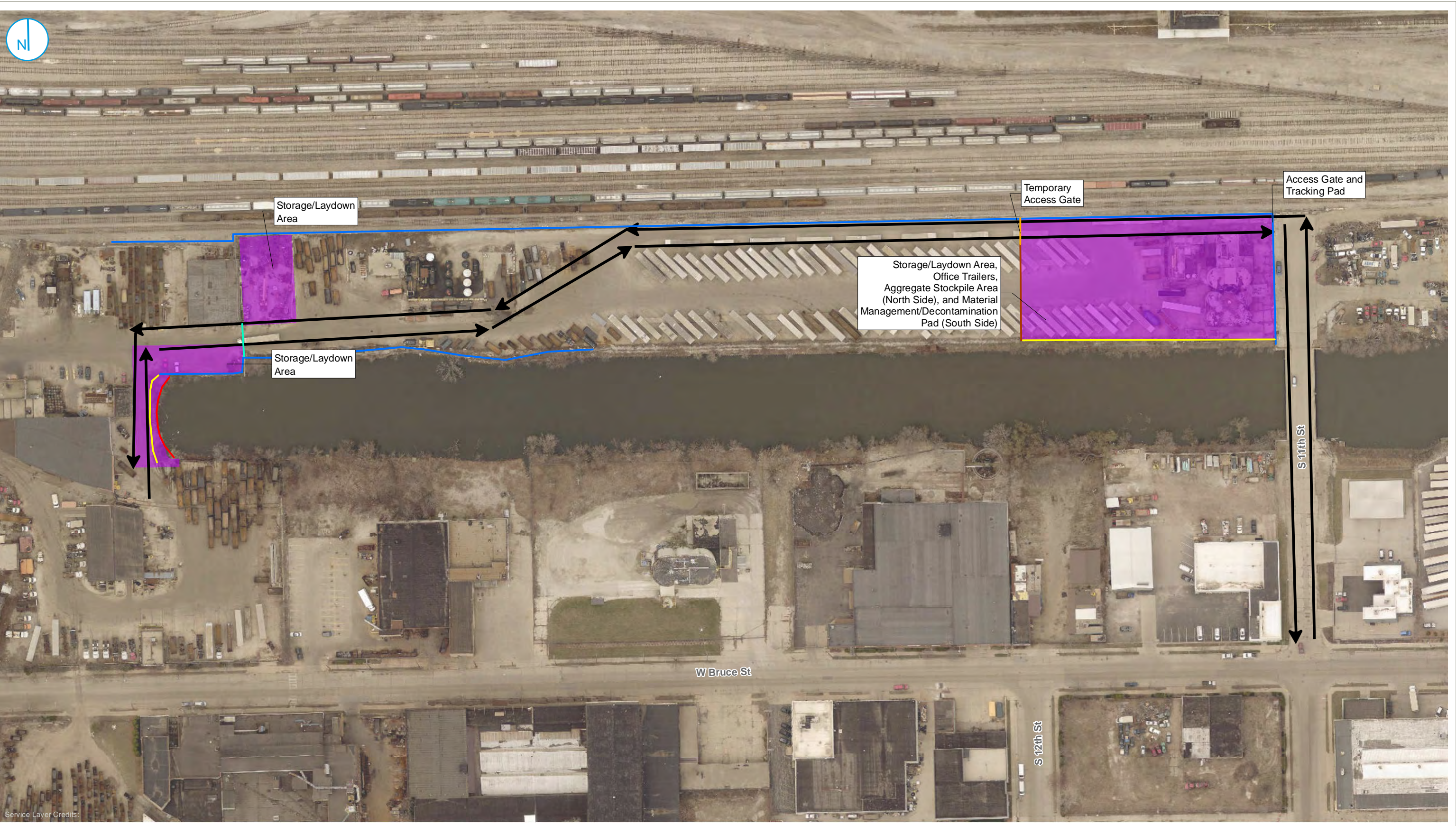
SITE LOCATION MAP

FINAL DESIGN REVISION 2
 BURNHAM CANAL SUPERFUND ALTERNATIVE SITE
 MILLER COMPRESSING COMPANY
 MILWAUKEE, WISCONSIN

PROJECT NO.
 1950075954
 DRAWING NO.
 2117-7-A01
 FIGURE NO.
 1

DRAWN: DMD DATE: 05/04/15 CHK'D: Y_Z DATE: 02/02/16 APP'D: RJB DATE: 02/02/16

Jul 25, 2016 3:25pm PLOTTED BY: rboeten SAVED BY: ddudd
 Y: Mapping\Projects\2117\CAD\7-12117\CAD\7-7-A01.dwg Layout1
 IMAGES: Y: Mapping\Projects\2117\CAD\7-7-A01.dwg SOURCE\MILWAUKEE.pgs
 XREFS:



- EROSION CONTROLS/SILT FENCE
- EXISTING ACCESS GATE TO BE USED FOR CONSTRUCTION VEHICLES
- EXISTING FENCE TO REMAIN
- FENCE TO BE REMOVED AND RESTORED FOLLOWING CONSTRUCTION
- TEMPORARY ACCESS GATE
- TEMPORARY FENCE
- TRUCK ROUTE
- CONSTRUCTION STAGING/ MATERIAL STORAGE AREAS



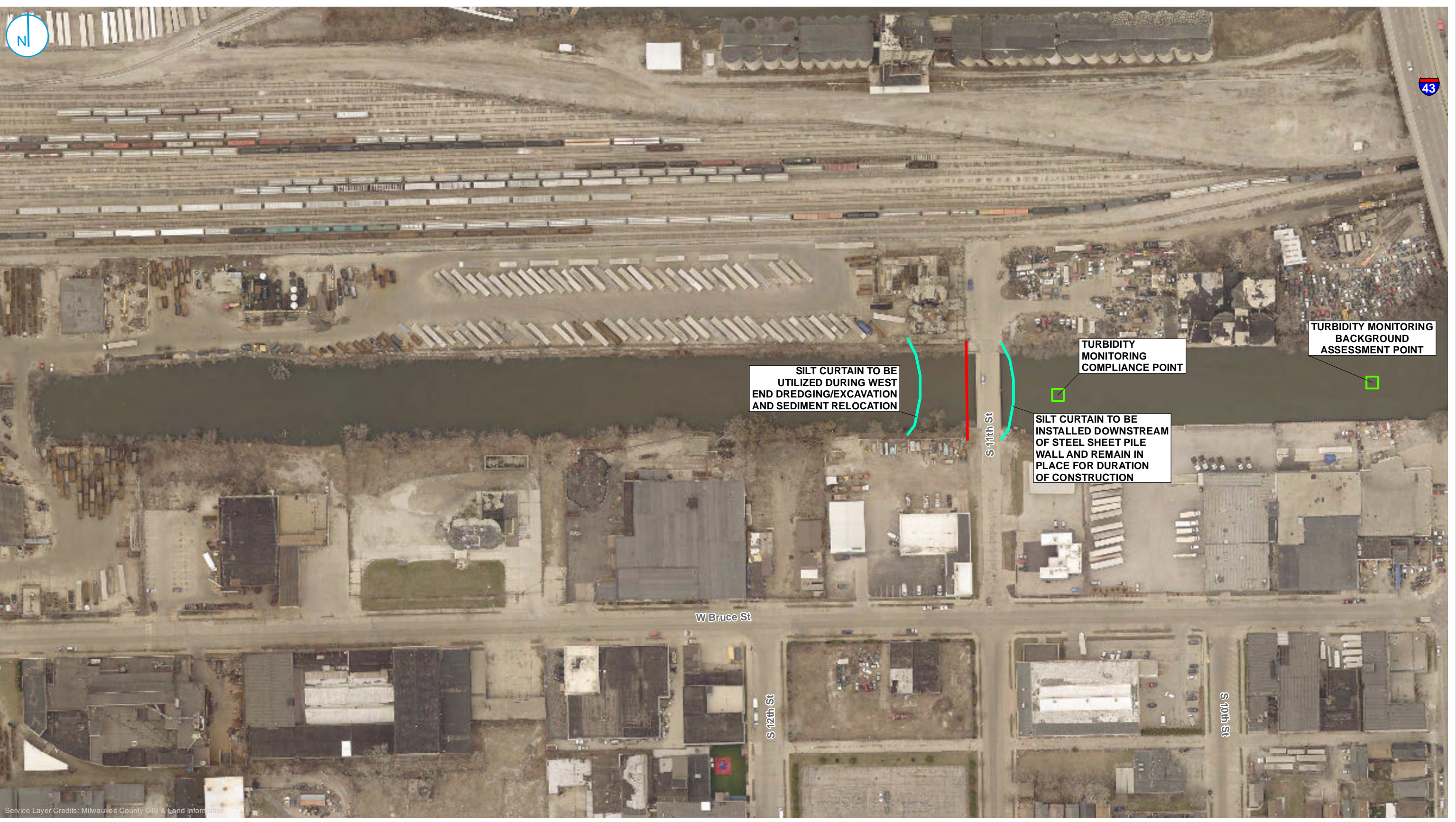
SITE PREP

**MCC HOLDINGS
BURNHAM CANAL**
1640 W. BRUCE ST.
MILWAUKEE, WI 53204

FIGURE 2

RAMBOLL US CORPORATION
A RAMBOLL COMPANY





- 11TH ST. REMEDIATION BOUNDARY STEEL SHEET PILE WALL
- SILT CURTAIN
- TURBIDITY MONITORING POINT



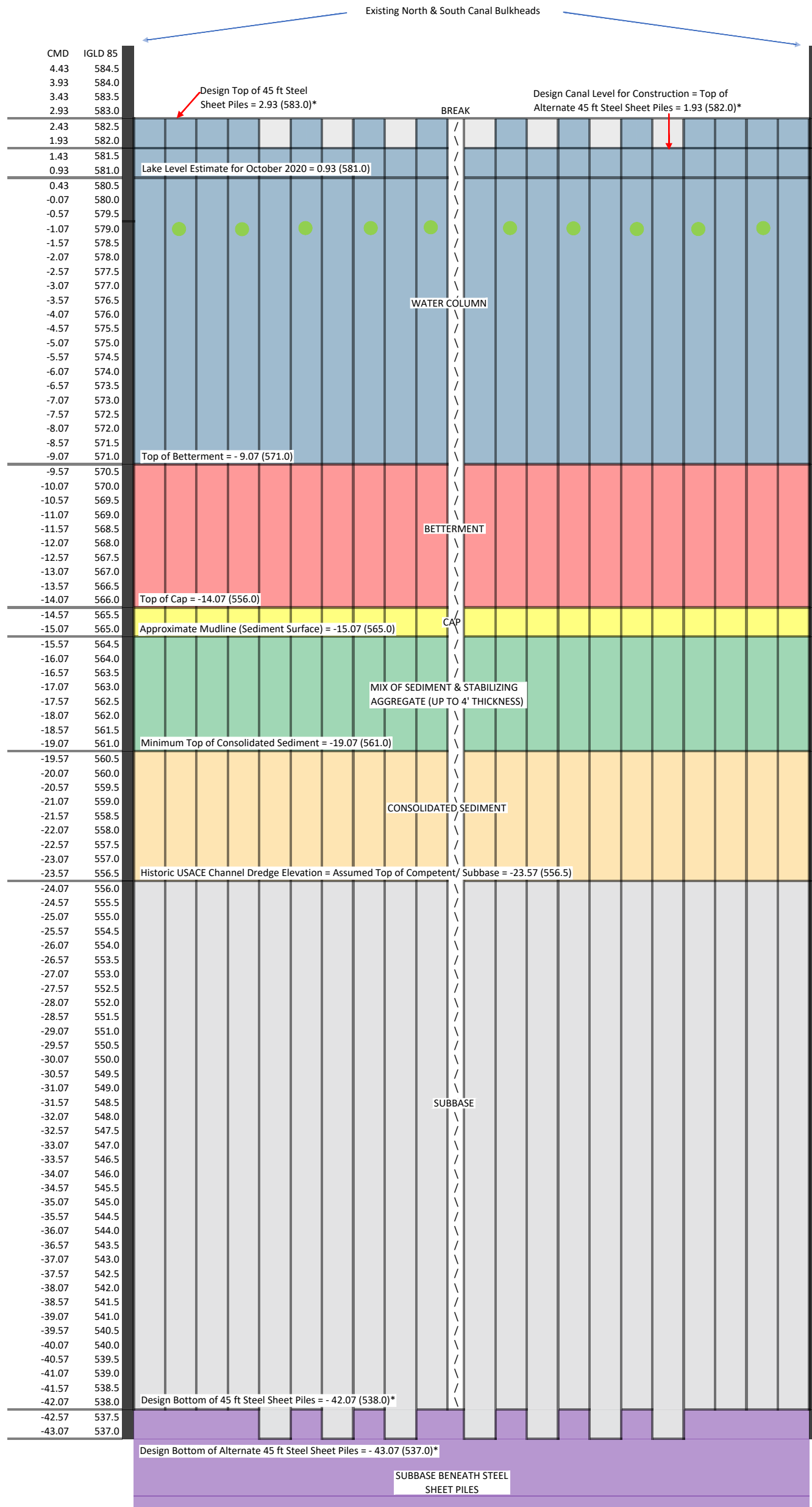
TURBIDITY CONTROLS

FIGURE 3

**MCC HOLDINGS
BURNHAM CANAL**
1640 W. BRUCE ST.
MILWAUKEE, WI 53204

RAMBOLL US CORPORATION
A RAMBOLL COMPANY





- LEGEND**
- WEIR GATES (REMOVABLE)
 - HYDRAULIC CONTROL VALVE

- NOTES**
1. This figure is only a concept. The horizontal axis/width of the remediation boundary system wall is not to scale. The total number of sheet piles, hydraulic control valves, and weir gates, are dependent on the width, flow, and water elevation of the Canal, as well as the specifications of the materials.
 2. Weir gates (removable) to be inserted if/when Canal level approaches top of alternate 45 ft sheet piles (design of 1.93 CMD [582.0 IGLD 85]*)
 3. Hydraulic control valve (number and size to be determined based on canal flow measurements)
- * Final sheet pile tip or bottom elevations will be determined based on lake level at the time the work starts

11th STREET REMEDIATION BOUNDARY SYSTEM (STEEL SHEET PILE WALL)

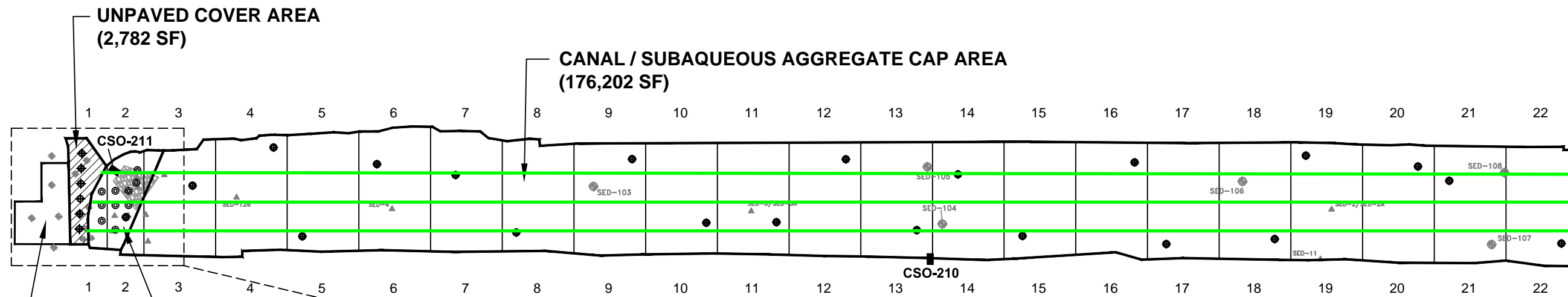
FIGURE 5

**MCC HOLDINGS
BURNHAM CANAL**
1640 W. BRUCE ST.
MILWAUKEE, WI 53204

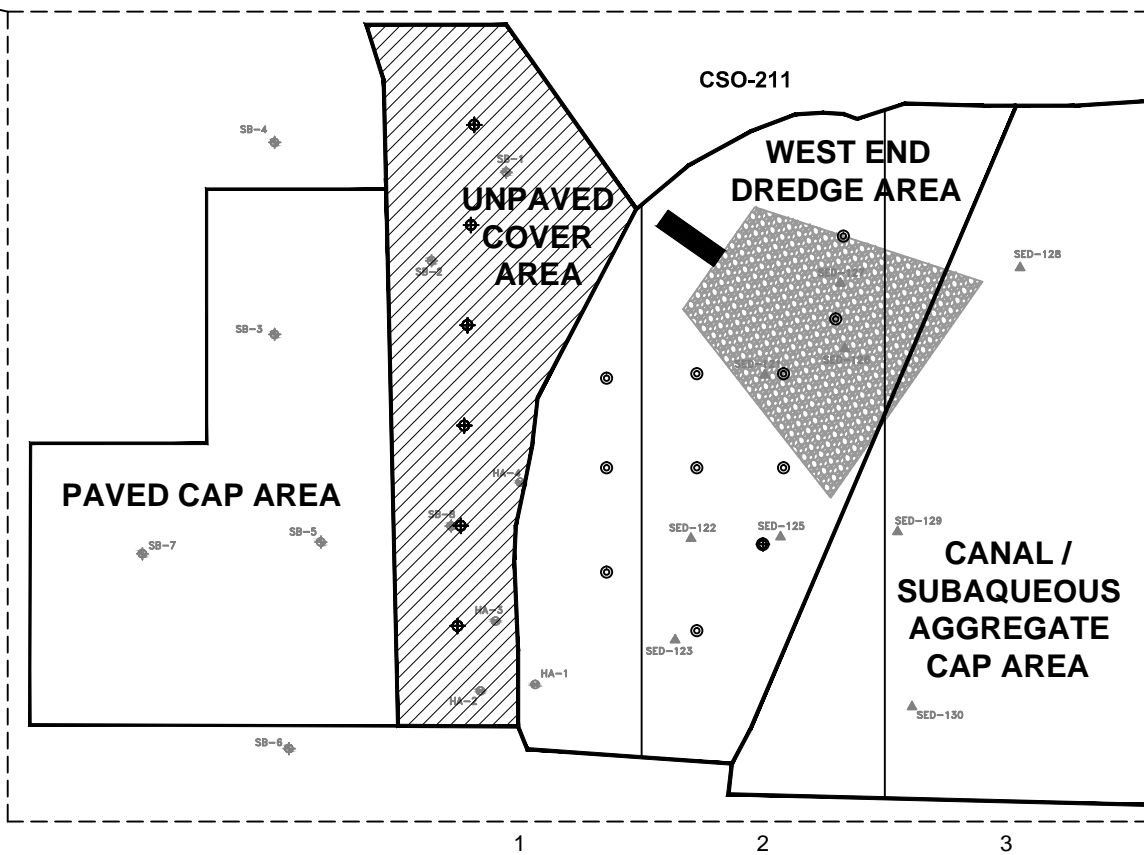
RAMBOLL US CORPORATION
A RAMBOLL COMPANY



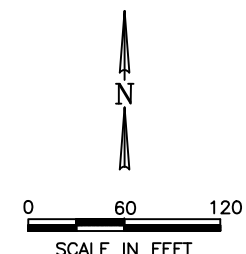
Jul 26, 2016 9:05am PLOTTED BY: rboeten SAVED BY: rboeten
 Y: \\Mapping\Projects\2117\CAD\7-1\Appendix C COAPP\2117-7-B03.dwg Layout1
 WPCS:



	PROPOSED UNSATURATED SOIL SAMPLE LOCATION		SOIL BORING LOCATION (7/2009)
	PROPOSED WEST END DREDGE SAMPLE LOCATION		HAND AUGER LOCATION (12/2007)
	PROPOSED AGGREGATE CAP THICKNESS CHECK LOCATION		SEDIMENT SAMPLE LOCATION, APPROX. (2006)
	COMBINED SEWER OUTFALL		SEDIMENT SAMPLE LOCATION (2007)
	RIPRAP		PRE-DESIGN SEDIMENT SAMPLE LOCATION (11/2011)
	APPROVAL UNIT		APPROVAL SUBUNIT



WEST END AREA DETAIL
 SCALE = 1:30



SOURCE NOTES:
 1. COORDINATES BASED ON MILWAUKEE COUNTY COORDINATE REFERENCE SYSTEM NAD 83(97).

DRAWN BY:	DMD	DATE:	07/29/16
CHECKED BY:	Y_Z	DATE:	07/29/16
APPROVED BY:	RJB	DATE:	07/29/16
DRAWING NO: 2117-7-B03		REFERENCE: .	

BURNHAM CANAL
SAMPLE LOCATION PLAN
 CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN (CQAPP)
 REVISION 2
 BURNHAM CANAL SUPERFUND ALTERNATIVE SITE
 MILLER COMPRESSING COMPANY
 MILWAUKEE, WISCONSIN

PROJECT NO.	1950075954
FIGURE NO.	8

APPENDIX A

RESUMES OF KEY PERSONNEL

- **OBG**
- **BRENNAN**

TODD A LEWIS

Project Manager

Mr. Lewis has over thirty years of construction and environmental services experience specializing in Design/Build project delivery and design optimization. Projects and service sectors include environmental remediation, sediment management, wastewater treatment, oil and gas and bio-gas industries. He has managed complex multiple year environmental construction projects for public and private clients, over a wide geography and exceeding \$30 million. Construction management experience includes achieving Remedy-in-Place status for three USEPA superfund projects. He is a construction professional able to identify, analyze and resolve complex problems, with strong and efficient abilities to lead staff, direct project planning, design, scheduling, procurement, cost control, and client coordination.

PROJECTS

Superfund Site, Remedial Design and Action, Indiana,

Managed the remedial design and action of buried waste, containment and groundwater treatment of a Superfund site in Indiana. Contract value of over \$30M. The project was first design-build project conducted under Superfund Region 5 and included construction of a 5,500 feet of subsurface barrier wall using insitu soil mixing, soil/membrane caps, groundwater extraction systems, groundwater treatment system, wetland remediation through excavation of impacted material, buried drum removal, ISVE systems and vapor treatment units.

Completed in-situ chemical oxidation treatment of upper aquifer groundwater in public roadway. While completing hazardous waste management activities, a complex water treatment system was constructed, utilizing phase separation, chemical separation, oxidation, air stripping, pH precipitation, flocculation, clarification, biological digestion, multimedia filtration, activated carbon filtration, nano filtration and UV oxidation. Responsible for on-going operation and maintenance of the site and the water treatment facility for 11 years. The site achieved USEPA closure status and recorded more than 4000 days without a lost time injury.

In Situ stabilization/solidification (ISS), Waukegan Illinois

Construction Manager for site remediation utilizing ISS of over 300,000 cubic yards of coal tar impacted soil at a former manufactured gas plant (MGP) site in northern Illinois. Project cost and schedule were significantly reduced compared to other remediation alternatives. Site remediation took place between 2013 and 2015 and achieved remedy in place status with the USEPA. Preconstruction work tasks included obtaining survey control, local and state permits, measures to minimize potential impacts to the community during remedial construction, and procuring materials and subcontractor services on a complete basis. Site activities included vegetative clearing of more than 30 years of growth, fence construction, demolition of former foundations, utility termination, excavation & removal of shallow soils, treatment and discharge of excavation water, ISS of impacted soil and site restoration. Quality control activities include continuous on-site surveys, material documentation & management, treated soil sample collection & analysis and collection real-time electronic process monitoring.

SPECIAL COMPETENCIES

- Management and oversight of large-scale remediation projects
- Scope and schedule development
- Project risk analysis and mitigation
- Claim mitigation
- SCADA and instrumentation methodologies
- Safety management and compliance
- Large and small-scale pilot testing of environmental processes
- Value engineering
- Start-up and commission of active remediation systems and waste water treatment system

PROJECT ASSIGNMENT

Construction Manager

TOTAL YEARS OF EXPERIENCE

Over 30

Former Manufactured Gas Plant (MGP) Site, In Situ Stabilization/Solidification (ISS), Two Rivers, Wisconsin, United States, 2014-2015

Construction Manager for site remediation utilizing in situ stabilization/solidification (ISS) of 75,000 cubic yards of coal tar impacted soil at a former MGP site in Two Rivers, Wisconsin. The project was a USEPA Time Critical Removal Action conducted in a residential area along a river shoreline. Project elements included shallow soil excavation and landfill disposal, demolition and removal of historical structures, abandonment of pipeline under the East Twin River, continuous real-time air monitoring and installation of groundwater management system. Quality control activities included continuous on-site surveys, material documentation & management and treated soil sample collection & analysis. Construction challenges included installing new utility electric service, working in a wetland, water management and elevated river water levels. Site achieved remedy in place status.

USACE Kansas City, Monitored Devices Superfund Site, Remedial Construction, Farmington, New Jersey

Provided remedial design optimization of in-situ treatment system to address a large TCE plume. Developed processes and plans for optimizing the amendment mixing and ground injection or groundwater amendments. Included subsurface clearance of utilities using non-destructive methods (air knife and vacuum excavation) for over 100 new well installations. The system delivered 2.06 million gallons of amendment to the subsurface with 111 tons of sodium bicarbonate and 312 tons of emulsified vegetable oil to enhance bio-degradation at the site. System optimization and project management improvements saved \$800,000 and achieved USEPA Remedy in Place status.

Former Industrial Property Remediation and Bluff Stabilization for Future Redevelopment, Mount Pleasant, Wisconsin, United States, CNH Industrial America LLC, 2013-ongoing

Project Manager for expedited PCB soil impact hot spot removal. Construction support for planning and procurement for continued Ramboll services supporting characterization and remediation of vacant 100-acre former industrial parcel adjacent to Lake Michigan in Racine County, Wisconsin. The program also includes bluff stabilization and capping to facilitate redevelopment of the property and achieve case closure under state regulations.

Chemical Processing Facility, Hammond, Indiana

Decontaminated a plant-wide PCB hot oil heat transfer system. Initial phase of the project documented and mapped the location of the process piping in congested process areas. Produced project plans and schedule for unit outage to coordinate 24 hour-a-day clean-up actions to return unit to operation. Multiple draining and flushing events were completed incorporating PCB oil waste capture, sampling and disposal. Successfully documented PCB removal from the process systems and boilers to regulatory standards.

Water Treatment Facility Design/Build, Utah, United States

Oversaw the engineering, construction and startup of multiple produced water treatment facilities in remote Utah. The civil design required storm water isolation away from process areas. Design and construct water treatment facilities to separate condensate (oil) and water to acceptable standards for reuse. Scope included rock blasting, earthwork, civil, tank installation, process piping, electrical, site-generated power systems and instrumentation. Responsible for the startup, commissioning, training and turnover of the project to the client. Excavation and placement of over 100,000 tons of rock and soil and installation of 30 acres of HDPE flexible membrane liner.

Operation and Maintenance of Closed Industrial Superfund Site, Modena, Pennsylvania

Project Manager to manage a closed site that was formerly a metal recycling facility. The approximately 20 acre site was remediated under USEPA and Pennsylvania regulations addressing environmental impacts resulting from industrial scrap salvaging operations dating back to 1922. A site waste removal action, grading, and cap construction were completed in 2002. Since 2013, provide the long-term care and inspections required for the site.

MARK D. WALTER, P.E.

Engineer III

Mr. Walter has over 10 years of professional engineering experience in environmental consulting, including site investigation/waste characterization, preparation of drawings and specifications for dredging/excavation, dewatering, and disposal of contaminated materials, permitting, construction oversight and quality assurance, and correspondence with appropriate federal, state, and local agencies.

EDUCATION

M.S. – Civil and Environmental Engineering, University of Wisconsin - Madison

B.S. – Civil and Environmental Engineering, University of Wisconsin – Madison

EXPERIENCE

BURNHAM CANAL SITE INVESTIGATION AND REMEDIATION, Milwaukee, WI

Mark has served as Project Engineer and Project Manager since WDNR approval of the Final Remedial Design Report in 2017. The project includes limited dredging of PAH- and metals-contaminated soil and sediment from the canal bank and shallow end and placing aggregate on the canal bottom to cap remaining sediments. The project also includes placing additional fill over the capped surface to establish a base for a future constructed wetland. Mark has guided the project through subsequent modifications to accomplish the filling plan for the wetland base, Chapter 30 and USACE permitting and approvals, approval of NR 718 sediment reuse within the canal, long term care plans, financial assurance, final designs, and preliminary construction specifications and procurement.

WISCONSIN DEPARTMENT OF TRANSPORTATION (WisDOT) ENVIRONMENTAL, HAZMAT, AND ASBESTOS SERVICES CONTRACT, Wisconsin

Mark has served as Project Engineer and Project Manager since 2015 and Contract Manager since 2016. Projects in the WisDOT portfolio include environmental investigation of soil, sediment, and groundwater for highway improvement projects, preparing specifications and drawings for the management and/or reuse of contaminated materials, obtaining regulatory agency approval of management and/or re-use plans, preparing waste profiles for landfill disposal of contaminated soil and sediment, field-screening soil and sediment for contamination, coordinating on-site or off-site treatment and discharge of contaminated water, collecting emergency waste characterization samples for laboratory analysis, and documenting compliance with cap maintenance plans. Under this contract, Mark has overseen over 20 Phase 1 HMAs, over 40 subsurface and/or sediment investigations, and over 30 highway construction projects, frequently managing thousands to tens of thousands of tons of contaminated soils and/or sediment.

FORMER INDUSTRIAL PROPERTY REMEDIATION FOR FUTURE REDEVELOPMENT, Mount Pleasant, WI

Mark has served as a Project Engineer for this project since 2017. The project includes remedial excavation of industrial waste and PCB-contaminated materials at a vacant 100-acre former industrial parcel adjacent to Lake Michigan. Mark has guided the project through the WPDES Construction Site Storm Water Runoff General Permit process, assisted with erosion control implementation, and led underground utility exploration and mapping efforts and preparation of associated abandonment plans and cost estimates.

CERTIFICATIONS & MEMBERSHIPS

40-Hr HAZWOPER, First Aid/CPR/AED, American Society of Civil Engineers (ASCE)

CONTACT INFORMATION

Mark Walter

Mark.Walter@ramboll.com

Ramboll
234 W. Florida St., Fifth Flr.
Milwaukee, WI 53204

STEVEN G WISKES

Senior Scientist

Mr. Wiskes has extensive professional experience in environmental consulting throughout the Midwest, as well as Colorado, Washington, Maine, Florida, North Carolina, Texas and Japan, focusing on investigation and remediation of petroleum, solvents, explosives, and metals contaminated sediments, soils, and groundwater. He has experience with a variety of field analytical equipment including Energy-Dispersive X-Ray Fluorescence (EDXRF) and organic vapor analyzer (OVA). As a project chemist he has written USEPA Region 5 QAPPs as well as Department of Defense (DoD) Uniform Federal Policy QAPPs for Federal projects, has performed data validation of organic and inorganic data according to USEPA and DoD guidelines and performed audits of fixed-base and mobile analytical laboratories. As a Health and Safety Manager he has written health and safety plans, reviewed health and safety plans, provided staff training, performed site health and safety audits for a variety of environmental and construction projects.

CONTACT INFORMATION

Steve.Wiskes@ramboll.com

+1 414-837-3614

Education

1982 BS, Water Chemistry

1980 BS, Limnology

PROJECTS

Safety Services - Manufactured Gas Plants (MGPs), Midwest, United States

Responsible for writing health and safety plans. Held health and safety orientations for site personnel. Performed daily tailgate safety meetings for site work. Performed air monitoring for site personnel for oxygen, hydrogen sulfide, cyanide, carbon monoxide, benzene, organics, metals, and particulates. Performed health and safety audits on active sites, which included documentation of training, air monitoring, personal protective equipment use, daily tailgate safety meetings topics and attendance and review of certification for equipment operation.

Safety Services, Midwest, United States

Wrote health and safety plans. Performed site personnel and visitor health and safety orientations; inspections of the site layouts, signage, and safety procedures. Performed health and safety audits on active sites, including documentation of training, air monitoring, personal protective equipment use, daily tailgate safety meetings topics and attendance, and review of certifications for equipment operation. Created and chaired a Health and Safety Committee at NRT. Reviews monthly project safety reports and compiles a rolling safety summary.

Remediation and Bluff Stabilization for Future Redevelopment, Mount Pleasant, Wisconsin, United States, CNH Industrial America LLC

Ramboll provided services supporting characterization and remediation of a predominantly vacant 100-acre former industrial parcel adjacent to Lake Michigan in Racine County, Wisconsin. The program also included bluff stabilization and capping to facilitate redevelopment of the property and achieve case closure under state regulations.

Fox River PCB Remediation, Green Bay, Wisconsin, United States, The Boldt Company

Lead technical consultant on the Boldt Company team providing oversight services on behalf of the Wisconsin Department of Natural Resources (WDNR) for the remedial design/remedial action for polychlorinated biphenyl (PCB) contaminated sediments in the Lower Fox River, Wisconsin.

Former Two Rivers MGP Time-Critical Removal Action, Two Rivers, Wisconsin, United States, Utility Provider

Ramboll provided services for all phases of investigation, removal action alternatives analysis, design, implementation, and removal action construction management for a U.S. Environmental Protection Agency (USEPA) Time-Critical Removal Action at a former manufactured gas plant (MGP) facility located adjacent to the West Twin River in the City of Two Rivers, Wisconsin.

Crawford Manufactured Gas Plant Site Remediation, Chicago, Illinois, United States, Utility Provider

Ramboll led planning and remedial design services related to Time Critical Removal Actions (TCRA) in two areas of the site to address MGP source material. Site contaminants include volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), metals, and cyanide.

MGP Site RI/FS, United States

Led RI/FS studies of upland and sediment for manufactured gas plant sites in the Midwest using push cores, piston cores, Ekman dredge and the vibrocore methods.

Superfund Site Investigation/Feasibility Studies (RI/FS), MI, IN, WI, United States

Lead FI/FS at 10 Superfund sites throughout Indiana, Michigan, and Wisconsin. Developed data quality objectives and the site specific QAPPs. Directed team of scientists in collection and analysis of soils, groundwater, surface water, and sediments.

ALEX BARTELME

Environmental Scientist

Alex has 3 years of consulting experience focused on site investigations and remediation. He has experience in leading investigations of contaminated groundwater, surface water, soil vapor, soil, and sediments in the field at various utility and industrial sites. He has additional project experience installing and developing monitoring and temporary wells, construction oversight and air monitoring.

Contact Information

Alex.Bartelme@ramboll.com

+1 414-531-0093

Education

2017 BS, Biology:
Environmental Science
Concentration

PROJECTS

Manufactured Gas Plant (MGP) Contaminated River Sediment Investigation, Manitowoc River, Manitowoc River/West Twin River, Wisconsin, United States, WBS

Completed sediment investigations of MGP contaminated river sediments. Field activities included navigating marine equipment to sampling locations using a differential global positioning system (GPS), sediment coring, vibracore, ponar, push core, and hollow stem auger (HSA) sampling and logging. Interpreted field data and input borehole logs into gINT.

NYSDEC Inactive Landfill Initiative, Albany, New York, United States, Parsons Engineering Science, Inc.

Ramboll and Parsons were retained by the NYSDEC under a Standby Engineering Contract to assess over 1,750 closed landfills and develop a prioritized approach to sampling the landfills to evaluate potential impacts to drinking water, primarily focused on per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane. Approximately 76 landfills were targeted for the first phase of sampling with an additional 47 landfills added during the second phase.

Subsurface Water Sampling - WPS Former Manufactured Gas Plant (MGP), Wisconsin, United States, WBS

Routine groundwater sampling as part of site investigation and monitoring plans. Sampling conducted utilizing different equipment and techniques such as passive diffusion bags, bailers, peristaltic pumps, and bladder pumps. Proper collection and storage of various samples in accordance with procedures specific to each analyte.

Asian Carp Backwater Study, Upper Mississippi River, United States, USGS

Collect biological, chemical and hydrological data in various off-channel and backwater locations on the Mississippi River. Processing of samples and data in the field, lab and the office. Lab procedures included: Chlorophyll a determination, phytoplankton and zooplankton abundance, total and volatile suspended solids, total and dissolved nitrogen and phosphorous concentrations, vacuum filtration of grab samples for lipids. Instrumentation used in the field includes YSI Sondes and controllers in addition to Hach flowmeters and turbidimeters.

Easement Property Species Inventories, La Crosse, Wisconsin, United States, Mississippi Valley Conservancy

Local flora and fauna species inventories were documented annually in accordance to management plans for property easements held by the Mississippi Valley Conservancy. ArcGIS software was used to construct maps delineating areas of certain flora, fauna or general areas of concern and then implemented to management plans

Remediation and Bluff Stabilization for Future Redevelopment, Mount Pleasant, Wisconsin, United States, CNH Industrial America LLC

Ramboll provided services supporting characterization and remediation of a predominantly vacant 100-acre former industrial parcel adjacent to Lake Michigan in Racine County, Wisconsin. The program also included bluff stabilization and capping to facilitate redevelopment of the property and achieve case closure under state regulations.

KYLE J SCHAEFER

Environmental Scientist

Mr. Schaefer has four years of experience in environmental consulting, field engineering, construction oversight and quality assurance for environmental construction projects, field sample collection of soils, water and sediment for environmental site investigations. Project experience focused on well development, soil and groundwater sampling, air monitoring, construction oversight and management, In Situ Stabilization/Solidification construction, and compliance reporting and inspections.

CONTACT INFORMATION

Kyle.Schaefer@ramboll.com

+1 414-837-3610

Education

2015 Bachelor of Science -
Fish and Water
Resource Mgmt

PROJECTS

Remediation and Bluff Stabilization for Future Redevelopment, Mount Pleasant, Wisconsin, United States, CNH Industrial America LLC

Ramboll provided services supporting characterization and remediation of a predominantly vacant 100-acre former industrial parcel adjacent to Lake Michigan in Racine County, Wisconsin. The program also included bluff stabilization and capping to facilitate redevelopment of the property and achieve case closure under state regulations.

Former Milwaukee Solvay Coke and Gas Site, Milwaukee, Wisconsin, United States, Utility Provider , Confidential Client

Design, engineering, implementation, and communication with State/Federal agencies for a USEPA Non-Time-Critical Removal Action at a former coke and gas production site located in Milwaukee, WI. Project elements include investigation, design and implementation for in situ solidification/stabilization (ISS) of over 220,000 cubic yards of soil, limited landfill disposal, demolition and removal of historical structures, and direct contact surface barrier construction in preparation for property redevelopment as a manufacturing facility.

Fredonia GW Remediation Oversight & Construction Documentation, Fredonia, Wisconsin, United States, Koch Remediation & Environmental Services LLC

Ramboll provided field construction oversight services associated with the installation of the selected groundwater remedy at the former HVC, Inc. site in Fredonia, Wisconsin.

Kingston Gas Works Brownfield Site Cleanup, Kingston, New York, United States, Central Hudson Gas & Electric Corp.

Ramboll provided services for design, implementation, and removal action construction management, and environmental monitoring for a New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program at a former Manufactured Gas Plant (MGP) facility located adjacent to Rondout Creek in Kingston, New York. Project elements included ISS of approximately 20,000 cubic yards of MGP impacted soils, along with an additional 15,000 cubic yards of MGP impacted sediments to be dredged. Duties included third party construction oversight, water quality/turbidity monitoring, sediment cap placement construction oversight, and client and agency communication.

Environmental Assessments and Site Investigations, United States

Field activities include analytical and geotechnical soil sampling and logging (e.g. drill rigs and test pits), low flow groundwater sampling, and gas emission monitoring.

Former Two Rivers MGP Time-Critical Removal Action, Two Rivers, Wisconsin, United States, Utility Provider

Ramboll provided services for all phases of investigation, removal action alternatives analysis, design, implementation, and removal action construction management for a U.S. Environmental Protection Agency (USEPA) Time-Critical Removal Action at a former manufactured gas plant (MGP) facility located adjacent to the West Twin River in the City of Two Rivers, Wisconsin.

Fox River Remediation, Green Bay, Wisconsin, United States, The Boldt Company

The Fox River Cleanup Project is designed to reduce risk to human health and the environment due to the presence of PCBs in Fox River sediment. The project is a multi-year cleanup effort that includes dredging, capping and covering over a 13-mile stretch of the Lower Fox River. The project officially started with dredging and processing on April 28, 2009. To date more than 5.4 million cubic yards of sediment has been removed, processed and landfilled (3 million tons). Oversight of the Lower Fox River Remedial Action for the Wisconsin Department of Natural Resources (WDNR). Responsibilities included oversight and documentation of investigation, confirmation, and sediment cap sampling.

ERNIE S MIYASHITA

Senior Scientist

Mr. Miyashita has extensive experience in environmental consulting in a broad range of environmental areas and various industries. Substantial experience with assessing and ensuring facility compliance for storm water pollution prevention planning, Spill Prevention Control and Countermeasure (SPCC) planning, natural gas pipelines, National Pollutant Discharge Elimination System (NPDES) permitting, wetland permitting, compliance auditing and other related environmental compliance regulations. He has compliance experience with numerous manufacturing facilities, and transportation, utility, and municipal entities, and experience with National Environmental Policy Act (NEPA) process. Mr. Miyashita also has experience in sediment field investigations and health & safety assessments.

Contact Information

Ernie.Miyashita@ramboll.com

+1 773-796-4075

Education

1997 MS, Water Resources Management
1995 BA, Geography

PROJECTS

Former Two Rivers MGP Time-Critical Removal Action, Two Rivers, Wisconsin, United States, Utility Provider

Ramboll provided services for all phases of investigation, removal action alternatives analysis, design, implementation, and removal action construction management for a U.S. Environmental Protection Agency (USEPA) Time-Critical Removal Action at a former manufactured gas plant (MGP) facility located adjacent to the West Twin River in the City of Two Rivers, Wisconsin.

Crawford Manufactured Gas Plant Site Remediation, Chicago, Illinois, United States, Utility Provider

Ramboll led planning and remedial design services related to Time Critical Removal Actions (TCRA) in two areas of the site to address MGP source material. Site contaminants include volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), metals, and cyanide.

Stormwater Pollution Prevention Plans, Various Locations, California, California, United States

Developed over 30 Stormwater Pollution Prevention Plans in accordance with the requirements of the State of California Water Resources Control Board NPDES General Permit No. CAS000001 for Storm Water Discharges Associated with Industrial Activities (General Permit) adopted on April 1, 2014 and effective on July 1, 2015. Clients include Menasha Packaging, Pacific Southwest Container, Montebello Container, Orora North America, Orange County Container, Smurfit Kappa North America, WestRock, and Graphic Packaging International.

Various Clients, Storm Water Pollution Prevention Plans, Various Locations, California, California, United States

Developed over 30 Storm Water Pollution Prevention Plans in accordance with the requirements of the State of California Water Resources Control Board NPDES General Permit No. CAS000001 for Storm Water Discharges Associated with Industrial Activities (General Permit) adopted on April 1, 2014 and effective on July 1, 2015. Clients include Menasha Packaging, Pacific Southwest Container, Montebello Container, Orora North America, Smurfit Kappa North America, WestRock, and Graphic Packaging International.

Midwest Generation LLC, Waukegan Generating Station, 404 Permit, Midwest Generation, LLC, NRG Energy

Ramboll prepared a Joint Application for the U.S. Army Corps of Engineers Rock Island District Nationwide Permit No. 3 Maintenance for the Collins Generating Station in Grundy County, IL.

Orange & Rockland Utilities, Inc., Construction Storm Water Pollution Prevention Plan, Haverstraw, New York, United States, Orange & Rockland Utilities, Inc.

Prepared a Construction SWPPP in support of the remediation of Operable Unit No. 1 Haverstraw Clove and Maple Avenues Former Manufactured Gas Plant (MGP) Site project in Haverstraw, NY.

Environmental Compliance Audit [prior to Ramboll], United Airlines

Conducted an environmental compliance audit at the airlines' world headquarters and Cleveland International Airport. The audits included the review of regulated wastes, hazardous chemical reporting, wastewater and stormwater, PCBs, and air emissions. Operations were reviewed against federal, state, local, and company-specific environmental regulations using company-specific audit protocols. The audit reports consisted of a narrative describing the audit process, facility operations, and an automated findings report that included recommended corrective actions and steps to take to correct each finding.

Environmental Compliance Audits [prior to Ramboll], Carnival Corporation

Conducted multi-media environmental audits on-board 13 Carnival Corporation ships to comply with US Justice Department plea agreement. Compliance was determined based on ship-specific and company requirements, the MARPOL Treaty requirements and state and federal regulations when in US waters. Main areas of audit included hazardous waste generation, storage, and transport; hazardous chemicals storage; refrigerant maintenance and repair; garbage separation and disposal; incinerator use; and ballast water management. Cruise lines included Carnival Cruise Line, Holland America Line, P&O Cruises, and Princess Cruise Line. Countries included USA, Canada, Mexico, Italy, Spain, Portugal, England, Jamaica, and St. Maarten.



Joel Dahlby

Site Safety Manager/Site Safety & Health Officer

Profile

Dedicated and motivated safety professional with 3 years of experience with J.F. Brennan Company, Inc. as a Site Safety & Health Officer (SSHO); additional 4 years working for Winona Area Public Schools and 8 years working for Shopko Stores Inc. in safety roles. Extensive training and experience in every aspect of site safety.

Areas of Excellence

- Situational Awareness & Hazard Recognition
- Pre-Planning Emergency Response to Incidents
- Quality Control Inspections
- Safety & Compliance Management
- Air Monitoring
- Site Safety Coordination
- Effective Accident & Incident Investigations
- Conduct On-Site Training
- Staff Training
- Communication
- Environmental Compliance
- Performing & Documenting Site & Equipment Inspections

Professional Experience

J.F. Brennan Company, Inc.—Site Safety Manager	2018–Present
Winona Area Public Schools—Safety Specialist	2016–2018
Shopko Stores Inc.—Loss Prevention & Safety Lead	2011–2017

Key Projects & Accomplishments

Fox River Sediment Remediation, Operable Units 2–5, Primary Safety Manager **2018–2020**

Green Bay, WI: This \$275M project involved remediation of polychlorinated biphenyl (PCB) contamination along the 39 MI length of the Lower Fox River. Brennan removed over 5.8M CY of contaminated sediment via surgical dredging and placed over 850 AC of sand covers and engineered caps using the Brennan-patented Broadcast Capping System (BCS™).

- Primary safety manager for polychlorinated biphenyl (PCB) remediation project involving both mechanical and hydraulic dredging, subsurface utility location, and dredging, as well as the placement of engineered caps for this US Environmental Protection Agency (EPA) SuperFund project.
- Assisted in coordination of on-site safety and performed site and equipment inspections during both dredging and cap installation operations during 2018–2019 project year.
- Maintained required paperwork and client documentation.

Grasse River Remediation **2019**

Massena, NY: Remediation of sediment impacted by polychlorinated biphenyls (PCBs) in the Grasse River via dredging and processing of near shore sediments, disposal of the dredged material in an on-site landfill, backfilling the dredged areas, and placing caps over sediments in the main channel of the river. The project area encompasses approximately 7.2 MI of the Grasse River between the Massena Power Canal and the St. Lawrence River.

- Conducted daily safety meetings, ensuring that Brennan ensuring Brennan met Occupational Safety and Health Administration (OSHA), US Coast Guard (USCG), and US Army Corps of Engineers (USACE) requirements.
- Maintained environmental documentation and conducted daily and monthly inspections.



Ashland Phase II Full-Scale Wet Dredge, Manufactured Gas Plant Remediation, Primary Safety Manager 2018

Ashland, WI: Mechanical and hydraulic dredging to remove polycyclic aromatic hydrocarbons (PAHs) at this Superfund site along the shoreline of Chequamegon Bay of Lake Superior. After achieving a final surface weighted average concentration (SWAC) of 2.4 PPM (well below the requisite 9.5 PPM), Brennan placed a restorative sand layer, riprap for peninsula backfill, and fish habitat structures.

- Conducted daily safety meetings, ensuring that Brennan met OSHA, USCG, and client requirements.
- Maintained environmental documentation and conducted daily and monthly inspections for this mechanical and hydraulic dredging, PCB-remediation project.

Additional Projects—Site Safety/SSHO

Kanawha River Capping (Winfield, WV)	2020
Sabic Repairs (Ottawa, IL)	2020
Lake Manawa (Council Bluffs, IA)	2020
Sabula Barge Strike (Sabula, IA)	2020
Seneca Yard (Marseilles, IL)	2020
Lake Wissota Concrete Repair (Chippawa Falls, WI)	2020
Neenah Dredge Remediation (Neenah, WI)	2020
St. Paul Slip (St. Paul, MN)	2020
USACE Conway Dredging (Lansing, IA)	2020
Fountain Lake Dredging (Albert Lea, MN)	2020
Exelon Dredging (Cordova, IL)	2020
Interstate Island Dredging (Duluth, MN)	2020
Pig's Eye Fender Repairs (St. Paul, MN)	2020
Massey's Ditch (Millsboro, DE)	2020
USACE Lock & Dam #14 Wall Restoration (Le Claire, IA)	2019, 2020
Alter Rock Island Dock Repair (Rock Island, IL)	2019, 2020
Growmark Fender Repair (Seneca, IL)	2019
MP Island Lake Sluice Gate (Duluth, MN)	2019
USACE Lock & Dam #5 Sheet Pile Installation (Wabasha, MN)	2019
USACE Lock & Dam Marseilles Upper Bulkhead Slots (Marseilles, IL)	2019
USACE Lock & Dam Starved Rock Upper Bulkhead Slots (Ottawa, IL)	2019
USACE Lock & Dam LaGrange (Cooperstown, IL)	2019
Alliant Kilbourn (Wisconsin Dells, WI)	2019
Duluth Yard (Duluth, MN)	2019
Canadian Pacific (CP) 85.34 Rest Pier Stabilization (Milwaukee, WI)	2019
Cargill Meredosia Barge Winch Renovation (Meredosia, IL)	2019
Lake Zumbro Dredging (Rochester, MN)	2019
Xcel Energy Nelson (Nelson, WI)	2019
USACE Lock & Dam #11 Install Relief Wells (Dubuque, IA)	2018, 2019
USACE Lock #4 Crib Wall Repairs (Alma, WI)	2018, 2019
USACE Lock #5A Crib Wall Grouting (Fountain City, WI)	2018, 2019



Alliant Energy Spillway Remediation (Prairie du Sac, WI)	2018, 2019
USACE Lock & Dam #6 Guidewall End Cell (Trempealeau, WI)	2018, 2019
Madeline Island Piling Installation (Madeline Island, WI)	2018
Union Pacific Railroad (UPRR) Pig's Eye Phase 3 (St. Paul, MN)	2018
UP BR 61.75 Lead Pier Nemadji (Superior, WI)	2018
Chicago Fish Barrier (Romeoville, IL)	2018
Domtar Port Edwards Scour (Port Edwards, WI)	2018
CP French Slough Span Replacement (French Island, WI)	2018

Education

Winona State University	Bachelor of Science, Police Science/Law Enforcement
Rochester Community Technical College	Police Academy, Law Enforcement Officer Certification

Training Certifications

- 40 HR OSHA Hazardous Waste Operations and Emergency Response Standard (HAZWOPER)
- 30 HR OSHA Construction Safety & Health
- 10 HR OSHA General Industry
- USACE EM 385-1-1 Certified
- USACE Construction Quality Management for Contractors (CQM-C) Certification
- Mine Safety and Health Administration (MSHA) 24 HR New Miner Certified
- MSHA Refresher 8 HR
- FRA 214 Railroad Safety (CN) Certified
- eRailSafe Certified
- American Red Cross CPR/First Aid/AED/ Instructor Authorization
- American Red Cross CPR/First Aid/AED/ Bloodborne Pathogens
- First Responder Certified
- Shipyard Competent
- Deckhand Certified
- COVID-19 Awareness Certified
- Competent Person—Trenching/Excavation Certified
- Qualified Rigger/Signalperson Certified
- Fall Protection/Bridge Worker Certified
- Aerial Lift/Forklift/Telehandler Certified
- Operations Security (OPSEC) Awareness Certified
- Wisconsin Boater Education Certified
- SMI Cargill Certified
- Standard Field Sobriety Testing Certified
- Active Shooter Response Certified
- Hazardous Materials Handling Certified
- Crime Scene Processing
- Defensive Driving Certification
- Chemical Agent Identification & Handling
- Accident Investigation Certified
- Emergency Vehicle Operator Certification
- Fall Protection Instructor Certified
- 700 Contractor Safety Orientation with RWP



Matt D. Wagner

Superintendent

Profile

Talented Superintendent with over 12 years of experience in environmental marine work. Extensive background in mechanical/hydraulic dredging and subaqueous environmental cap installation. Focused and driven team member with strong skills in project and personnel coordination, scheduling onsite work, and material and subcontractor coordination.

Areas of Excellence

- Crew Coordination/Project Supervision
- Hydraulic Dredging
- Subaqueous Capping Supervision
- Project and Crew Management/Assignment
- Hazardous Material Containment
- Client Relations
- Scheduling Coordination
- Environmental Dredging

Professional Experience

J.F. Brennan Company, Inc. 2008–Present

Key Projects & Accomplishments

Massey's Ditch Channel Maintenance Dredging, Superintendent 2019–2020

Sussex County, DE: Channel maintenance dredging and beach nourishment project for the Delaware Department of Natural Resources and Environmental Control (DNREC) Division of Watershed Stewardship, removing approximately 160,000 CY of sand via hydraulic dredging and increasing the depth of the channel to 6.5 FT. This work enables commercial and recreational fisherman, emergency responders, and recreational boaters to move freely through the channel during low tide, improving safety as well as navigation.

Delaware and Raritan Canal Dredging

Superintendent 2019

Foreman 2018

Kingston, NJ: Three-year ongoing dredging project for the New Jersey Water Supply Authority to remove 248,000 CY of maintenance material from a 10.5-MI stretch of the Delaware and Raritan Canal and restore water supply functionality to this historic waterway.

Fox River Sediment Remediation, Operable Units 2–5

Foreman 2019

Leverman 2012–2014, 2017

Boosterhand 2009–2011

Green Bay, WI: This \$275M project involved remediation of polychlorinated biphenyl (PCB) contamination along the 39 MI length of the Lower Fox River. Brennan removed over 5.8M CY of contaminated sediment via surgical dredging and placed over 850 AC of sand covers and engineered caps using the Brennan-patented Broadcast Capping System (BCS™).

Ninigret Pond Maintenance Dredging, Foreman 2019

Charlestown, RI: Dredged shoaled sand from the Charlestown Breachway and hydraulically transported this material to replenish the Charlestown Town Beach.



Quonochontaug Marsh and Eelgrass Restoration, Leverman **2018**
Charlestown, RI: Dredged approximately 70,000 CY of sand for use in restoring and elevating 30 AC of degraded salt marsh.

Rhode Island Ninigret Marsh Wetland Restoration and Beach Re-nourishment, Leverman **2017**
Ninigret Pond, RI: Project for the Rhode Island Coastal Resource Management Council (CRMC) to hydraulically dredge the Charlestown Breachway and to beneficially reuse the sand to raise the elevation of the adjacent marsh; sand also re-nourished the beach adjacent to the breachway inlet. This was one of the first salt marsh restoration projects completed in the State of Rhode Island.

Mill River Remediation, Areas I–V, Leverman **2015–2016**
Fairfield, CT: Performed lead- and chromium-impacted sediment remediation in 5 areas (Study Areas I–V) within the Mill River.

East Branch Grand Calumet River Remediation, Leverman **2013**
Hammond, IN: Remediation and restoration of a 1.8 MI track of the Grand Calumet River and adjacent Seidner Marsh; a total of 360,000 CY of polychlorinated biphenyl (PCB)-contaminated material was removed using several innovative methods. This project also included installation of both an inert and a reactive sediment cap, followed by complete restoration of the remediated wetlands.

Waukegan Harbor Environmental Remediation, Leverman **2012**
Waukegan, IL: Demolished existing marina, removed contaminated sediments, applied sand cover, installed sub-surface armament, and reconstructed marina facilities; project presented several challenges that required a combination of construction and remediation techniques that ultimately surpassed post-cleanup goals of the United States Environmental Protection Agency (EPA).

Professional Affiliations

- Member, International Union of Operating Engineers Local #139

Training Certifications

- 40 HR Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard (HAZWOPER)
- 8 HR HAZWOPER Refresher
- Boaters Safety
- Boating Safety Practical Skills Testing
- Texas A&M University Cutter Suction Dredge Simulator Short Course
- DSC Basic Dredge Operation



Nathan R. Wyrowski

Project Manager

Profile

Highly skilled marine construction professional with a background in civil engineering. Expertise in working as a dedicated team member on complex projects over multiple years. Performs project management tasks including estimating, scheduling, quality control, cost management, and contract administration, achieving excellent results while consistently focusing on safety.

Areas of Excellence

- Personnel Management
- Safety and Compliance Management
- AutoCAD® Software
- HYPACK® Hydrographic Survey Software
- Communication
- Project Coordination

Professional Experience

J.F. Brennan Company, Inc. 2017–Present
Great Lakes Dredge & Dock Corporation 2014–2017

Key Projects & Accomplishments

Fox River Sediment Remediation, Operable Units 2–5, Assistant Project Manager 2018–Present

Green Bay, WI: Green Bay, WI: Currently in its final stages, this \$275M project involves remediation of polychlorinated biphenyl (PCB) contamination along the 39-MI length of the Lower Fox River. To date on this project, Brennan removed over 5.8M CY of contaminated sediment via surgical dredging and placed over 850 AC of sand covers and engineered caps using the Brennan-patented Broadcast Capping System (BCS™).

- Coordinates project tasks, schedules equipment operations, and works closely with multiple parties and regulatory agencies (e.g., Tetra Tech; Foth Infrastructure & Environment, LLC; Stuyvesant Projects Realization Inc.; and Agencies Oversight Team [Wisconsin Department of Natural Resources, U.S. Environmental Protection Agency, and Departments of Justice]).

Winnapaug Pond Dredging and Beach Nourishment, Assistant Project Manager 2018

Westerly, RI: Navigational work dredging areas of shoaled sand from the Winnapaug Pond and hydraulically transport the sand to Wuskenau Town Beach for nourishment. Winnapaug Pond essentially served as a borrow area for beach fill sand; however, Brennan worked to create a channel-like feature within the pond for local boaters.

- Worked closely with the management team, client, and Brennan operators to successfully complete dredging operations in the Winnapaug Pond, RI and hydraulically transport dredged material to the Wuskenau Town Beach.



West Coast Hopper Dredging, Assistant Project Manager**2017**

- Managed site engineering staff, ensuring completion of all tasks safely and per company policy on channel maintenance project consisting of dredging 3.25M CY of material in four locations on the West Coast including Humboldt Bay, CA; Coos Bay, OR, Columbia River, OR/WA from River Mile 3+00 through River Mile 105+00 and Mouth of the Columbia River, OR/WA.
- Performed quality control checks on survey procedures and deliverables including, but not limited to, hydrographic survey data collection, real-time kinematic (RTK) land survey data collection, bathymetric and topographic maps, volume reports, and dredge production reports. Coordinated with Project Engineer and site management to successfully plan and design all dredging and fill operations, including investigating sites for unknown utilities or other hazards, planning dredge sail routes, subline layouts, dredge cut layouts, fill site pumping strategies, and many other site and project logistics.
- Collaborated with project contractors and third-party surveyors or subcontractors to ensure completion of all work within specification and in a timely manner.
- Communicated with dredge captains, mates, drag tenders, and leverman to ensure clear understanding of dig instructions and incorporated necessary changes based on feedback.
- Trained new hires on company policy, safety procedures, and work tasks.
- Encouraged experienced engineers to assume more project responsibility and prepared them for advancement within the company.

Willoughby Spit Beach Nourishment, Assistant Project Manager**2017**

- Managed site engineering staff, ensuring completion of all tasks safely and per company policy on project involving nourishment of a 7-MI stretch of beach, placing 1.2M CY of sand that contributed an additional 60 FT of beach for future storm protection.
- Performed quality control checks on survey procedures and deliverables including, but not limited to, hydrographic survey data collection, RTK land survey data collection, bathymetric and topographic maps, volume reports, and dredge production reports. Coordinated with Project Engineer and site management to successfully plan and design all dredging and fill operations, including investigating sites for unknown utilities or other hazards, planning dredge sail routes, subline layouts, dredge cut layouts, fill site pumping strategies, and many other site and project logistics.
- Collaborated with project contractors and third-party surveyors or subcontractors to ensure completion of all work within specification and in a timely manner.
- Communicated with dredge captains, mates, drag tenders, and leverman to ensure clear understanding of dig instructions and incorporated necessary changes based on feedback.
- Trained new hires on company policy, safety procedures, and work tasks.
- Encouraged experienced engineers to assume more project responsibility and prepared them for advancement within the company.



Shell Island West NRDA Restoration, Assistant Project Manager**2016–2017**

- Managed site engineering staff, ensuring completion of all tasks safely and per company policy on project that included dredging of nearly 4.8M CY of sand from the Mississippi River, and hydraulic transport to the Gulf of Mexico to create an additional 319 acres of beach and dune. Dredged an additional 1.57M CY of organic sediment from the Gulf of Mexico to create 287 acres of marshland.
- Performed quality control checks on survey procedures and deliverables including, but not limited to, hydrographic survey data collection, RTK land survey data collection, bathymetric and topographic maps, volume reports, and dredge production reports. Coordinated with Project Engineer and site management to successfully plan and design all dredging and fill operations, including investigating sites for unknown utilities or other hazards, planning dredge sail routes, subline layouts, dredge cut layouts, fill site pumping strategies, and many other site and project logistics.
- Collaborated with project contractors and third-party surveyors or subcontractors to ensure completion of all work within specification and in a timely manner.
- Communicated with dredge captains, mates, drag tenders, and leverman to ensure clear understanding of dig instructions and incorporated necessary changes based on feedback.
- Trained new hires on company policy, safety procedures, and work tasks.
- Encouraged experienced engineers to assume more project responsibility and prepared them for advancement within the company.

Jesuit Bend Mitigation Bank, Site Engineer**2016**

- Planning, coordination, and supervision of technical aspects on project consisting of dredging 1.32M CY from the Mississippi River and hydraulically transporting the material to restore nearly 275 acres of marshland. Following completion of dredging, 211,000 plugs of marsh grass were planted to assist in restoring the marsh habitat.
- Installed, calibrated, and performed troubleshooting of multi- and single-beam systems on various survey vessels.
- Collected daily multi- or single-beam hydrographic surveys, processed data, and created deliverables to monitor and alter dredging procedures including cross sections, volume reports, face maps, and bathymetric maps.
- Collected daily RTK land surveys, processed data, and merged with hydrographic survey data to create fill cross sections, calculate volumes, and create topographic maps to monitor fill site operations; RTK land surveying also included setting up a base station and conducting all proper quality control (QC) checks.
- Updated dredge positioning systems with the latest surveys and modified dig instructions for more effective dredge operations.
- Produced and analyzed dredge production reports to optimize dredge efficiency and production.
- Recruited and interviewed potential employees at Purdue University career fair.



GE Hudson River PCB Cleanup, Site Engineer

2014–2016

- Planning, coordination, and supervision of technical aspects on part of a 40-MI cleanup that removed 2.75M CY of sediment containing 300,000 LB PCBs from the Hudson River. At Great Lakes, responsible for a roughly 2-MI landlocked stretch between the Thompson Island Dam and the Fort Miller Dam. After conclusion of dredging, completed backfill operations, placing sand, soil, and stone to protect the river bottom from further contamination.
- Installed, calibrated, and performed troubleshooting of multi- and single-beam systems on various survey vessels.
- Collected daily multi- or single-beam hydrographic surveys, processed data, and created deliverables to monitor and alter dredging procedures including cross sections, volume reports, face maps, and bathymetric maps.
- Collected daily RTK land surveys, processed data, and merged with hydrographic survey data to create cross sections, calculate volumes, and create topographic maps to monitor shore land excavation and capping operations along the shoreline; RTK land surveying also included setting up a base station and conducting all proper QC checks.
- Updated dredge positioning systems with the latest surveys and modified dig instructions for more effective dredge operations.
- Produced and analyzed dredge production reports to optimize dredge efficiency and production.
- Recruited and interviewed potential employees at Purdue University career fair.

Folly Beach Nourishment, Site Engineer

2014

- Planning, coordination, and supervision of technical aspects on project that involved dredging 1.5M CY of material from the coast of South Carolina to restore a stretch of over 5 MI of storm-deteriorated beach.
- Installed, calibrated, and performed troubleshooting of multi- and single-beam systems on various survey vessels.
- Collected daily multi- or single-beam hydrographic surveys, processed data, and created deliverables to monitor and alter dredging procedures including cross sections, volume reports, face maps, and bathymetric maps.
- Collected daily RTK land surveys, processed data, and merged with hydrographic survey data to create fill cross sections, calculate volumes, and create topographic maps to monitor fill site operations; RTK land surveying also included setting up a base station and conducting all proper QC checks.
- Updated dredge positioning systems with the latest surveys and modified dig instructions for more effective dredge operations.
- Produced and analyzed dredge production reports to optimize dredge efficiency and production.
- Recruited and interviewed potential employees at Purdue University career fair.

Education

Purdue University

Bachelor of Science, Civil Engineering

Training Certifications

- 40 HR Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard (HAZWOPER)
- 8 HR HAZWOPER Refresher
- 30 HR OSHA Construction Safety & Health
- American Red Cross First Aid/CPR/AED/Bloodborne Pathogens
- United States Coast Guard (USCG) Auxiliary Boating Safety



Timothy S. Butz

Field Safety Coordinator and Lead Safety Manager

Profile

Field Safety Coordinator with extensive experience as a Site Safety & Health Officer (SSHO) and a strong background in project safety for heavy civil and marine construction; 4 years of experience with J.F. Brennan Company, Inc. as an SSHO and an additional 13 years as a US Army Construction Safety Supervisor. Expertise in implementation of and compliance with the Occupational Safety and Health Administration (OSHA), US Army Corps of Engineers (USACE), Federal Railroad Administration (FRA), US Coast Guard (USCG), and general industry safety standards. Works as a member of the project management team in planning and troubleshooting work activities to ensure project completion in a safe manner. Serve as direct client liaison regarding project safety and reporting. Responsible for identification and mitigation of hazards within the area of project operations.

Areas of Excellence

- Monitor and assess hazardous situations and develop measures to ensure personnel safety
- Effectively communicate occupational safety standards and laws to employees and supervisors via training, meetings, and new employee orientations
- Thorough accident and incident investigation
- Perform and document site and equipment inspections
- Consistent monitoring of site safety operations
- Extensive knowledge of the USACE EM 385-1-1 and OSHA 29 CFR 1926 safety manuals
- Confined Space trainer
- Fall protection competent person trainer

Professional Experience

J.F. Brennan Company, Inc. 2017–Present

Key Projects

Field Safety Coordinator 2017–Present

- Responsible for staffing and oversight for approximately 50% of Brennan projects across divisions.
- Development of internal protocols for pre-job hazard analysis and risk mitigation for heavy marine construction projects.
- Responsible for final review of all internally created project and site-specific Health and Safety Plans.

Canadian National (CN) Railway Rainy Sub Bridge Replacement 2018

- Monitored all site safety construction operations.
- Monitored all safety equipment for compliance.
- Assisted with making any required changes to safety policies and procedures.
- Performed daily safety meetings at construction sites and maintained safe work sites.

WSOR Double Bridge Replacement 2018

- Monitor all site safety operations including FRA procedures.
- Perform daily safety meetings with an emphasis on procedural and policy conformance.
- Provide on-site training to crews.
- Ensure all daily and monthly inspections were completed.

Minnesota Power 2017

- Monitored all construction safety operations for Knife Falls, Island Lake, and Thomson Dams.

J.F. Brennan Company, Inc.



- Performed daily safety meetings with an emphasis on procedural and policy conformance.
- Ensured all daily and monthly inspections were completed.
- Provided on-site training to crews.
- Monitored and kept current with the storm water pollution prevention plan.

LaGrange Lock & Dam **2017**

- Monitored all site safety operations including sub-contractor management, confined space procedures, and air monitoring.
- Assisted with making any required changes to site safety policies and procedures.
- Performed daily safety meetings with an emphasis on procedural and policy conformance.

Lock & Dam #15 Auxiliary Chamber Bulkhead Slots (Rock Island, IL) **2017**

- Monitored all site safety operations including sub-contractor management, confined space procedures, and air monitoring.
- Assisted with making any required changes to site safety policies and procedures.
- Performed daily safety meetings with an emphasis on procedural and policy conformance.

Sabula Bridge (Sabula, IA) **2017**

- Monitored all site safety pile driving operations.
- Monitored all safety equipment for compliance.
- Assisted with making any required changes to safety policies and procedures.
- Performed daily safety meetings at construction sites and maintain safe work sites.

Traveling Screen Replacement Project (Alma, WI) **2017**

- Monitored all site safety operations including sub-contractor management, confined space procedures, and air monitoring.
- Assisted with making any required changes to site safety policies and procedures.
- Performed daily safety meetings with an emphasis on procedural and policy conformance.

US Army Construction Safety Supervisor **2008–Present**

- 10+ years Supervisor experience in construction safety.
- Monitored weapons range safety compliance.
- Assisted with making any required changes to unit safety policies and procedures.
- Performed daily safety meetings at construction sites and convoy safety briefings to and from work sites.



Training Certifications

- USACE Construction Quality Management for Contractors (CQM-C) Certification
- USACE 40-Hour EM 385-1-1 Construction Safety Hazard Awareness for Contractors
- 30-Hour OSHA Construction Safety & Health Certified
- 10-Hour OSHA General Construction
- 132-Hour OSHA Certified
- Minnesota Flagger Trainer
- 40-Hour OSHA Hazardous Waste Operations and Emergency Response Standard (HAZWOPER)
- eRailSafe Certified
- FRA Bridge Worker Fall Protection
- CN On-Track Certified
- BNSF Railway On-Track Certified
- WATCO Certified
- Wisconsin Boaters Safety
- Mine Safety and Health Administration (MSHA) Part 46 Certified
- Rigger/Signal Person Certified
- Fall Protection Competent Person Certified
- SWPPP Certified
- American Red Cross First Aid/CPR
- Confined Space Trainer

APPENDIX B

PLAN DRAWINGS AND TECHNICAL SPECIFICATIONS FROM PROJECT'S CHAPTER 30 PERMIT APPLICATIONS

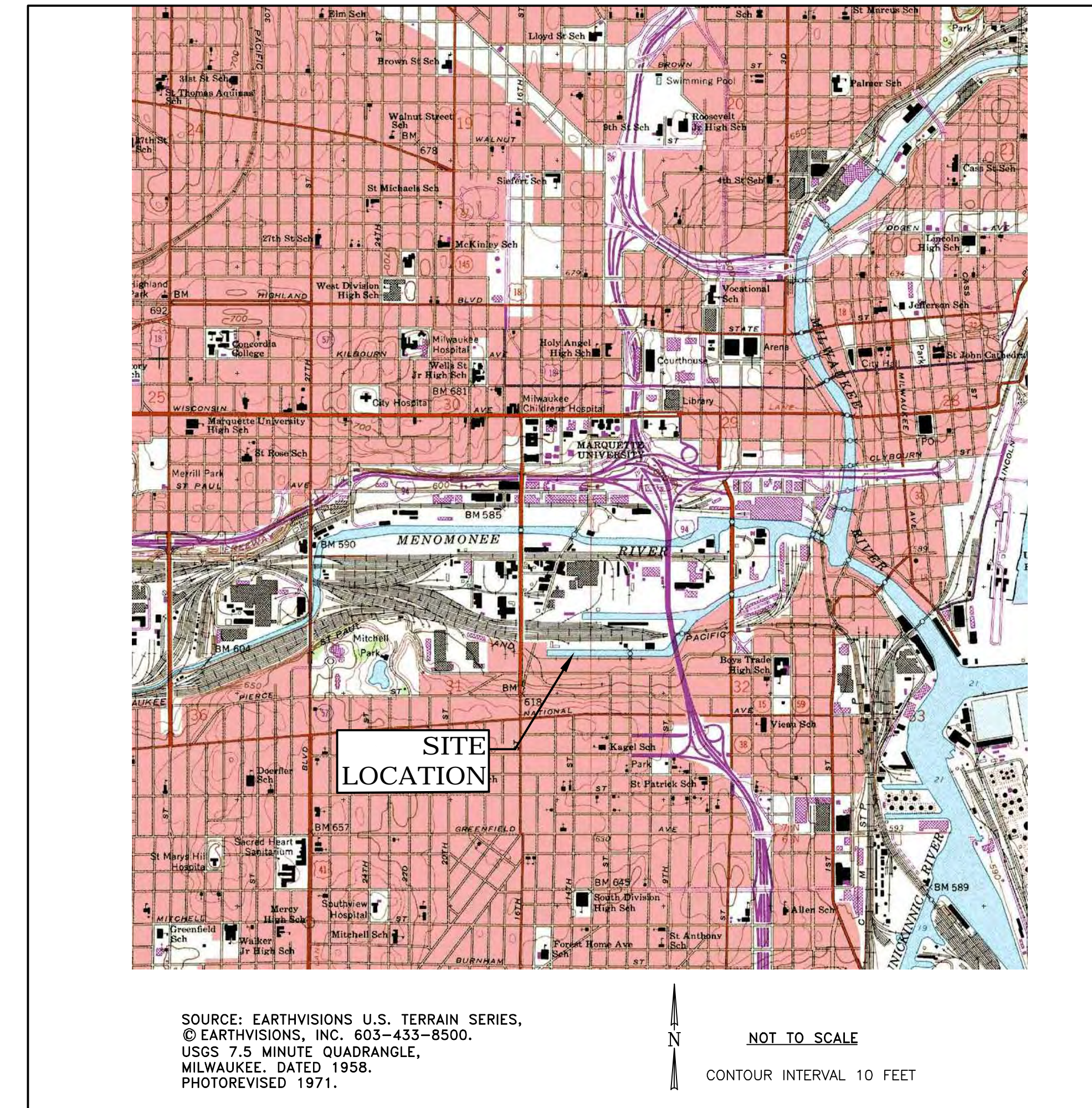
PLANS AND SPECIFICATIONS

SHEETS

BURNHAM CANAL REMEDIATION FINAL DESIGN REVISION 2 MILLER COMPRESSING COMPANY CITY OF MILWAUKEE, MILWAUKEE COUNTY, WISCONSIN

LIST OF DRAWINGS

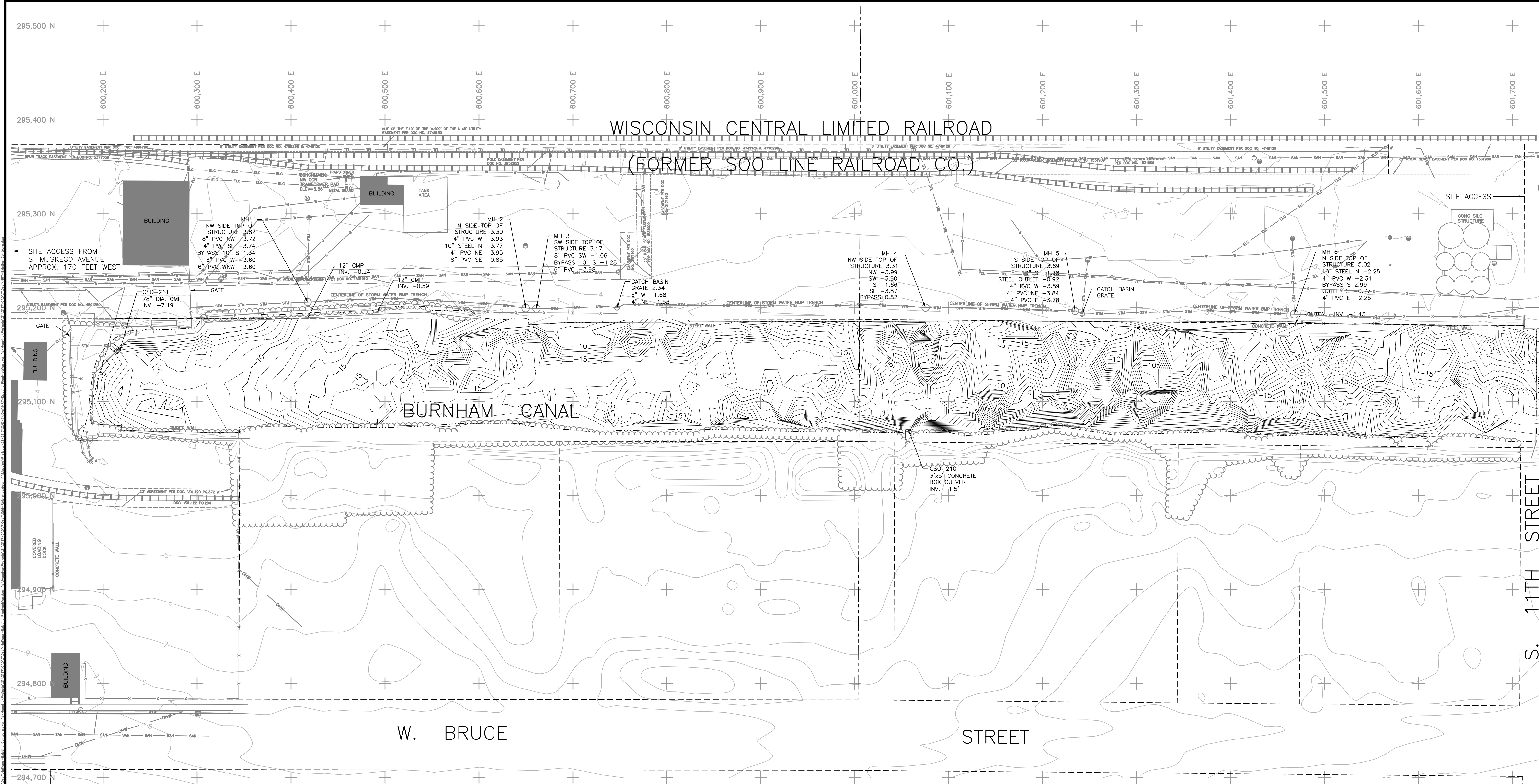
SHEET NO.	TITLE	DRAWING NO.
TS	TITLE SHEET	D2117TS-04
C010	PRECONSTRUCTION SITE CONDITIONS	D2117C010-04
C020	INITIAL SITE PREPARATION	D2117C020-04
C035	PROFILE AND CROSS SECTIONS	D2117C035-04
C040	DETAILS	D2117C040-04
C041	DETAILS	D2117C041-04
C042	WEST END EXCAVATION DETAILS	D2117C042-04



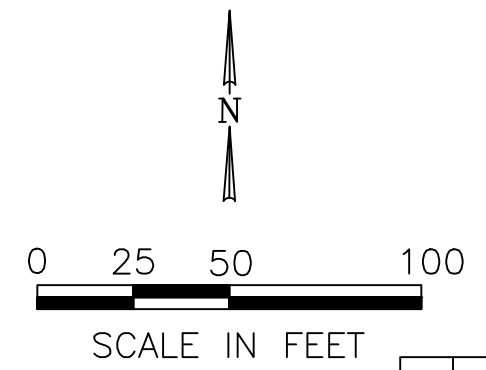
PREPARED FOR:
MILLER COMPRESSING COMPANY
1640 WEST BRUCE STREET
MILWAUKEE, WISCONSIN 53204

TITLE SHEET	
PROJECT NO. 21177-1	BURNHAM CANAL REMEDIATION FINAL DESIGN REVISION 2 MILLER COMPRESSING COMPANY CITY OF MILWAUKEE, WISCONSIN
DRAWN BY: DMD 06/04/15	
CHECKED BY: Y.Z. 02/02/16	
APPROVED BY: RJB 02/02/16	
DRAWING NO.: D2117TS-04.DWG	SHEET NO. TS
NATURAL RESOURCE TECHNOLOGY	
6.	
5.	RJB
4. ISSUED FOR AGENCY REVIEW	07/29/16
3. ISSUED FOR AGENCY REVIEW	02/02/16
2. ESD MODIFICATIONS ISSUED FOR AGENCY REVIEW	01/15/15
1. ISSUED TO ADDRESS AGENCY COMMENTS	07/19/13
0. ISSUED FOR AGENCY REVIEW	03/29/13
REVISION:	DATE:
	APPD BY:

All U.S. 7.5 Minute Topographic Maps are in the Public Domain and are available from the National Archives and Records Administration.



	LAND SURFACE CONTOURS		OVERHEAD WIRE
	CANAL BOTTOM MAJOR CONTOUR		TELEPHONE
	CANAL BOTTOM MINOR CONTOUR		ELECTRIC
	APPROXIMATE LOCATION OF WATER EDGE FOR BURNHAM CANAL		WATER MAIN
	RIGHT-OF-WAY (R.O.W.)/ PARCEL LINE		GAS
	SECTION LINE		SANITARY SEWER
	TREES & BRUSH		STORM SEWER
	FENCE		MANHOLE
	BUILDING		CATCH BASIN
			RAILROAD TRACKS



GENERAL NOTES:

- THE INFORMATION SHOWN ON THIS DRAWING CONCERNING TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATIONS AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO.

DIGGERS HOTLINE
 CONTACT DIGGER'S HOTLINE PRIOR TO ANY UNDERGROUND WORK ON-SITE
 CALL 811 OR (800) 242-8511
 (262) 432-7910
 (877) 500-9592 (EMERGENCY ONLY)

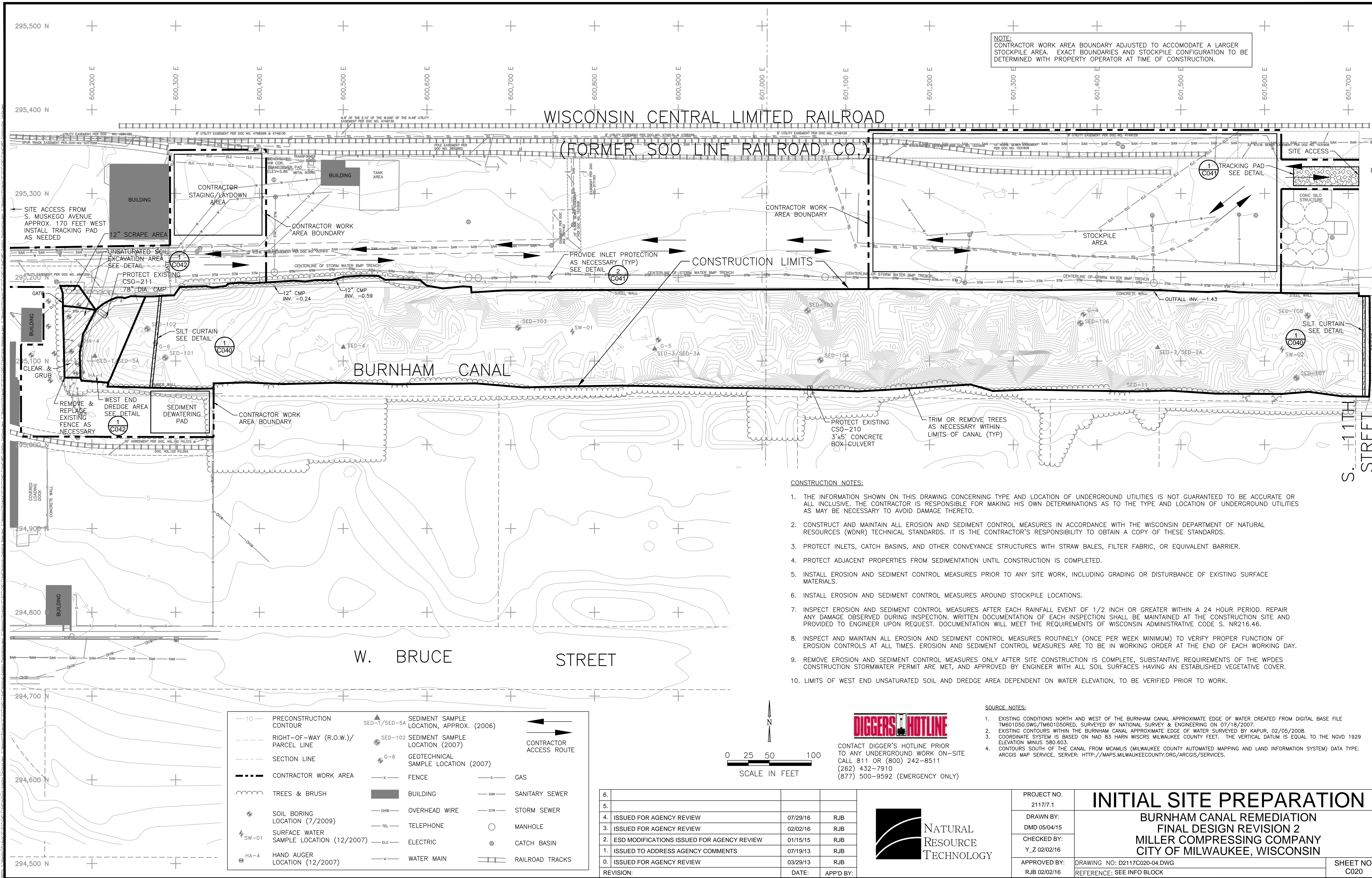
SOURCE NOTES:

- EXISTING CONDITIONS NORTH AND WEST OF THE BURNHAM CANAL APPROXIMATE EDGE OF WATER CREATED FROM DIGITAL BASE FILE TM601D50.DWG/TM601D50RED, SURVEYED BY NATIONAL SURVEY & ENGINEERING ON 07/18/2007.
- EXISTING CONTOURS WITHIN THE BURNHAM CANAL APPROXIMATE EDGE OF WATER SURVEYED BY KAPUR, 02/05/2008.
- COORDINATE SYSTEM IS BASED ON NAD 83 HARN WISCRS MILWAUKEE COUNTY FEET. THE VERTICAL DATUM IS EQUAL TO THE NGVD 1929 ELEVATION MINUS 560.603.
- CONTOURS SOUTH OF THE CANAL FROM MCAMUS (MILWAUKEE COUNTY AUTOMATED MAPPING AND LAND INFORMATION SYSTEM) DATA TYPE: ARCGIS MAP SERVICE, SERVER: HTTP://MAPS.MILWAUKEECOUNTY.ORG/ARCGIS/SERVICES.

6.			
5.			
4.	ISSUED FOR AGENCY REVIEW	07/29/16	RJB
3.	ISSUED FOR AGENCY REVIEW	02/02/16	RJB
2.	ESD MODIFICATIONS ISSUED FOR AGENCY REVIEW	01/15/15	RJB
1.	ISSUED TO ADDRESS AGENCY COMMENTS	07/19/13	RJB
0.	ISSUED FOR AGENCY REVIEW	03/29/13	RJB
REVISION:		DATE:	APP'D BY:



PROJECT NO. 21177.1	PRECONSTRUCTION SITE CONDITIONS	SHEET NO. C010
DRAWN BY: DMD 05/27/15		
CHECKED BY: Y_Z 02/02/16	BURNHAM CANAL REMEDIATION FINAL DESIGN REVISION 2 MILLER COMPRESSING COMPANY CITY OF MILWAUKEE, WISCONSIN	
APPROVED BY: RJB 02/02/16	DRAWING NO: D2117C010-04.DWG REFERENCE: SEE INFO BLOCK	



NOTE:
 CONTRACTOR WORK AREA BOUNDARY ADJUSTED TO ACCOMMODATE A LARGER STOCKPILE AREA. EXACT BOUNDARIES AND STOCKPILE CONFIGURATION TO BE DETERMINED WITH PROPERTY OPERATOR AT TIME OF CONSTRUCTION.

WISCONSIN CENTRAL LIMITED RAILROAD
 (FORMER SOO LINE RAILROAD CO.)

BURNHAM CANAL

W. BRUCE STREET

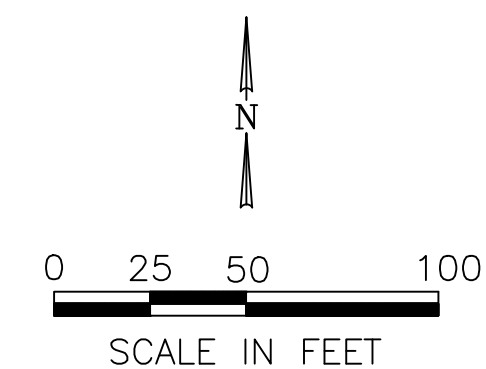
S. 11TH STREET

CONSTRUCTION NOTES:

1. THE INFORMATION SHOWN ON THIS DRAWING CONCERNING TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATIONS AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO.
2. CONSTRUCT AND MAINTAIN ALL EROSION AND SEDIMENT CONTROL MEASURES IN ACCORDANCE WITH THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES (WDNR) TECHNICAL STANDARDS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN A COPY OF THESE STANDARDS.
3. PROTECT INLETS, CATCH BASINS, AND OTHER CONVEYANCE STRUCTURES WITH STRAW BALES, FILTER FABRIC, OR EQUIVALENT BARRIER.
4. PROTECT ADJACENT PROPERTIES FROM SEDIMENTATION UNTIL CONSTRUCTION IS COMPLETED.
5. INSTALL EROSION AND SEDIMENT CONTROL MEASURES PRIOR TO ANY SITE WORK, INCLUDING GRADING OR DISTURBANCE OF EXISTING SURFACE MATERIALS.
6. INSTALL EROSION AND SEDIMENT CONTROL MEASURES AROUND STOCKPILE LOCATIONS.
7. INSPECT EROSION AND SEDIMENT CONTROL MEASURES AFTER EACH RAINFALL EVENT OF 1/2 INCH OR GREATER WITHIN A 24 HOUR PERIOD. REPAIR ANY DAMAGE OBSERVED DURING INSPECTION. WRITTEN DOCUMENTATION OF EACH INSPECTION SHALL BE MAINTAINED AT THE CONSTRUCTION SITE AND PROVIDED TO ENGINEER UPON REQUEST. DOCUMENTATION WILL MEET THE REQUIREMENTS OF WISCONSIN ADMINISTRATIVE CODE S. NR216.46.
8. INSPECT AND MAINTAIN ALL EROSION AND SEDIMENT CONTROL MEASURES ROUTINELY (ONCE PER WEEK MINIMUM) TO VERIFY PROPER FUNCTION OF EROSION CONTROLS AT ALL TIMES. EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE IN WORKING ORDER AT THE END OF EACH WORKING DAY.
9. REMOVE EROSION AND SEDIMENT CONTROL MEASURES ONLY AFTER SITE CONSTRUCTION IS COMPLETE, SUBSTANTIVE REQUIREMENTS OF THE WPDES CONSTRUCTION STORMWATER PERMIT ARE MET, AND APPROVED BY ENGINEER WITH ALL SOIL SURFACES HAVING AN ESTABLISHED VEGETATIVE COVER.
10. LIMITS OF WEST END UNSATURATED SOIL AND DREDGE AREA DEPENDENT ON WATER ELEVATION, TO BE VERIFIED PRIOR TO WORK.

SOURCE NOTES:

1. EXISTING CONDITIONS NORTH AND WEST OF THE BURNHAM CANAL APPROXIMATE EDGE OF WATER CREATED FROM DIGITAL BASE FILE TM601D50.DWG/TM601D50.DRD, SURVEYED BY NATIONAL SURVEY & ENGINEERING ON 07/18/2007.
2. EXISTING CONTOURS WITHIN THE BURNHAM CANAL APPROXIMATE EDGE OF WATER SURVEYED BY KAPUR, 02/05/2008.
3. COORDINATE SYSTEM IS BASED ON NAD 83 HARN WISCONSIN MILWAUKEE COUNTY FEET. THE VERTICAL DATUM IS EQUAL TO THE NGVD 1929 ELEVATION MINUS 580.603.
4. CONTOURS SOUTH OF THE CANAL FROM MCAMJIS (MILWAUKEE COUNTY AUTOMATED MAPPING AND LAND INFORMATION SYSTEM) DATA TYPE: ARCGIS MAP SERVICE, SERVER: HTTP://MAPS.MILWAUKEECOUNTY.ORG/ARCGIS/SERVICES.



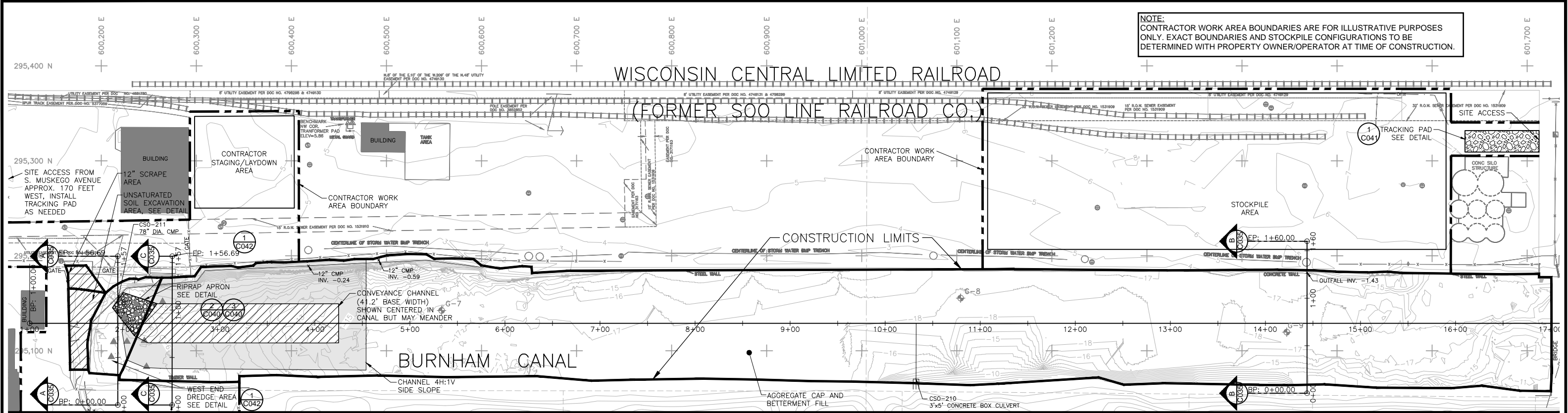
DIGGERS HOTLINE
 CONTACT DIGGER'S HOTLINE PRIOR TO ANY UNDERGROUND WORK ON-SITE
 CALL 811 OR (800) 242-8511
 (262) 432-7910
 (877) 500-9592 (EMERGENCY ONLY)

— 10 —	PRECONSTRUCTION CONTOUR	▲ SED-1/SED-5A	SEDIMENT SAMPLE LOCATION, APPROX. (2006)	←	CONTRACTOR ACCESS ROUTE
---	RIGHT-OF-WAY (R.O.W.)/ PARCEL LINE	● SED-102	SEDIMENT SAMPLE LOCATION (2007)	→	
---	SECTION LINE	◆ G-6	GEOTECHNICAL SAMPLE LOCATION (2007)		
---	CONTRACTOR WORK AREA	— x —	FENCE	— G —	GAS
—	TREES & BRUSH	— BLDG —	BUILDING	— SAN —	SANITARY SEWER
◆	SOIL BORING LOCATION (7/2009)	— OHW —	OVERHEAD WIRE	— STM —	STORM SEWER
◆ SW-01	SURFACE WATER SAMPLE LOCATION (12/2007)	— TEL —	TELEPHONE	○	MANHOLE
◆ HA-4	HAND AUGER LOCATION (12/2007)	— ELC —	ELECTRIC	●	CATCH BASIN
		— W —	WATER MAIN	—	RAILROAD TRACKS

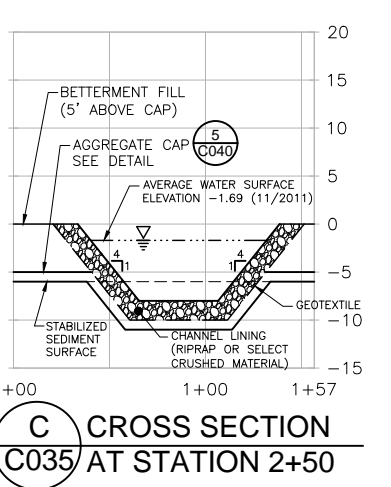
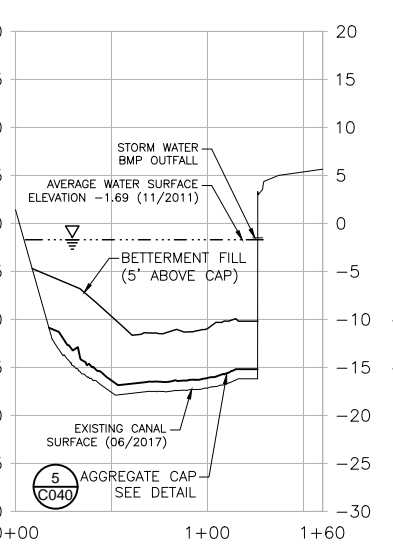
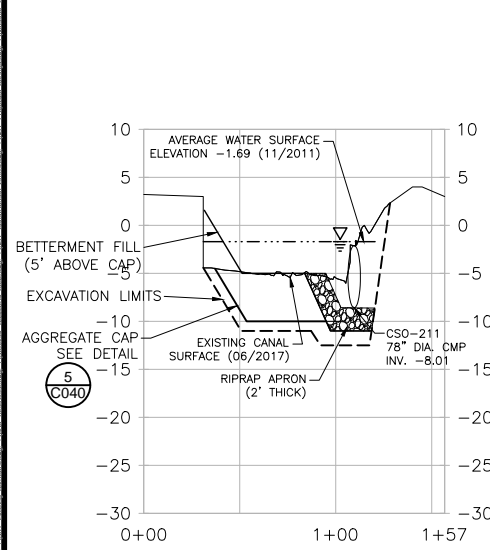
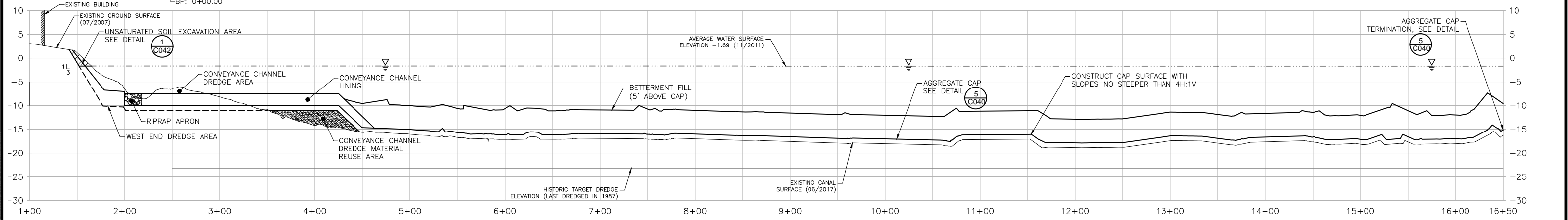
6.			
5.			
4.	ISSUED FOR AGENCY REVIEW	07/29/16	RJB
3.	ISSUED FOR AGENCY REVIEW	02/02/16	RJB
2.	ESD MODIFICATIONS ISSUED FOR AGENCY REVIEW	01/15/15	RJB
1.	ISSUED TO ADDRESS AGENCY COMMENTS	07/19/13	RJB
0.	ISSUED FOR AGENCY REVIEW	03/29/13	RJB
REVISION:	DATE:	APP'D BY:	



PROJECT NO. 2117/7.1	INITIAL SITE PREPARATION BURNHAM CANAL REMEDIATION FINAL DESIGN REVISION 2 MILLER COMPRESSING COMPANY CITY OF MILWAUKEE, WISCONSIN	SHEET NO. C020
DRAWN BY: DMD 05/04/15		
CHECKED BY: Y_Z 02/02/16		
APPROVED BY: RJB 02/02/16	DRAWING NO: D2117C020-04.DWG REFERENCE: SEE INFO BLOCK	



NOTE:
 CONTRACTOR WORK AREA BOUNDARIES ARE FOR ILLUSTRATIVE PURPOSES ONLY. EXACT BOUNDARIES AND STOCKPILE CONFIGURATIONS TO BE DETERMINED WITH PROPERTY OWNER/OPERATOR AT TIME OF CONSTRUCTION.



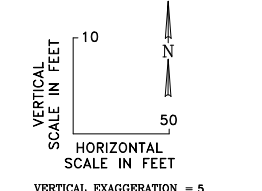
— 10 —	PRECONSTRUCTION CONTOUR	● SED-102	SEDIMENT SAMPLE LOCATION (2007)	— G —	GAS
- - - -	RIGHT-OF-WAY (R.O.W.)/ PARCEL LINE	◆ G-6	GEOTECHNICAL SAMPLE LOCATION (2007)	— SAN —	SANITARY SEWER
- - - -	SECTION LINE	◆ G-7	PRE-DESIGN GEOTECHNICAL SAMPLE LOCATION (11/2011)	— STH —	STORM SEWER
— — — —	CONTRACTOR WORK AREA	▲	PRE-DESIGN SEDIMENT SAMPLE LOCATION (11/2011)	○	MANHOLE
— — — —	TREES & BRUSH	— X —	FENCE	●	CATCH BASIN
◆	SOIL BORING LOCATION (7/2009)	— B —	BUILDING	— — — —	RAILROAD TRACKS
◆ SW-01	SURFACE WATER SAMPLE LOCATION (12/2007)	— OHW —	OVERHEAD WIRE		
◆ HA-4	HAND AUGER LOCATION (12/2007)	— TEL —	TELEPHONE		
◆ SED-T/SED-5A	SEDIMENT SAMPLE LOCATION, APPROX. (2006)	— ELC —	ELECTRIC		
		— W —	WATER MAIN		

CONSTRUCTION NOTES:

1. THE INFORMATION SHOWN ON THIS DRAWING CONCERNING TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATIONS AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO.
2. LIMITS OF WEST END UNSATURATED SOIL AND DREDGE AREA DEPENDENT ON WATER ELEVATION, TO BE VERIFIED PRIOR TO WORK.

SOURCE NOTES:

1. EXISTING CONTOURS NORTH AND WEST OF THE BURNHAM CANAL APPROXIMATE EDGE OF WATER CREATED FROM DIGITAL BASE FILE TM601D50.DWG/TM601D50RED, SURVEYED BY NATIONAL SURVEY & ENGINEERING ON 07/18/2007.
2. EXISTING CONTOURS WITHIN THE BURNHAM CANAL BASED ON BATHYMETRY SURVEY COMPLETED BY THE U.S. ARMY CORPS OF ENGINEERS ON 06/27/2017.
3. COORDINATE SYSTEM IS BASED ON NAD 83 HARN WISCONSIN COUNTY METER FEET. THE VERTICAL DATUM IS EQUAL TO THE NGVD 1929 ELEVATION MINUS 580.603.
4. CONTOURS SOUTH OF THE CANAL FROM MCAMLIUS (MILWAUKEE COUNTY AUTOMATED MAPPING AND LAND INFORMATION SYSTEM) DATA TYPE: ARCGIS MAP SERVICE, SERVER: [HTTP://MAPS.MILWAUKEECOUNTY.ORG/ARCGIS/SERVICES](http://MAPS.MILWAUKEECOUNTY.ORG/ARCGIS/SERVICES).



CONTACT DIGGER'S HOTLINE PRIOR TO ANY UNDERGROUND WORK ON-SITE
 CALL 811 OR (800) 242-8511
 (262) 432-7910
 (877) 500-9592 (EMERGENCY ONLY)

A CROSS SECTION C035 AT STATION 1+93

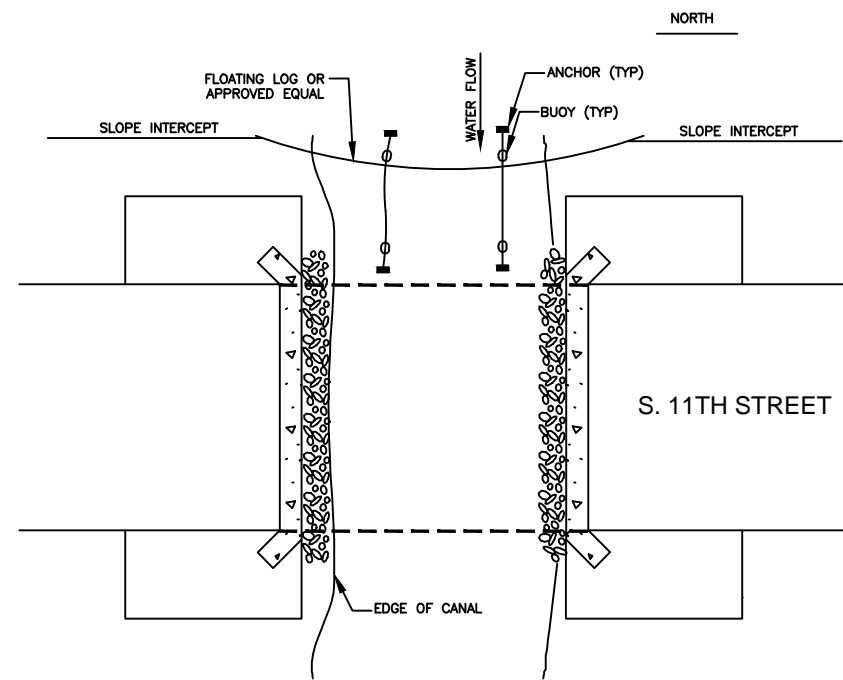
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C CROSS SECTION C035 AT STATION 2+50

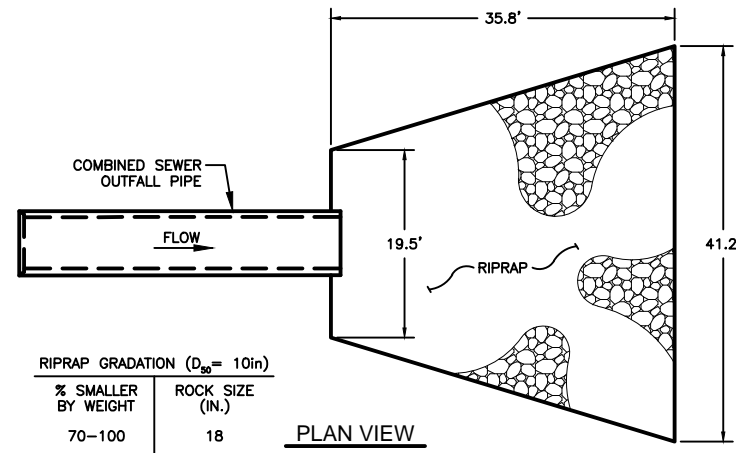
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5.	VOL. BETTERMENT MOD. ISSUED FOR AGENCY REVIEW	DRAFT	
4.	ISSUED FOR AGENCY REVIEW	07/29/16	RJB
3.	ISSUED FOR AGENCY REVIEW	02/02/16	RJB
2.	ESD MODIFICATIONS ISSUED FOR AGENCY REVIEW	01/15/15	RJB
1.	ISSUED TO ADDRESS AGENCY COMMENTS	07/19/13	RJB
0.	ISSUED FOR AGENCY REVIEW	03/29/13	RJB
REVISION:		DATE:	APP'D BY:



PROJECT NO. 67830/910	PROFILE AND CROSS SECTIONS	BURNHAM CANAL REMEDIATION VOLUNTARY BETTERMENT AGGREGATE FILL MATERIAL PLACEMENT REVISION MILLER COMPRESSING COMPANY CITY OF MILWAUKEE, WISCONSIN	SHEET NO. C035
DRAWN BY: DMD 05/04/15			
CHECKED BY: Y_Z 02/02/16	DRAWING NO: D2117C035-04.DWG		
APPROVED BY: RJB 02/02/16	REFERENCE: SEE INFO BLOCK		



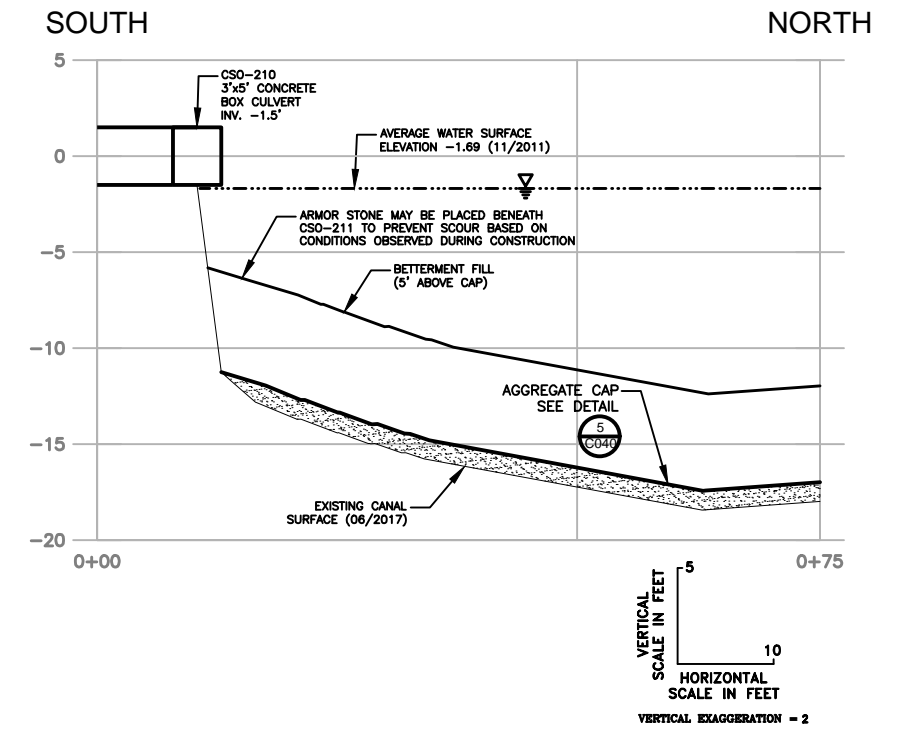
PLAN VIEW



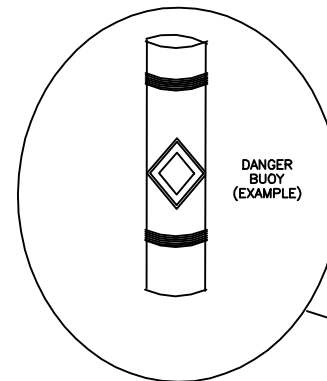
PLAN VIEW

RIPRAP GRADATION (D ₉₀ = 10in)	
% SMALLER BY WEIGHT	ROCK SIZE (IN.)
70-100	18
50-70	14
35-50	10
2-10	3

2 RIPRAP APRON DETAIL
C040 NOT TO SCALE



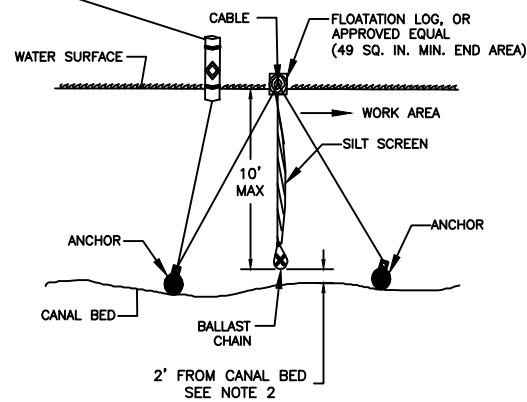
4 CROSS SECTION THROUGH CSO-210
C040



SEE NOTE 3
DANGER BUOY (EXAMPLE)

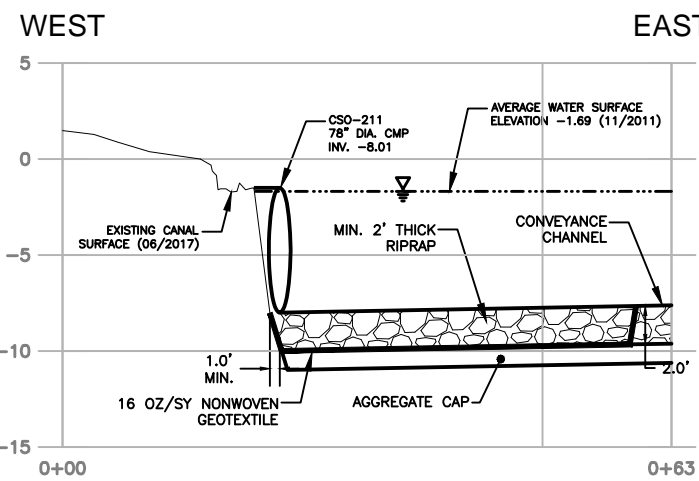
GENERAL NOTES:

1. DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THE DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE WDNR TECHNICAL STD. 1070.
2. 2' SHALL BE MAINTAINED DURING CONSTRUCTION PERIOD.
3. USE AS DIRECTED BY COAST GUARD OR WDNR WHEN WORKING IN NAVIGABLE WATERWAYS.

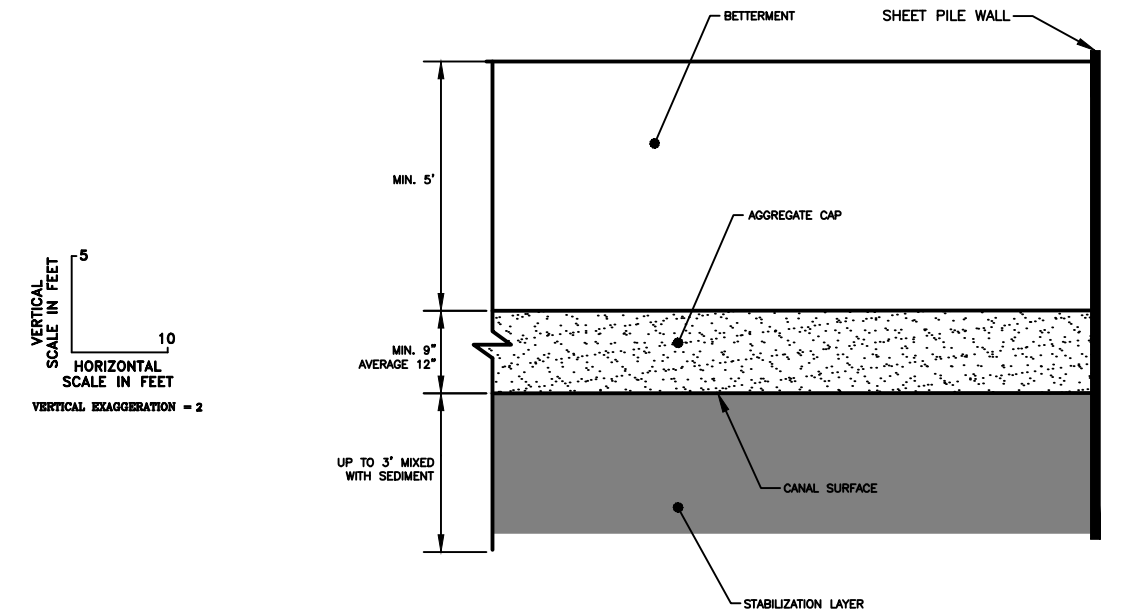


CROSS SECTION

1 SILT CURTAIN DETAIL
C040 NOT TO SCALE



3 CROSS SECTION THROUGH CSO-211
C040



5 AGGREGATE CAP PROFILE AND EAST END TERMINATION DETAIL
C040 NOT TO SCALE

6.			
5.	VOL. BETTERMENT MOD. ISSUED FOR AGENCY REVIEW	DRAFT	
4.	ISSUED FOR AGENCY REVIEW	07/29/16	RJB
3.	ISSUED FOR AGENCY REVIEW	02/02/16	RJB
2.	ESD MODIFICATIONS ISSUED FOR AGENCY REVIEW	01/15/15	RJB
1.	ISSUED TO ADDRESS AGENCY COMMENTS	07/19/13	RJB
0.	ISSUED FOR AGENCY REVIEW	03/29/13	RJB
REVISION:		DATE:	APP'D BY:



O'BRIEN & GERE ENGINEERS, INC

PROJECT NO. 67830/910	DETAILS	BURNHAM CANAL REMEDIATION VOLUNTARY BETTERMENT AGGREGATE FILL MATERIAL PLACEMENT REVISION MILLER COMPRESSING COMPANY CITY OF MILWAUKEE, WISCONSIN
DRAWN BY: DMD 05/04/15		
CHECKED BY: Y_Z 02/02/16	DRAWING NO: D2117C040-04.DWG	SHEET NO. C040
APPROVED BY: RJB 02/02/16	REFERENCE: SEE INFO BLOCK	

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.

TRACKING PAD SHALL BE INSPECTED DAILY. DEFICIENT AREAS SHALL BE REPAIRED OR REPLACED IMMEDIATELY.

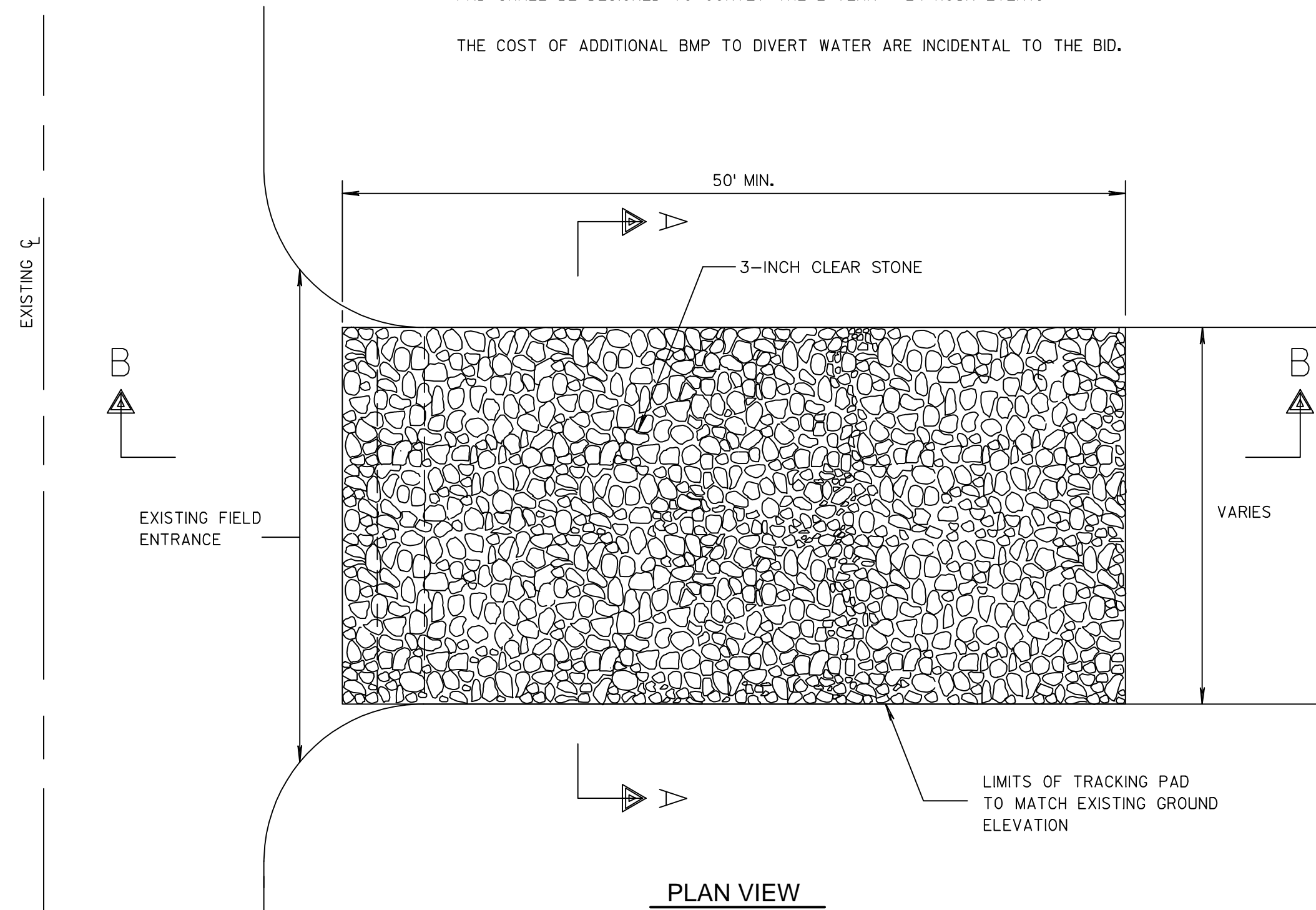
TRACKING PAD TO BE REMOVED AFTER CONSTRUCTION IS COMPLETED.

TRACKING PAD SHALL BE THE FULL WIDTH OF THE EGRESS POINT.

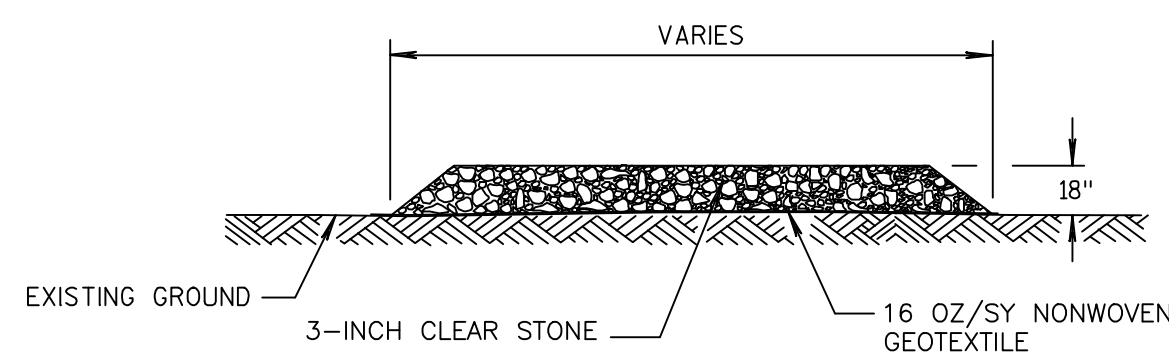
SURFACE WATER MUST BE PREVENTED FROM PASSING THROUGH THE TRACKING PAD. FLOWS SHALL BE DIVERTED AWAY, AROUND OR CONVEYED UNDER THE TRACKING PAD.

CULVERT PIPE OR OTHER BMP USED TO DIVERT WATER AWAY, AROUND OR UNDER THE TRACKING PAD SHALL BE DESIGNED TO CONVEY THE 2 YEAR - 24 HOUR EVENT.

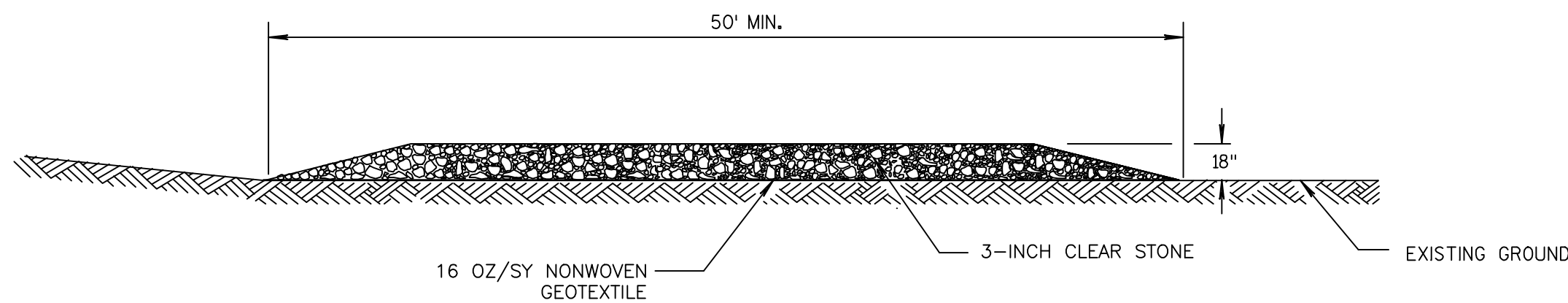
THE COST OF ADDITIONAL BMP TO DIVERT WATER ARE INCIDENTAL TO THE BID.



PLAN VIEW

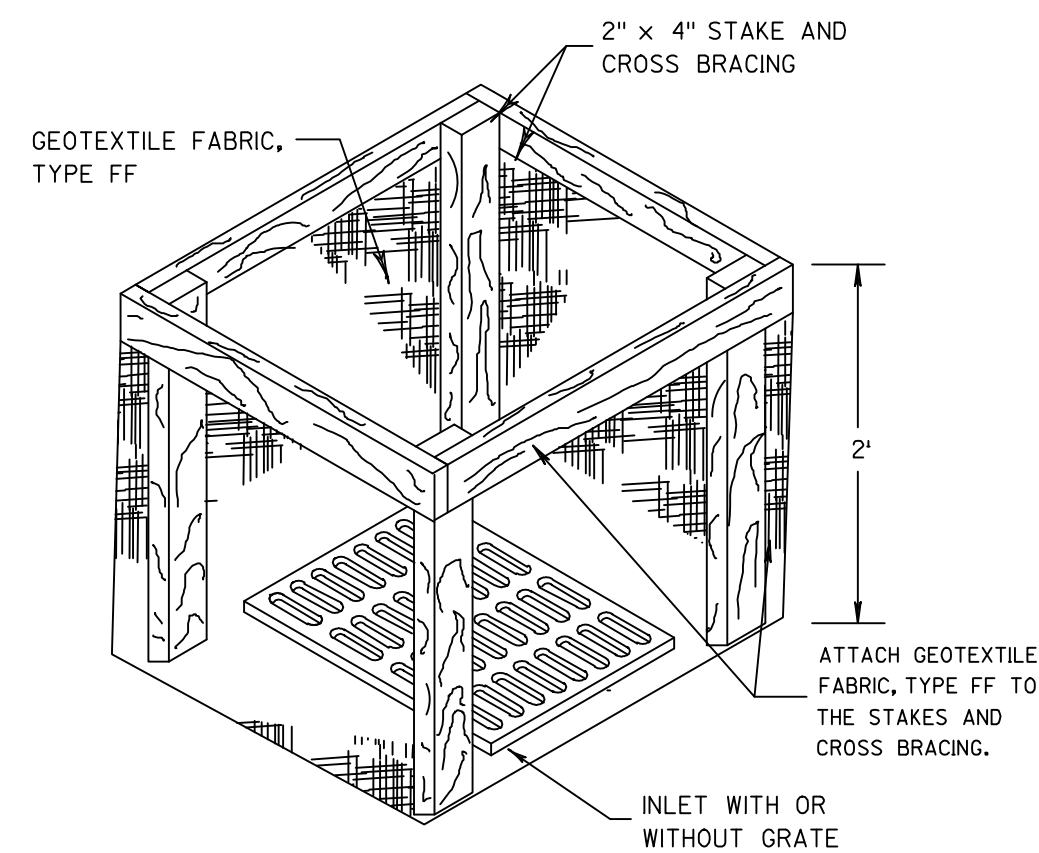
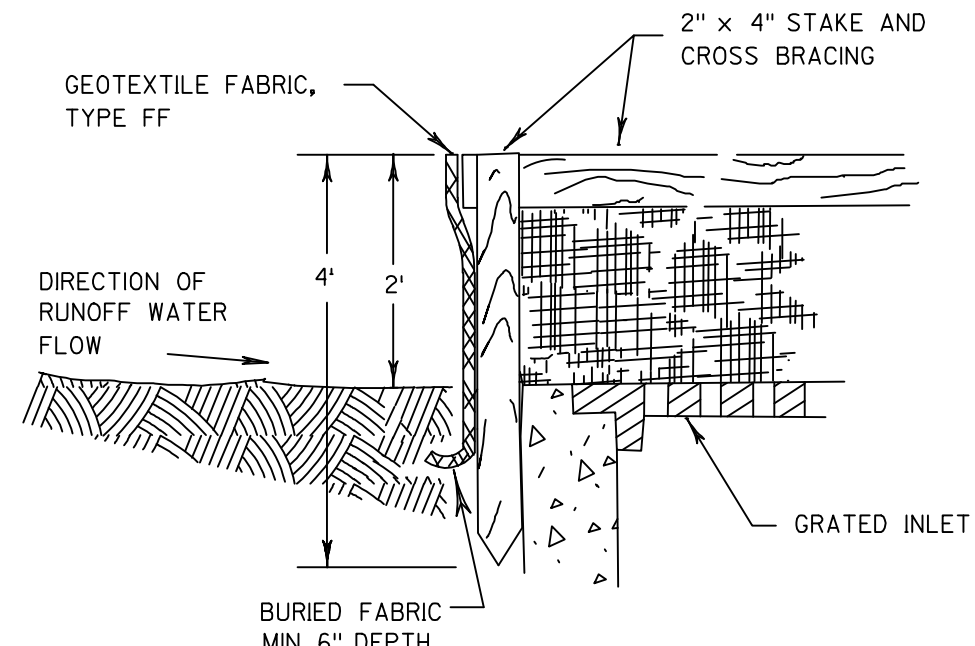


SECTION A-A



SECTION B-B

1 TRACKING PAD
C041 NOT TO SCALE



INLET PROTECTION, TYPE A

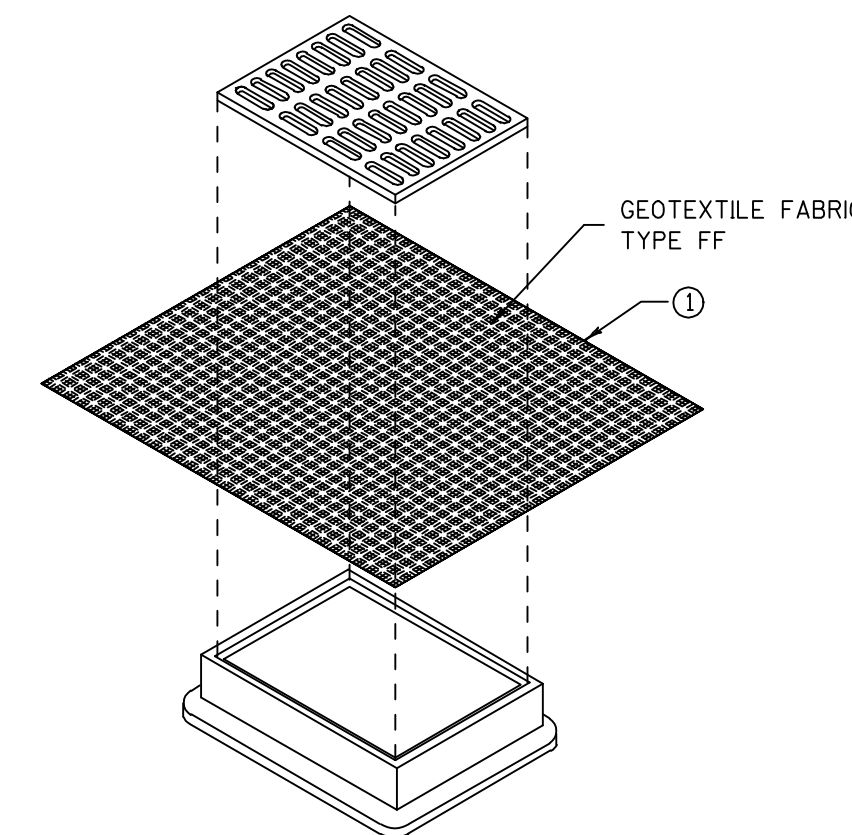
GENERAL NOTES

INLET PROTECTION DEVICES SHALL BE MAINTAINED OR REPLACED AT THE DIRECTION OF THE ENGINEER.

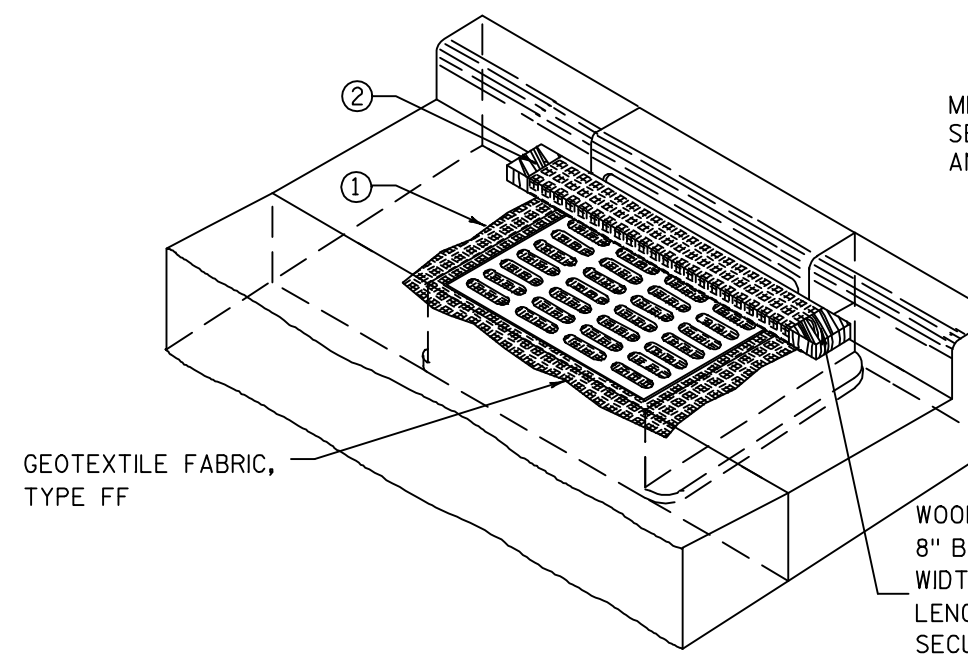
MANUFACTURED ALTERNATIVES APPROVED AND LISTED ON THE DEPARTMENT'S EROSION CONTROL PRODUCT ACCEPTABILITY LIST MAY BE SUBSTITUTED.

WHEN REMOVING OR MAINTAINING INLET PROTECTION, CARE SHALL BE TAKEN SO THAT THE SEDIMENT TRAPPED ON THE GEOTEXTILE FABRIC DOES NOT FALL INTO THE INLET. ANY MATERIAL FALLING INTO THE INLET SHALL BE REMOVED IMMEDIATELY.

- ① FINISHED SIZE, INCLUDING FLAP POCKETS WHERE REQUIRED, SHALL EXTEND A MINIMUM OF 10" AROUND THE PERIMETER TO FACILITATE MAINTENANCE OR REMOVAL.
- ② FOR INLET PROTECTION, TYPE C (WITH CURB BOX), AN ADDITIONAL 18" OF FABRIC IS WRAPPED AROUND THE WOOD AND SECURED WITH STAPLES. THE WOOD SHALL NOT BLOCK THE ENTIRE HEIGHT OF THE CURB BOX OPENING.
- ③ FLAP POCKETS SHALL BE LARGE ENOUGH TO ACCEPT WOOD 2X4.



INLET PROTECTION, TYPE B (WITHOUT CURB BOX)
(CAN BE INSTALLED IN ANY INLET WITHOUT A CURB BOX)



INLET PROTECTION, TYPE C (WITH CURB BOX)

INSTALLATION NOTES

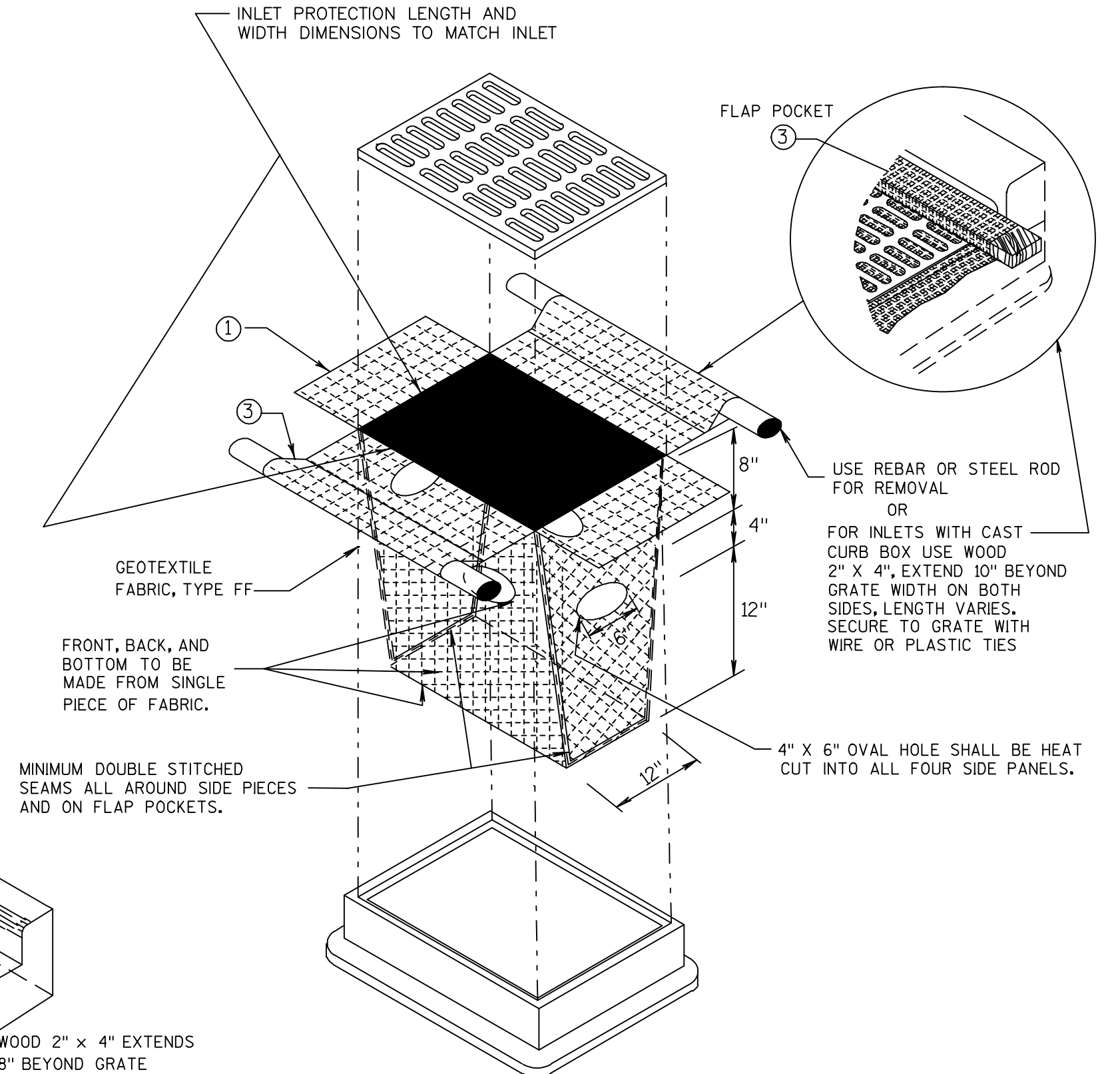
TYPE B & C

TRIM EXCESS FABRIC IN THE FLOW LINE TO WITHIN 3" OF THE GRATE. THE CONTRACTOR SHALL DEMONSTRATE A METHOD OF MAINTENANCE, USING A SEWN FLAP, HAND HOLDS OR OTHER METHOD TO PREVENT ACCUMULATED SEDIMENT FROM ENTERING THE INLET.

TYPE D

DO NOT INSTALL INLET PROTECTION TYPE D IN INLETS SHALLOWER THAN 30", MEASURED FROM THE BOTTOM OF THE INLET TO THE TOP OF THE GRATE. TRIM EXCESS FABRIC IN THE FLOW LINE TO WITHIN 3" OF THE GRATE.

THE INSTALLED BAG SHALL HAVE A MINIMUM SIDE CLEARANCE, BETWEEN THE INLET WALLS AND THE BAG, MEASURED AT THE BOTTOM OF THE OVERFLOW HOLES, OF 3". WHERE NECESSARY THE CONTRACTOR SHALL CINCH THE BAG, USING PLASTIC ZIP TIES, TO ACHIEVE THE 3" CLEARANCE. THE TIES SHALL BE PLACED AT A MAXIMUM OF 4" FROM THE BOTTOM OF THE BAG.



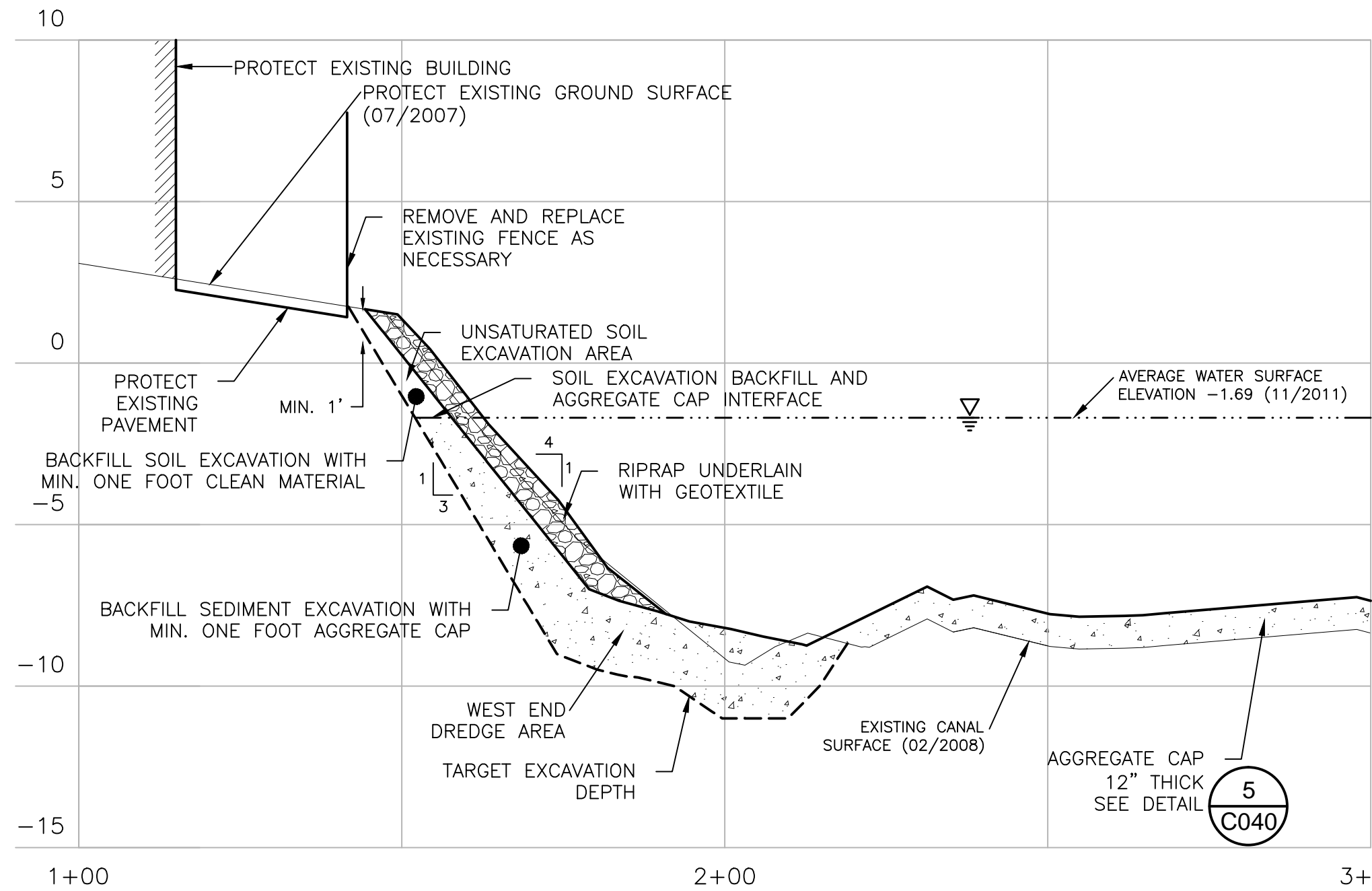
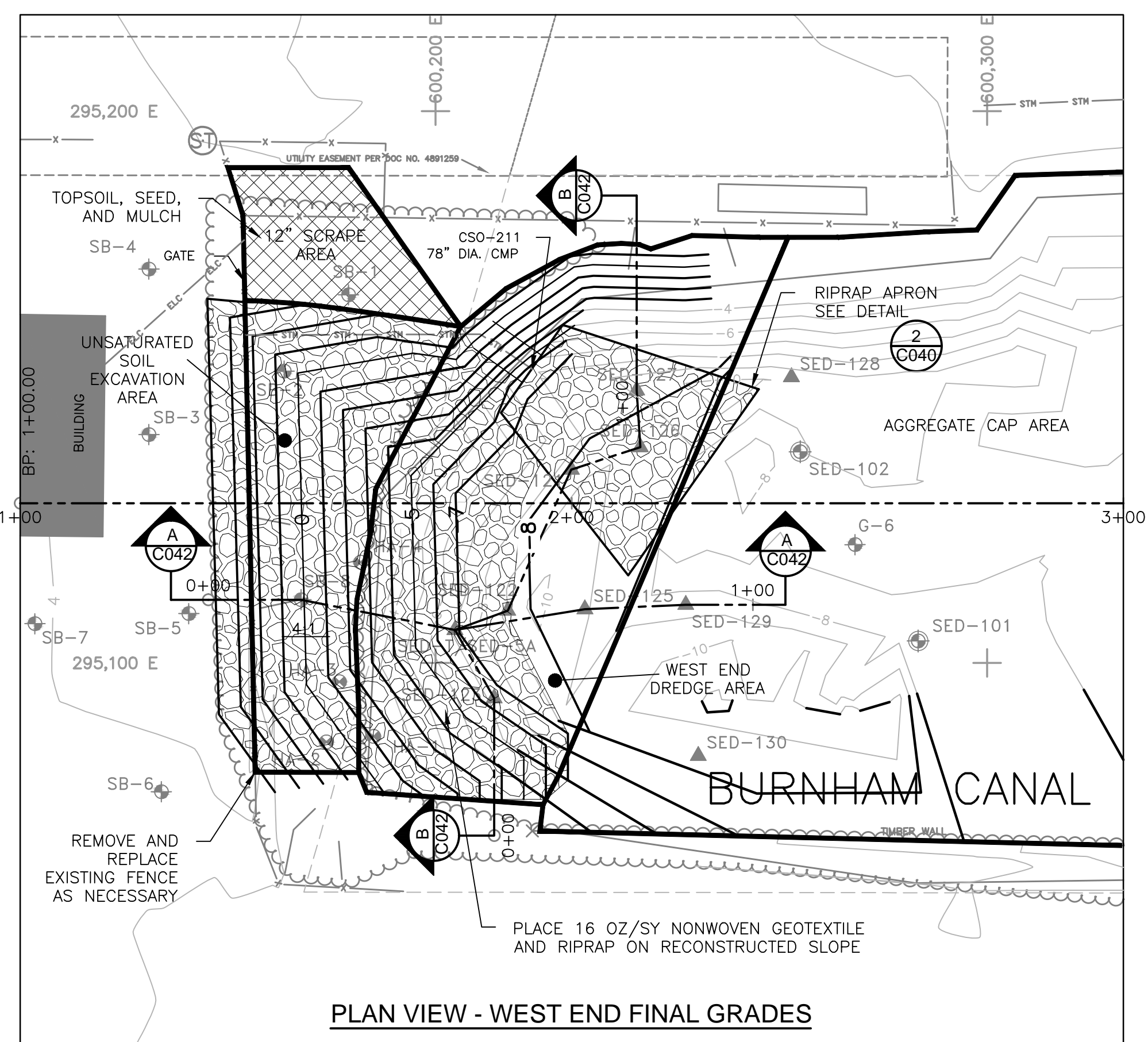
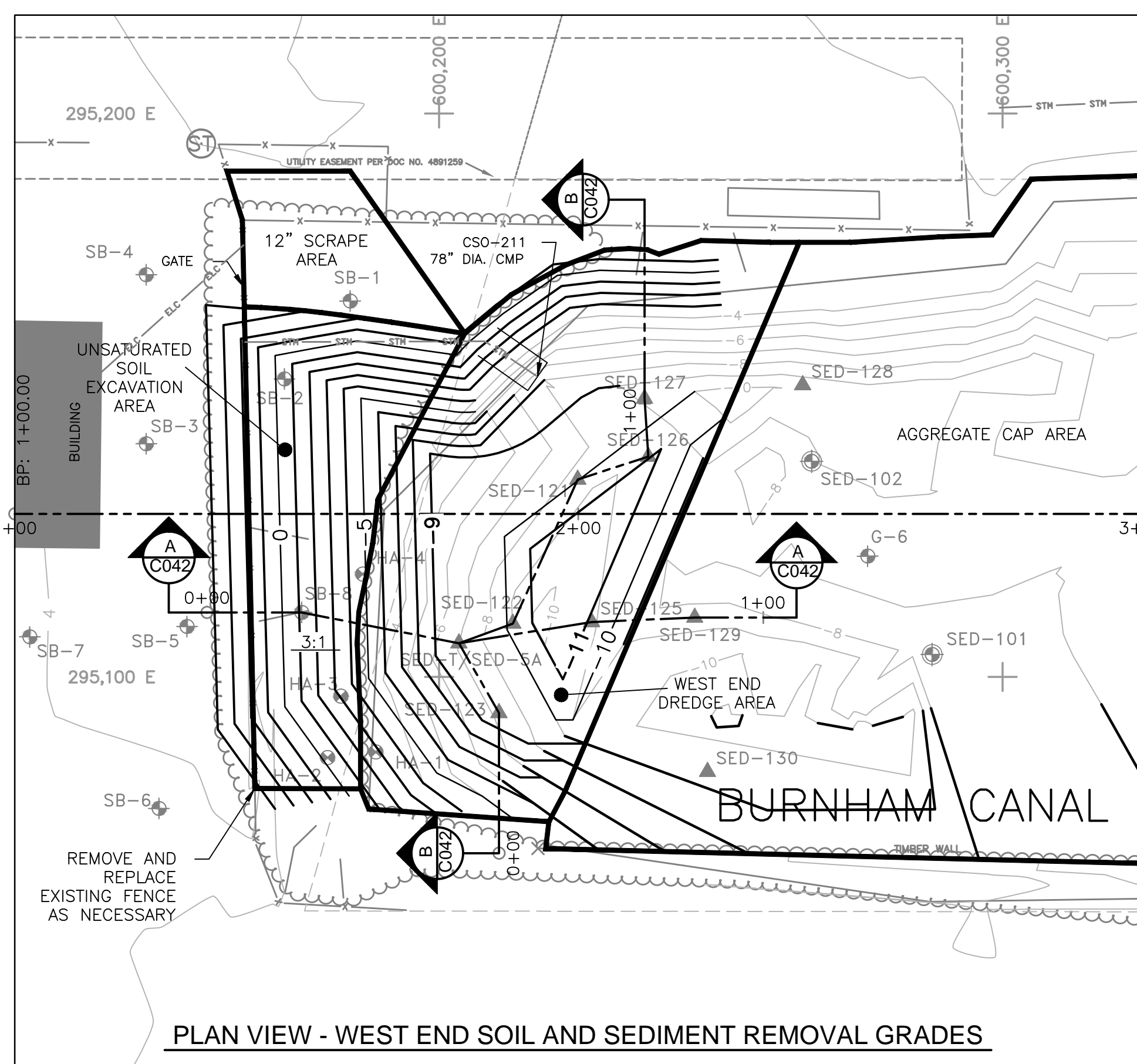
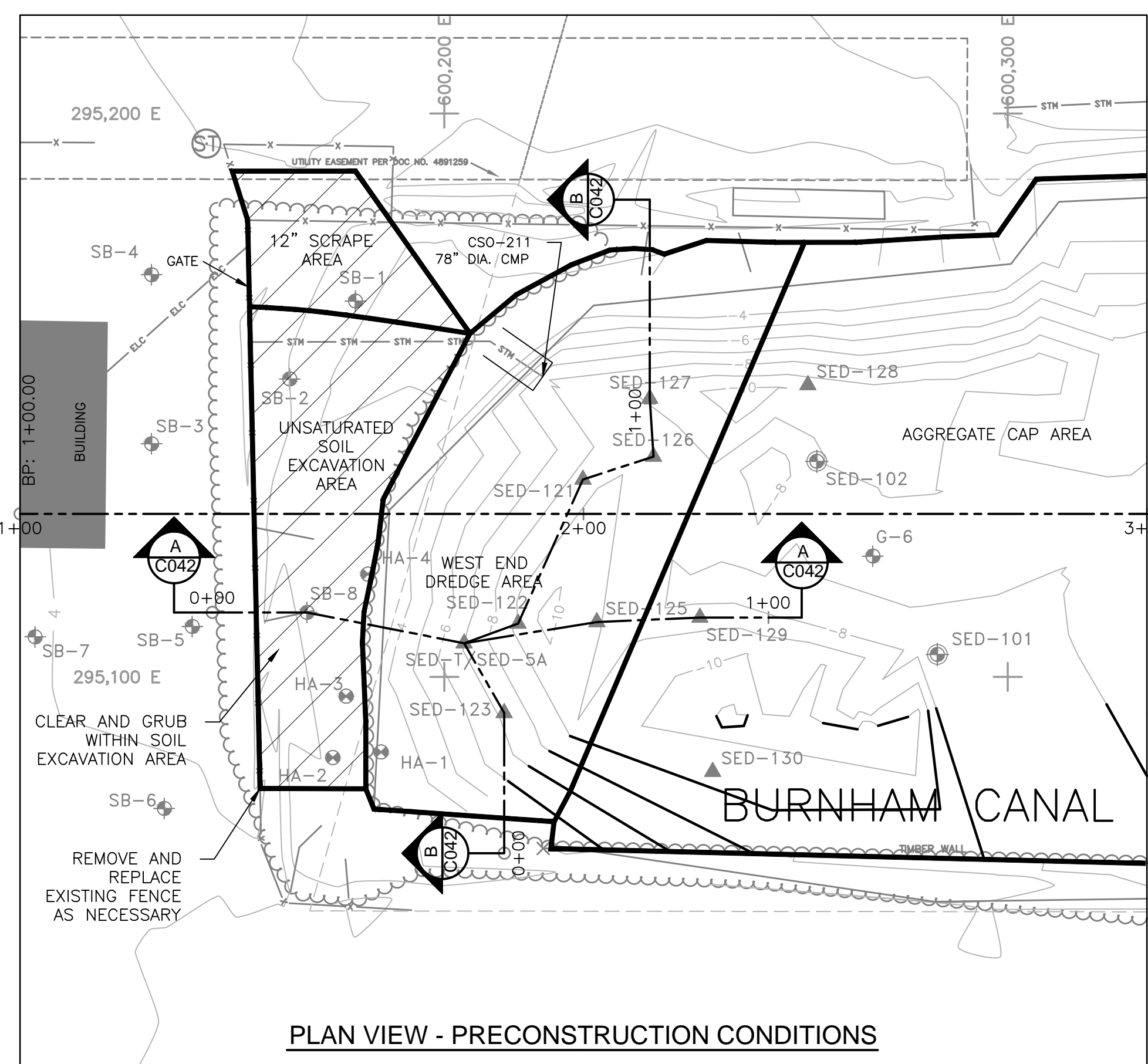
INLET PROTECTION, TYPE D
(CAN BE INSTALLED IN ANY INLET TYPE WITH OR WITHOUT A CURB BOX AS PER NOTE ②.)

2 INLET PROTECTION
C041 NOT TO SCALE

6.			
5.			
4.	ISSUED FOR AGENCY REVIEW	07/29/16	RJB
3.	ISSUED FOR AGENCY REVIEW	02/02/16	RJB
2.	ESD MODIFICATIONS ISSUED FOR AGENCY REVIEW	01/15/15	RJB
1.	ISSUED TO ADDRESS AGENCY COMMENTS	07/19/13	RJB
0.	ISSUED FOR AGENCY REVIEW	03/29/13	RJB
REVISION:	DATE:	APP'D BY:	



PROJECT NO. 21177.1	DETAILS BURNHAM CANAL REMEDIATION FINAL DESIGN REVISION 2 MILLER COMPRESSING COMPANY CITY OF MILWAUKEE, WISCONSIN	SHEET NO. C041
DRAWN BY: DMD 05/04/15		
CHECKED BY: Y_Z 02/02/16	DRAWING NO: D2117C041-04.DWG	REFERENCE: SEE INFO BLOCK
APPROVED BY: RJB 02/02/16		

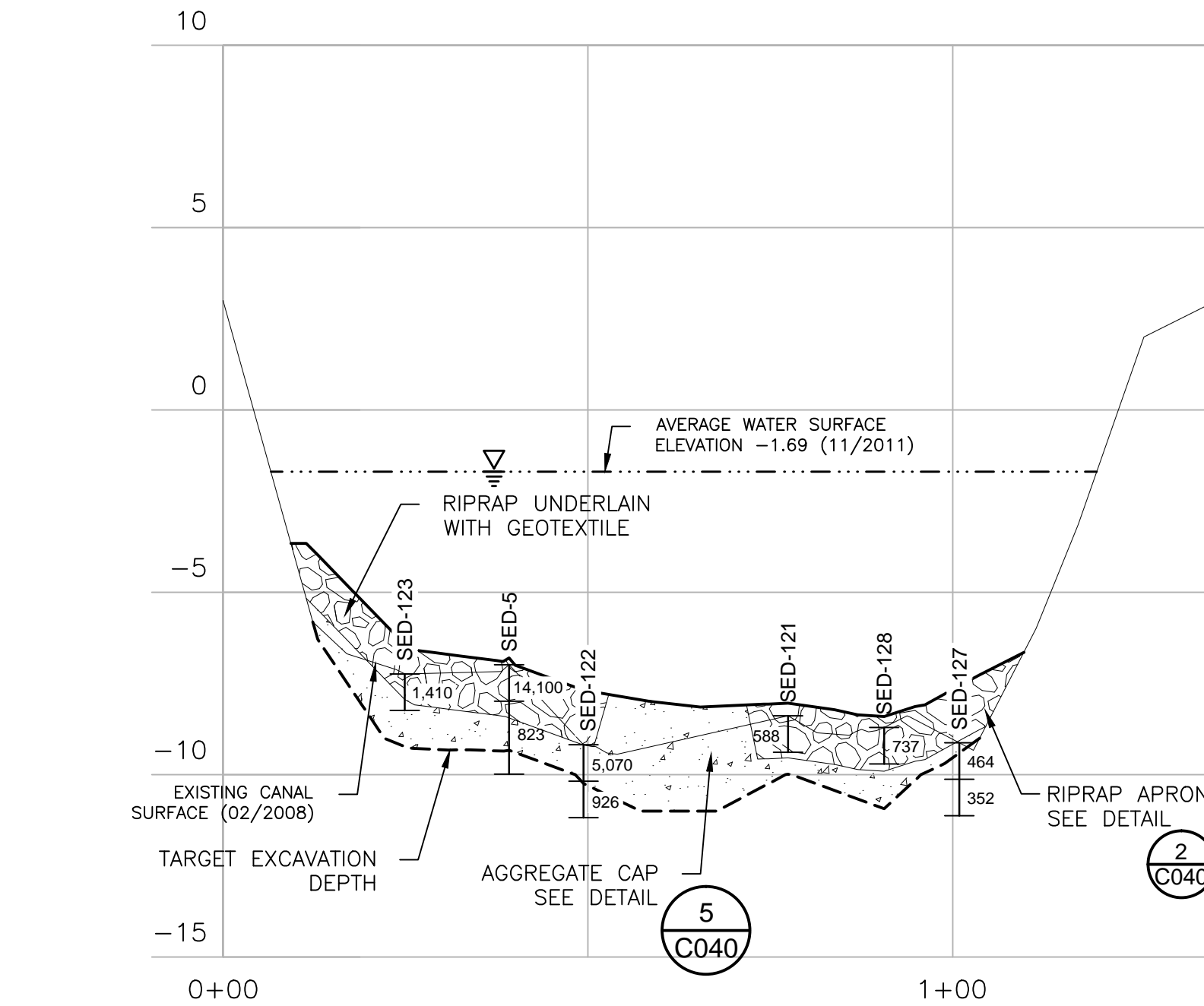
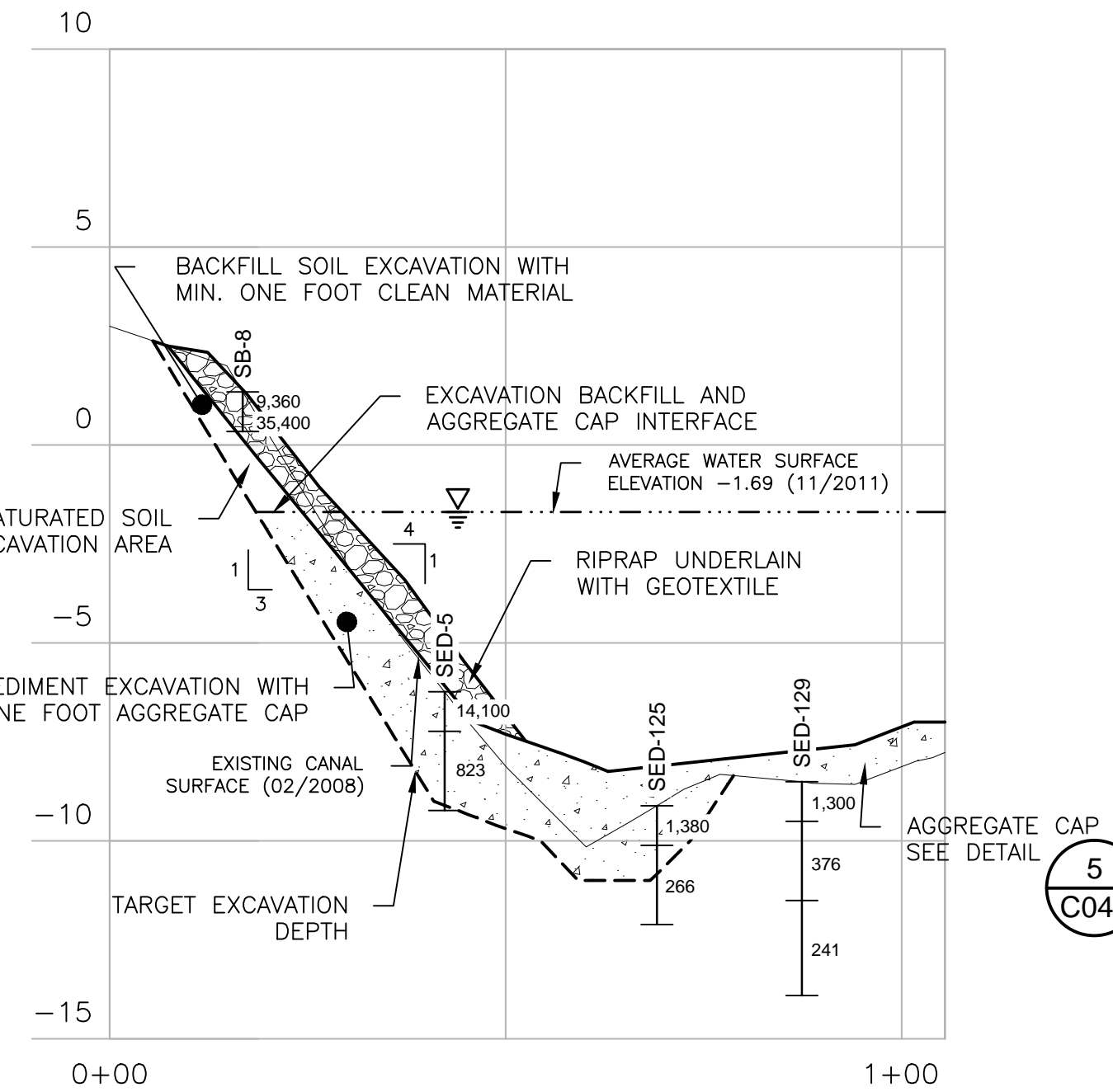


DIGGERS HOTLINE

CONTACT DIGGERS' HOTLINE PRIOR TO ANY UNDERGROUND WORK ON-SITE
 CALL 811 OR (800) 242-8511
 (262) 432-7910
 (877) 500-9592 (EMERGENCY ONLY)

CONSTRUCTION NOTES:

- THE INFORMATION SHOWN ON THIS DRAWING CONCERNING TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATIONS AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO.
- LIMITS OF WEST END UNSATURATED SOIL AND DREDGE AREA DEPENDENT ON WATER ELEVATION, TO BE VERIFIED PRIOR TO WORK.



1 C042 UNSATURATED SOIL EXCAVATION AND WEST END DREDGE DETAIL

—10— PRECONSTRUCTION CONTOUR	—ELC— ELECTRIC	HA-4 EXISTING HAND AUGER LOCATION (12/2007)
- - - RIGHT-OF-WAY (R.O.W.)/ PARCEL LINE	—STH— STORM SEWER	SED-T/SED-5A EXISTING SEDIMENT SAMPLE LOCATION, APPROX. (2006)
~~~~ TREES & BRUSH	SED-102 EXISTING SEDIMENT SAMPLE LOCATION (2007)	SED-129 PRE-DESIGN SEDIMENT SAMPLE LOCATION (11/2011)
-x- FENCE	G-6 EXISTING GEOTECHNICAL SAMPLE LOCATION (2007)	SED-127 SAMPLE INTERVAL WITH COPPER CONCENTRATIONS mg/kg
■ BUILDING	◆ EXISTING SOIL BORING LOCATION (7/2009)	
○ MANHOLE		

**SOURCE NOTES:**

- EXISTING CONDITIONS NORTH AND WEST OF THE BURNHAM CANAL APPROXIMATE EDGE OF WATER CREATED FROM DIGITAL BASE FILE: TM601D50.DWG/TM601D50.DRD, SURVEYED BY NATIONAL SURVEY & ENGINEERING ON 07/18/2007.
- EXISTING CONTOURS WITHIN THE BURNHAM CANAL APPROXIMATE EDGE OF WATER SURVEYED BY KAPUR, 02/05/2008.
- COORDINATE SYSTEM IS BASED ON NAD 83 HARN WISCONSIN MILWAUKEE COUNTY FEET. THE VERTICAL DATUM IS EQUAL TO THE NGVD 1929 ELEVATION MINUS 580.603.

6.			
5.			
4.	ISSUED FOR AGENCY REVIEW	07/29/16	RJB
3.	ISSUED FOR AGENCY REVIEW	02/02/16	RJB
2.	ESD MODIFICATIONS ISSUED FOR AGENCY REVIEW	01/15/15	RJB
1.	ISSUED TO ADDRESS AGENCY COMMENTS	07/19/13	RJB
0.	ISSUED FOR AGENCY REVIEW	03/29/13	RJB
REVISION:	DATE:	APP'D BY:	



**WEST END EXCAVATION DETAILS**

**BURNHAM CANAL REMEDIATION FINAL DESIGN REVISION 2**

**MILLER COMPRESSING COMPANY CITY OF MILWAUKEE, WISCONSIN**

PROJECT NO. 2117/7.1	DRAWN BY: DMD 07/29/16	CHECKED BY: TAL 07/29/16	APPROVED BY: RJB 07/29/16
DRAWING NO: D2117C042-04.DWG		REFERENCE: SEE INFO BLOCK	
SHEET NO. C042			

**DIVISION 00**

**DOCUMENTS**

**SECTION 00005**  
**TABLE OF CONTENTS**

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01270 Measurement and Payment	01270-4
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01310 Project Management and Coordination	01310-7
01330 Submittals	01330-10
01400 Quality Control and Quality Assurance	01400-8
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**Appendices**

- Appendix A Chemical and geotechnical data collected by Natural Resource Technology in November 2011, consisting of 56 pages
- Appendix B Report dated November 30, 2010, prepared by Natural Resource Technology, Inc., entitled: “Remedial Investigation Report, Final, Burnham Canal Site”, consisting of 311 pages (to be provided on CD during bid procurement - not included with Final Design Report)
- Appendix C Construction Quality Assurance Project Plan (to be provided during bid procurement - included as Appendix C of the Final Design Report)
- Appendix D Example WPDES Discharge Permit, consisting of 16 pages
- Appendix E Contractor Safety Rule Notification, consisting of 7 pages

**Drawings** (provided separately)

- Sheet TS Title Sheet
- Sheet C010 Preconstruction Site Conditions
- Sheet C020 Initial Site Preparation
- Sheet C035 Profile and Cross Sections
- Sheet C040 Details
- Sheet C041 Details
- Sheet C042 West End Excavation Details

**END OF SECTION**

**DIVISION 01**  
**GENERAL REQUIREMENTS**



## SECTION 01100 SUMMARY OF WORK

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### PART 1 - GENERAL

#### 1.01 PROJECT INFORMATION

- A. Work of this Contract comprises general remediation of a manmade canal by excavation and dredging of soil and sediment, installation of a stabilization layer and an aggregate cap, placement of voluntary betterment aggregate material on top of the cap, and construction of a water conveyance channel. Items required to complete the Work generally include, but are not limited to: clearing and grubbing, excavation, soil and aggregate placement, and soil and sediment disposal.

West end soil and sediment dredging/excavation and fill activities will be performed with the least amount of environmental impact as possible. The west end excavation work will consist of soil above the waterline and sediment where submerged and is anticipated to be accessible by land based equipment.

Excavation of 12 inches of unsaturated soil is required in the area of soil boring SB-1, as shown in the Contract Documents. Additional unsaturated soil excavation will commence from the fence line down to the water elevation at a 3H:1V slope. Excavation below the waterline will continue at a 3H:1V slope to the depth shown on the Contract Documents.

Excavated contaminated materials will be disposed off-site at an approved facility. Soil and sediment will be dewatered, as necessary, prior to being loaded into trucks and transported to a landfill. Dredging activities will be sequenced and carefully monitored to contain sediment materials during dewatering, staging, and transport.

The excavated soil and sediment will be backfilled with clean fill to achieve preconstruction grade (an approximate 4H:1V slope). Fill below the waterline will consist of select crushed material and material above the waterline will be compacted in lifts to reach final grades. In addition, riprap will be placed over the west bank of the Canal and beneath the CSO-211 discharge area to provide erosion protection.

Subaqueous aggregate placement will consist of three layers: stabilization layer, aggregate cap, and voluntary betterment aggregate. The stabilization layer will consist of placing aggregate that will mix with and stabilize the soft sediment. A 12-inch aggregate cap will be placed over the stabilization layer. A minimum of five feet of voluntary betterment aggregate will be placed over the aggregate cap in most areas. In other limited areas, the voluntary betterment will consist of two feet of riprap or other select crushed material underlain by nonwoven geotextile. Water depth and geotechnical properties of the sediments present challenges that will be addressed through selection and placement techniques. The soft sediments are subject to bearing capacity failure. As such, aggregate is expected to mix with the sediment and will serve as a stabilization layer prior to placement of the 12-inch aggregate cap. Placement of the stabilization layer and subaqueous aggregate cap will consist of several thin lifts of material and will be monitored for stability prior to subsequent lift placement.

Remedial work and placement of voluntary betterment aggregate material will require one or more best management practices to control sediment transport and protect downstream habitat.

Two Milwaukee Metropolitan Sewerage District (MMSD) combined sewer outfalls, CSO-210 and CSO-211, are located within the Canal project area. Riprap apron will be installed at the CSO-211 outfall, located at the west end of the Canal as indicated in the Contract Documents.

Trees adjacent to the construction limits shall be preserved as reasonably possible to complete the Work.

Contractor will be responsible for pumping surface water if needed during the project.

Contractor will be responsible for protecting existing features, including utilities and pavement in aggregate stockpile area(s).

B. Project Schedule:

Bid Document Issuance .....	TBD
Mandatory Pre-Bid Conference .....	TBD
Bid Submittal .....	TBD
Award Remedial Work .....	TBD
Remedial Work Completed.....	TBD

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of the Project is defined by the Contract Documents and consists of the following:

1. Mobilization and Demobilization: As specified in Contract Documents, including, but not limited to, the following activities:

Mobilization of all labor, equipment, materials, and other incidentals to and from the Site, including procurement of materials, and preparation of Contractor’s Remedial Action Work Plan described in the Contract Documents. Included are preparing and providing submittals, maintaining the quality of materials and workmanship, and implementing a site specific health and safety program. Also includes maintenance and restoration of site access roads where Contractor’s work force or vehicles cause damage.

Demobilization of all Contractor construction and marine-support equipment, job trailers and temporary utilities, temporary erosion controls, trash, and miscellaneous construction materials from the site. Also included are cleaning/decontamination of Contractor equipment and removal from the site. Surplus construction materials shall be salvaged by Contractor, transported to the Owner’s designated location, or disposed of as construction debris, as directed by the Owner.

2. Site Preparation: as specified in the Contract Documents, including but not limited to the following activities:

- a. Furnish, install, inspect, maintain, and remove upon completion of the Work the temporary erosion controls.
  - b. Remove and reinstall chain-link fence as necessary to achieve access to the work area.
  - c. Clear, grub, and remove existing riprap along the west bank. Temporarily stockpile riprap for later use during restoration activities.
  - d. Trim or remove trees and other vegetation along the south edge of the Canal as necessary to complete the work.
  - e. Provide, install, and maintain best management practices (BMPs) during excavation, dredging, and cap and voluntary betterment aggregate material placement activities.
  - f. Implement measures to protect utilities, structures, subsurface features, facilities, and environment.
  - g. Verify permits necessary for construction are in-place. Owner will obtain as necessary to complete Work.
  - h. Construct and maintain a temporary decontamination area for personnel and construction equipment, as needed.
  - i. Construct and maintain a sediment stabilization area, if needed, for sediment excavated from the west end of the Canal.
3. West End of Canal Soil and Sediment Dredging/Excavation and Fill: As specified in the Contract Documents, including but not limited to the following activities:
- a. Dredge/excavate and transport impacted soil and sediment off-site at an approved disposal facility.
  - b. Furnish, install, operate, and maintain a Contact Water Management System including conveyance piping, storage tanks, treatment additives, etc. for treatment of soil stabilization area contact water.
  - c. Stabilize impacted sediments with appropriate additive, as necessary, to meet approved landfill disposal requirements including the paint filter test.
  - d. Conduct progress surveys to adequately control the work within the construction limits.
  - e. Assist Engineer in sampling of the final soil and sediment excavation areas to verify completion of remedial action.
  - f. Conduct pre- and post-remediation surveys and provide to the Engineer for verification of material removal requirements.



- d. Assist Engineer with surveying and thickness checks to verify completion of Work.
    - 7. Voluntary Betterment Aggregate Placement: As specified in the Contract Documents, including but not limited to the following activities:
      - a. Provide and install voluntary betterment aggregate material layer(s) on top of the aggregate cap within the project area, generally extending from the 11th Street Bridge west to the termination of the Canal.
      - b. Conduct progress surveys to adequately control the work within the construction limits.
      - c. Conduct pre- and post-betterment placement surveys and provide to the Engineer for documentation of the completed construction conditions.
      - d. Assist Engineer with surveying and thickness checks to verify completion of Work.
    - 8. Restoration as specified in the Contract Documents, including but not limited to the following activities:
      - a. Topsoil, seed, and mulch the 12-inch scrape area.
      - b. Provide and install geotextile and riprap at the west end of canal utilizing salvaged riprap from the shoreline and supply and install supplemental riprap as necessary to complete the Work.
      - c. Provide and install riprap apron at the Milwaukee Metropolitan Sewer District (MMSD) combine sewer outfall located at the west end of the canal (CSO-211).
  - B. It shall be the Contractor's responsibility to obtain complete information as to the field work involved in the remedy construction in order to submit a complete and comprehensive Bid. Under no circumstances shall the Contractor make any claims for any additional expenses incurred due to his failure to obtain a complete understanding of the complete and detailed scope of work involved during the bid period, after award, or after the Work is in progress. The summary of work described above is an overall summary of work to be performed and is the responsibility of the Contractor. It does not supersede specific requirements of other Contract Documents.
  - C. Type of Contract
    - 1. Project will be constructed under a single prime contract that may or may not include the engineering requirements under a Design/Build turnkey agreement.
- 1.03 WORK BY OWNER
- A. Work to be performed by the Owner, or Owner's designated representatives (e.g., Engineer), is as follows:

1. Construction observation and construction quality assurance (CQA) activities, observation of turbidity monitoring, water treatment sampling and analyses to confirm effluent limitations have been met, post-dredging/excavation sediment sampling and analyses to confirm remedial goals have been achieved, and observation of backfill activities.
2. Public relations
3. Identification of substantive permit requirements for the Work.

1.04 ACCESS TO SITE

A. General:

1. Lead Agency (WDNR and their representatives) will have limited access to the project site to observe construction progress and as indicated by applicable requirements of this Section.
2. Contractor shall have limited use of project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site:

1. Limit use of Project site to areas within the Contract limits indicated (e.g., Miller Property and Burnham Canal). Do not disturb portions of Project site beyond areas in which the Work is indicated.
2. The Contractor must satisfy himself by personal examination of the site as to all local conditions affecting the performance of this contract. The Contractor is deemed to accept such conditions as found to exist.
3. Confine operations to areas within Contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
4. Owner will occupy site and existing buildings during entire period of construction for conduct of normal operations. Cooperate with Owner during construction operations to minimize conflict and facilitate Owner's operations.
5. Contractor shall, at all times, conduct operations to ensure least inconvenience to Owner, Owner's Subcontractors, and Owner's operations.
6. Coordinate use of premises under direction of Owner.
7. Assume full responsibility for protection and safekeeping of materials and equipment under this Contract.
8. Protection and repair of existing facilities and utilities: Contractor shall perform operations carefully and in such a manner as to protect existing facilities and utilities. Obstructions not shown on the Drawings may exist and shall be exposed

by Contractor without damage. Contractor shall be responsible for damages to existing facilities and utilities resulting from Contractor's operations and shall repair or replace damaged items to Owner's satisfaction.

- C. Work on Properties Owned by Others:
  - 1. Contractor shall be familiar with Owner's property boundaries and those of the adjacent properties in the Site where work is to be conducted.
  - 2. Work on property owned by others will be in compliance with applicable access agreements, copies of any obtained access agreements will be supplied by Owner.
  - 3. Storage of materials or equipment on property owned by others is not allowed unless as authorized by an access agreement.
  - 4. Notify and receive advance approval of the Engineer of need to remove or disturb materials not addressed by these Contract Documents.

#### 1.05 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site and existing buildings during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
  - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
  - 2. Notify the Owner not less than 72 hours in advance of activities that will affect Owner's operations.

#### 1.06 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
  - 1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work to the hours of 7 A.M. to 7 P.M. local time, Monday through Saturday, except for emergencies or as approved by the Owner in writing.
- C. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
- D. Nonsmoking: Smoking is not permitted within 25 feet of entrances, operable windows, or outdoor air intakes.

- E. Controlled Substances: Use of tobacco products and other controlled substances within the remediation and betterment area is not permitted.
- F. Employee Screening: Comply with Owner's requirements regarding drug and background screening of Contractor personnel working on the Project site.

1.07 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  - 2. The term “provide” or “provided” shall mean, “furnish and install in place.”
- B. Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:
  - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  - 2. Abbreviations: Materials and products are identified by abbreviations.
  - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.08 SAFETY PRECAUTIONS AND PROGRAMS

- A. The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.
- B. The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to:
  - 1. Employees on the Work and other persons who may be affected thereby
  - 2. The Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Subcontractor or the Contractor’s Subcontractors
  - 3. Other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.
- C. The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.



- D. The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent sites and utilities.

PART 2 - **PRODUCTS (Not Used)**

PART 3 - **EXECUTION (Not Used)**

**END OF SECTION**

## **SECTION 01210 ALLOWANCES**

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### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section includes administrative and procedural requirements governing allowances.
  - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to the Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
  - 1. Lump-sum allowances.
  - 2. Unit-cost allowances.
  - 3. Quantity allowances.
  - 4. Contingency allowances.
  - 5. Testing and inspecting allowances.

#### **1.02 SELECTION AND PURCHASE**

- A. At the earliest practical date after award of the Contract, advise the Owner and Engineer of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Engineer's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

#### **1.03 SUBMITTALS**

- A. Submit proposals for purchase of products or included in allowances, in the form specified for Change Orders.
- B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- C. At Engineer's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

- D. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- E. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

#### 1.04 COORDINATION

- A. Coordinate allowance items with other portions of the Work.

#### 1.05 LUMP-SUM, UNIT-COST, AND QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Engineer under allowance and shall include taxes, freight, and delivery to Site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Site, labor, installation, overhead and profit, and similar costs related to products and materials under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
  - 1. If requested by Engineer, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

#### 1.06 TESTING AND INSPECTING ALLOWANCES

- A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.
- B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.
- C. Costs of services not required by the Contract Documents are not included in the allowance.
- D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

#### 1.07 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
  - 1. Include installation costs in purchase amount only where indicated as part of the allowance.

2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
  3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
  4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
  2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

3.01 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.02 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

**END OF SECTION**

## **SECTION 01230 ALTERNATES**

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### **PART 1 - GENERAL**

#### 1.01 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

#### 1.02 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

#### 1.03 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other work of the Contract.

### **PART 2 - PRODUCTS (Not Used)**

### **PART 3 - EXECUTION**

#### 3.01 SCHEDULE OF ALTERNATES

- A. As indicated on the Bid Form

**END OF SECTION**

## SECTION 01250 CONTRACT MODIFICATION PROCEDURES

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### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

#### 1.02 MINOR CHANGES IN THE WORK

- A. Engineer will issue Field Order authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

#### 1.03 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Engineer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Proposal Requests issued by Engineer are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data (or other acceptable field measurements) to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    - e. Quotation Form: Use forms acceptable to Engineer.

- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Engineer.
  - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  - 4. Include costs of labor and supervision directly attributable to the change.
  - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
  - 6. Proposal Request Form: Use form acceptable to Engineer.

1.04 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Engineer will issue a Change Order for signatures of Owner and Contractor.

1.05 WORK CHANGE DIRECTIVE

- A. Work Change Directive: Engineer may issue a Work Change Directive. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  - 1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.
  - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION**

## **SECTION 01270 MEASUREMENT AND PAYMENT**

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### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Administrative and procedural requirements for measurement and payment.
- B. Measurements and payment criteria applicable to portions of the Work performed under a unit price payment method.
- C. Defect assessment and non-payment for rejected Work.

#### **1.02 DEFINITIONS**

- A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

#### **1.03 AUTHORITY**

- A. Measurement methods delineated in the individual specification sections are intended to complement the criteria of this section. In the event of conflict, the requirements of the individual specification section shall govern.
- B. The Engineer will take measurements and compute quantities accordingly.
  - 1. Assist by providing necessary equipment, workers, and survey personnel as required.
- C. The Engineer will make measurements and determinations as necessary to classify the work within Pay Items and determine the quantities for pay purposes; such decisions will be final after 3 days if the Contractor does not submit a written notice as defined in the following paragraph.
  - 1. If the Contractor differs with the Engineer's classification of the Pay Items or determination of quantities of the Pay Items, he must notify the Engineer in writing within 3 days of the time that the Contractor is informed of the Engineer's decision. Otherwise the Owner will not consider any such difference as a claim for payment.
- D. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.



- E. Owner reserves the right to alter the Contract Documents, modify incidental work as may be necessary, and increase or decrease quantities of work to be performed to accord with such changes, including deduction or cancellation of any one or more of the Pay Items. Changes in the work shall not be considered as a waiver of any conditions of the Contract nor invalidate any provisions thereof. When changes result in changes in quantities of Work to be performed, the Contractor will accept payment according to Contract Unit Prices that appear in the original Contract. For significant changes in the quantity for a particular item or total estimated cost of a particular item from the Contract Price as addressed under the General Conditions, a supplemental agreement between the Contractor and the Owner may be negotiated and/or required.

#### 1.04 UNIT QUANTITIES SPECIFIED

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit sum/prices contracted.
- C. Quantities necessary to complete the work as shown on the Contract Drawings or as specified herein shall govern over those shown in the Proposal Form. The Contractor shall take no advantage of any apparent error or omission in the Contract Drawings or Technical Specifications, and the Engineer shall be permitted to make corrections and interpretations as may be deemed necessary for fulfillment of the intent of the Contract Documents.
- D. The quantity for a payment item will be revised only in the event that it is determined to be substantially in error. An error shall be deemed substantial if the quantity will increase or decrease in excess of five percent of the original quantity for that item or the amount due for that item will increase or decrease in excess of \$500 (whichever is smaller). In general, such revisions will be determined by final measurement or plan calculations or both as additions to or deduction from plan quantities specified within these Contract Documents.

#### 1.05 MEASUREMENT OF QUANTITIES

- A. Measurement Devices:
  - 1. Weight Scales: Inspected, tested, and certified by the applicable Wisconsin Weights and Measures department within the past year.
  - 2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
  - 3. Metering Devices. Inspected, tested, and certified by the applicable Wisconsin department within the past year.
- B. Measurement by Weight: Measured by certified scale with supporting documentation provided by scale operator.

- C. Measurement by Volume: Measured by in-place cubic dimension using mean length, width, and height or thickness as determined by survey.
- D. Measurement by Area: Measured by square dimension using mean length and width or radius as determined by survey.
- E. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord as determined by survey.
- F. Stipulated Sum/Price Measurement: Items measured by linear means as a completed item or unit of the Work.

1.06 PAYMENT

- A. Payment for all Work done in compliance with the Contract Documents, inclusive of furnishing all manpower, equipment, materials, and performance of all operations relative to construction of this project. Work for which there is not a Pay Item will be considered incidental to the Contract and no additional compensation will be allowed.
- B. Work shall not be considered complete until all testing has been satisfactorily completed and the item of work has demonstrated compliance with the Contract Documents.
- C. Pay item numbers shown on the bid form are only provided in order to use them for pay application purposes. Utilize the descriptions on the bid form and within the Contract Documents to determine the work associated with each pay item.

1.07 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Owner, it is not practical to remove and replace the Work, the Owner will direct one of the following remedies:
  - 1. The defective Work may remain, but the unit sum/price will be adjusted to a new sum/price at the discretion of the Owner.
  - 2. The defective Work will be partially repaired to the instructions of the Owner, and the unit sum/price will be adjusted to a new sum/price at the discretion of the Owner.
- C. The authority of the Owner to assess the defect and identify payment adjustment is final.

1.08 NON-PAYMENT FOR REJECTED PRODUCTS

- A. Payment will not be made for any of the following:
  - 1. Products wasted or disposed of in a manner that is not acceptable.
  - 2. Products determined as unacceptable before or after placement.
  - 3. Products not completely unloaded from the transporting vehicle.

4. Products placed beyond the lines, levels, or tolerances of the required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected Products.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION**

## **SECTION 01290 PAYMENT PROCEDURES**

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### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

#### **1.02 DEFINITION**

- A. **Schedule of Values:** A statement furnished by Contractor allocating portions of the Contract Sum into various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

#### **1.03 SCHEDULE OF VALUES**

- A. **Coordination:** Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
  - 1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
    - a. Application for Payment forms with continuation sheets.
    - b. Submittal schedule.
    - c. Items required to be indicated as separate activities in Contractor's construction schedule.
  - 2. Submit the schedule of values to Engineer at earliest possible date but no later than 7 days before the date scheduled for submittal of initial Applications for Payment.
  - 3. **Subschedules for Phased Work:** Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
- B. **Format and Content:** Use the Bid Form as a guide to establish line items for the schedule of values.
  - 1. **Identification:** Include the following Project identification on the schedule of values:
    - a. Project name and location.
    - b. Name of Engineer.
    - c. Engineer's project number.

- d. Contractor's name and address.
- e. Date of submittal.
- 2. Arrange schedule of values consistent with format of EJCDC Document C-620.
- 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Bid Form.
- 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
- 5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
- 6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
- 7. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
- 8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
  - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
- 9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.04 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Owner.
  - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

- C. Application for Payment Forms: Use EJCDC Document C-620 as form for Applications for Payment. Sample form is included in the Contract Documents.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.
  - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
  - 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit one (1) signed and notarized original copies of each Application for Payment to Engineer by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
  - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
  - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  - 2. When an application shows completion of an item, submit conditional final or full waivers.
  - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  - 4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
  - 1. List of subcontractors.
  - 2. Schedule of values.
  - 3. Contractor's construction schedule (preliminary if not final).
- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
  - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
  2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  3. Updated final statement, accounting for final changes to the Contract Sum.
  4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
  5. AIA Document G706, "Contractor's Affidavit of Release of Liens."
  6. AIA Document G707, "Consent of Surety to Final Payment."
  7. Evidence that claims have been settled.
  8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
  9. Final liquidated damages settlement statement.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION**

**SECTION 01310**  
**PROJECT MANAGEMENT AND COORDINATION**

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**PART 1 - GENERAL**

1.01 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General project coordination procedures
  - 2. Administrative and supervisory personnel
  - 3. Coordination drawings
  - 4. Requests for Information (RFIs)
  - 5. Project meetings

1.02 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1.03 CONTRACTOR SUPERVISION AND SUBCONTRACTED WORK

- A. A superintendent and/or foreman shall be on site continuously during working hours from start to finish of project. Submit all site superintendent and foreman's names and phone numbers prior to project start. If Contractor changes a superintendent and/or foreman assigned to site, Contractor shall make transition seamless to avoid lost work.



- B. Use adequate number of skilled workers who are thoroughly trained and experienced in necessary crafts and who are completely familiar with specified requirements and methods needed for performance of Work.
- C. Use experienced professional personnel for that work which requires judgment, knowledge and expertise of qualified professionals and who are familiar with all aspects of Work.
- D. Contractor's Superintendent/Foreman shall maintain communication between subcontracted personnel and retain personnel, and shall be onsite when Subcontractors are onsite performing Work.
- E. Contractor shall direct and supervise all Subcontractors.
- F. Contractor shall submit names of all Subcontractors who shall be performing any work with Bid.

#### 1.04 KEY PERSONNEL

- A. Key Personnel Names: With bid, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

#### 1.05 PROJECT MEETINGS

- A. General: Engineer in coordination with Contractor will schedule and conduct meetings and conferences at Site unless otherwise indicated.
  - 1. Attendees: Engineer will inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. A principal member of Contractor's staff, authorized to make decisions on the Contractor's behalf, shall represent Contractor at each meeting. Owner and/or Engineer may direct certain subcontractors to attend meetings as needed. Failure to attend a meeting does not relieve Contractor from acting on contents of meetings.
  - 2. Agenda: Engineer will prepare the meeting agenda and distribute to all invited attendees.
  - 3. Minutes: Engineer will record significant discussions and agreements achieved and distribute the meeting minutes to everyone concerned prior to next meeting.
  - 4. Special Meetings may be called at discretion of the Owner or Engineer for purpose of resolving problems or other purposes concerning Work. Attendance at special meetings is mandatory for Contractor, subcontractors, or other parties notified by Engineer to attend.

- B. Preconstruction Meeting (Conference): Engineer will conduct a preconstruction conference before starting construction, at a time convenient to Owner. Contractor shall submit before the meeting all submittals required prior to the project start. Meeting shall be held at the Site unless otherwise announced.
1. Conduct the conference to review responsibilities and personnel assignments.
  2. Attendees: Authorized representatives of Owner, Engineer, Contractor and its superintendent/foreman; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Safety procedures
    - b. Construction schedule as prepared by Contractor
    - c. Phasing
    - d. Review status of submittal's required to be transmitted prior to project commencement
    - e. Discuss Contractor's Contact Water Plan, Material Management and Stockpiling Plan, remedy construction sequencing and location of major equipment
    - f. Discuss project administration prior to start of work
    - g. Schedule weekly progress meetings
    - h. Discuss the coordination and scheduling of excavation, water conveyance channel construction, capping, and placement of betterment layer(s)
    - i. Discuss the coordination and scheduling of each major element of the remedy construction
    - j. Discuss Owner's emergency notification and operating practices for emergency situations
    - k. Critical work sequencing and long-lead items
    - l. Designation of key personnel and their duties
    - m. Lines of communications
    - n. Procedures for processing field decisions and Change Orders
    - o. Procedures for testing and inspecting

- p. Procedures for processing Applications for Payment
  - q. Distribution of the Contract Documents
  - r. Submittal procedures
  - s. Preparation of record documents
  - t. Use of the premises
  - u. Work restrictions
  - v. Working hours
  - w. Responsibility for temporary facilities and controls
  - x. Procedures for disruptions and shutdowns
  - y. Construction waste management and recycling
  - z. Parking availability
  - aa. Office, work, and storage areas
  - bb. Equipment deliveries and priorities
  - cc. Security
  - dd. Progress cleaning
4. Minutes: Engineer will record and distribute meeting minutes. Engineer will distribute meeting minutes to all interested parties prior to the next meeting.
- C. Weekly Progress Meetings: The Engineer will conduct weekly progress meetings. All parties at pre-construction meeting shall agree upon day of week and hour of day. Meetings shall be held at the Site unless announced otherwise.
- 1. Attendees: Contractor, subcontractors (as necessary), Owner, and Engineer.
  - 2. Agenda: Review progress of work and coordination of work:
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period as prepared by Contractor.

- b. Review present and future needs of each entity present, including the following:
  - 1) Safety improvements
  - 2) Interface requirements
  - 3) Sequence of operations
  - 4) Status of submittals
  - 5) Deliveries
  - 6) Site utilization
  - 7) Temporary facilities and controls
  - 8) Progress cleaning
  - 9) Quality and work standards
  - 10) Status of correction of deficient items
  - 11) Field observations
  - 12) Status of proposal requests
  - 13) Pending changes
  - 14) Status of Change Orders
  - 15) Pending claims and disputes
- 3. Documentation of information for payment requests. Engineer will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
- 4. Reporting: Engineer will distribute minutes of the meeting to each party present and to other parties requiring information.
- 5. Schedule Updating: Contractor shall provide an updated construction schedule at each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule at weekly meetings.
- D. Project Closeout/Inspection Meeting: Engineer and Contractor will schedule and conduct a Project closeout/inspection meeting once Contractor Work is substantially complete and ready for Engineer's inspection.
  - 1. Conduct the meeting to review requirements and responsibilities related to Project closeout/inspection.

2. Attendees: Authorized representatives of Owner, Engineer and Contractor and shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
  - a. Preparation of record documents
  - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance
  - c. Submittal of written warranties
  - d. Preparation of Contractor's action item list of Work remaining (Punch List)
  - e. Procedures for processing Applications for Payment at Substantial Completion and for final payment
  - f. Submittal procedures
  - g. Responsibility for removing temporary facilities and controls
4. Minutes: Engineer will record and distribute meeting minutes.
5. Inspection: Engineer will conducted a final inspection of the work

#### 1.06 REPORTS

- A. Contractor shall be responsible for submitting a progress report each week prior to regularly scheduled progress meeting. Weekly report shall include following:
  1. Safety report with accidents, improvements, and near misses
  2. A brief description of work completed each week
  3. Quantities and volumes of work completed each week
  4. Contractor's summary of work completed and estimate of percentage of completion for each work item
  5. A list of work scheduled for the following week
  6. Quantities and volumes of work anticipated for the following week
  7. A list and number of supervision and craft people on-site by craft
  8. A review of conditions affecting execution of work, including encountered or anticipated problem areas, including delays and causes
  9. Copies of all operational logs for the previous week

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION**

## **SECTION 01330 SUBMITTAL PROCEDURES**

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### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Where required by the specifications, the Contractor shall submit descriptive information (plans or other submittals) which will enable the Owner and the Engineer to evaluate whether the Contractor's proposed materials, equipment, or methods of work are in compliance with the Contract Documents and compatible with Work objectives.

#### **1.02 DEFINITIONS**

- A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

#### **1.03 GENERAL REQUIRMENTS**

- A. Submittals required by the Technical Specifications include but are not limited to:
  - 1. Soil and/or material test data
  - 2. Survey data
  - 3. Product test data
  - 4. Product specifications
  - 5. Progress reports
  - 6. Drawings
  - 7. Manufacturers' instructions, certifications, guarantees and warranties
  - 8. Management, staging, and sequencing plan
  - 9. Schedules
- B. Refer to Technical Specifications for complete list of required submittals.

- C. In addition to specific submittal requirements outlined above, each Contractor shall prepare and submit to the Owner a Work Plan to ensure that Contract Drawings and Technical Specifications are followed efficiently and safely through each phase of the Work. Submittal of the Remedial Action Work Plan is divided into two phases: Preliminary Work Plan and the Final Work Plan, discussed below.
- D. A Preliminary Work Plan shall be submitted with the Bid that will outline conceptually required elements that are discussed in detail in the Technical Specifications. Preliminary Work Plan Elements that are required to be submitted with the Bid are indicated in the Contract Documents and include but are not limited to the following:
1. List of proposed equipment for:
    - a. Soil and sediment excavation
    - b. Water conveyance channel construction
    - c. Placing cap material
    - d. Placing betterment material
    - e. Contact water treatment system
  2. Contact water management plan, including:
    - a. Containment
    - b. Collection
    - c. Handling
    - d. Pumping into temporary frac tanks
    - e. Treatment
  3. Dredged/excavated sediment stabilization area configuration including proposed geosynthetics and soil layers. Also include a discussion on protection of the geosynthetics for the duration of its use.
  4. Elements of the remedial construction that is significantly different from the Contract Drawings and Technical Specifications.
- E. A Preliminary Submittals Schedule shall be submitted within 10 days of Notice of Award. The Bidder should carefully review all Technical Specifications to confirm submittal requirements.
- F. A Draft Construction Health and Safety Plan (HASP) shall be submitted within 14 days of Notice of Award.
- G. A Draft Construction Quality-Control Plan (CQCP) shall be submitted within 14 days of Notice of Award.



- H. Following submittal and review of the Preliminary Work Plan by the Owner and Engineer, a Final Work Plan shall be submitted within 14 days of the start of Construction. The Bidder should carefully review all Technical Specifications to confirm submittal requirements. Within the Final Work Plan the Contractor shall incorporate the following submittals:
1. Final Submittals Schedule
  2. Site Plan as indicated in Section 01500
  3. Site Preparation Plan as indicated in Section 02050
  4. Erosion Control and Surface Water Management Plan as indicated in Section 02111
  5. Equipment Storage Location Plan
  6. Conceptual plan for environmental management including proposed transportation routes for equipment and transport vehicles
  7. A plan for decontamination of equipment during operations
  8. Contact Water Management Plan, including collection, handling, pumping into temporary frac tanks and treatment as indicated in Section 02241
  9. Soil and sediment excavation plan, water conveyance channel construction plan, and capping and betterment placement plan as indicated in Section 02300
  10. Construction Health and Safety Plan (HASP)
  11. Construction Quality Control Plan (CQCP)
  12. Contractor's Quality-Control Manager Qualifications

#### 1.04 FORWARDING SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Engineer and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
  2. Format: Arrange the following information in a tabular format:
    - a. Project name and contract number
    - b. Scheduled date for first submittal (or revision number)
    - c. Specification Section number, title and submittal number

- d. Submittal category: action or informational
- e. Name of subcontractor
- f. Description of the Work covered
- g. Scheduled date for Engineer's final release or approval
- h. Sequential page numbers

1.05 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Engineer's Digital Data Files: Electronic copies of AutoCAD Drawings of the Contract Drawings will be provided by Engineer for Contractor's use in preparing submittals.
  - 1. Engineer will furnish Contractor one (1) set of digital data drawing files of the Contract Drawings for use in preparing Drawings.
    - a. Engineer makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    - b. Digital Drawing Software Program: The Contract Drawings are available in AutoCAD Civil 3D format.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
  - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  - 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  - 1. Initial Review: Allow five (5) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer

will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow five (5) days for review of each resubmittal.

D. Identification and Information:

1. Indicate name of firm or entity that prepared each submittal in title block.
2. Provide a space approximately 6 by 8 inches beside title block to record Contractor's review and approval markings and action taken by Engineer.
3. Include the following information for processing and recording action taken:
  - a. Project name
  - b. Date
  - c. Name of Engineer
  - d. Name of Contractor
  - e. Name of subcontractor
  - f. Name of supplier
  - g. Name of manufacturer
  - h. Submittal number or other unique identifier, including revision identifier
  - i. Number and title of appropriate Specification Section
  - j. Drawing number and detail references, as appropriate
  - k. Location(s) where product is to be installed, as appropriate
  - l. Other necessary identification
4. Include the following information as keywords in the electronic file metadata.
  - a. Project name.
  - b. Number and title of appropriate Specification Section.

E. Deviations: Identify deviations from the Contract Documents on submittals.

F. Additional Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Submit one (1) copy of submittal to Engineer.
- G. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will return submittals received from sources other than Contractor.
1. Transmittal Form: Provide locations on form for the following information:
    - a. Project name
    - b. Date
    - c. Destination (To :)
    - d. Source (From :)
    - e. Names of subcontractor, manufacturer, and supplier
    - f. Category and type of submittal
    - g. Submittal purpose and description
    - h. Specification Section number and title
    - i. Indication of full or partial submittal
    - j. Drawing number and detail references, as appropriate
    - k. Transmittal number (numbered sequentially)
    - l. Submittal and transmittal distribution record
    - m. Remarks
    - n. Signature of transmitter
  2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal
  2. Note date and content of revision in label on title block and clearly indicate extent of revision
  3. Resubmit submittals until they are marked with approval notation from Engineer action stamp

- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals that are marked with approval notation from Engineer action stamp, if applicable.

**PART 2 - PRODUCTS (Not Used)****PART 3 - EXECUTION****3.01 SUBMITTAL PROCEDURES**

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
  - 1. Submit electronic submittals via email as PDF electronic files.
    - a. Engineer will return annotated file.
  - 2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
- B. Provide all submittals and information as identified in Technical Specifications to named individuals in the time frames as indicated in the Contractor prepared Schedule of Submittals. Payments may be withheld, in whole or in part, at discretion of the Owner in the event that submittals are not made in times specified unless previously requested in writing by the Contractor (to Engineer) and approved in writing by Engineer or Owner.
- C. Transmit submittals by appropriate means to expedite review or submittal.
- D. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Mark each copy of each submittal to show which products and options are applicable.
  - 3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts
    - b. Manufacturer's product specifications
    - c. Statement of compliance with specified referenced standards

- d. Testing by recognized testing agency
  - e. Application of testing agency labels and seals
  - f. Notation of coordination requirements
  - g. Availability and delivery time information
4. Submit Product Data before or concurrent with Samples
- E. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based upon Engineer's digital data drawing files is otherwise permitted.
- 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products
    - b. Schedules
    - c. Compliance with specified standards
    - d. Notation of coordination requirements
    - e. Notation of dimensions established by field measurement
    - f. Relationship and attachment to adjoining construction clearly indicated
    - g. Seal and signature of professional engineer if specified
  - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
- F. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form.
- 1. Name, address, and telephone number of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- G. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Engineers and Owners, and other information specified.

- H. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- I. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- J. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- K. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- L. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- M. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- N. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.
- O. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- P. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- Q. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- R. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

### 3.02 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note

corrections and field dimensions. Mark with approval stamp before submitting to Engineer.

- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.03 ENGINEER'S [AND CONSTRUCTION MANAGER'S] ACTION

- A. General: Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- C. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.
- D. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

**END OF SECTION**



## SECTION 01400 QUALITY CONTROL AND QUALITY ASSURANCE

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### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing, observation, and documentation services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities.
  - 2. Specified tests, observations, documentation, and related actions do not limit Contractor's other quality assurance and quality control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and -control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

#### 1.02 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, observation, documentation, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer.
- C. Preconstruction Testing: Tests and documentation performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- D. Product Testing: Tests and documentation that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- E. Source Quality-Control Testing: Tests and documentation that are performed at the source, i.e., plant, mill, factory, or shop.

- F. Field Quality Control Testing: Tests and documentation that is performed on-site for installation of the Work and for completed Work.
- G. Testing Agency: An entity engaged to perform specific tests, documentation, or both. Testing laboratory shall mean the same as testing agency.
- H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.
- I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

#### 1.03 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

#### 1.04 SUBMITTALS

- A. Contractor's Construction Quality-Control Plan (CQCP): For quality-assurance and quality-control activities and responsibilities.
- B. Contractor's Quality-Control Manager Qualifications: For supervisory personnel.

#### 1.05 CONTRACTOR'S CONSTRUCTION QUALITY-CONTROL PLAN

- A. Construction Quality-Control Plan: Submit draft Construction Quality-Control Plan (CQCP) to Engineer 14 days following the Notice of Award. Submit in format acceptable to Engineer. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule. Following review and comment by the Engineer and Owner, the Contractor shall incorporate revisions and resubmit within 10 days for review and approval. The CQCP shall address all aspects of

the construction operations to include but not be limited to mobilization, site preparation, soil and sediment excavation, water conveyance channel construction, capping, placement of betterment layer, contact water management, on and off-site management of excavated materials, and site restoration.

- B. **Quality-Control Personnel Qualifications:** Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
- C. **Submittal Procedure:** Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. **Continuous Documentation of Workmanship:** Describe process for continuous documentation during construction to identify and correct deficiencies in workmanship in addition to testing and documentation specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements.
- E. **Monitoring and Documentation:** Maintain testing and documentation reports including log of approved and rejected results. Include work Engineer has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

#### 1.06 REPORTS AND DOCUMENTS

- A. **Test and Documentation Reports:** Prepare and submit certified written reports specified in other Sections. Include the following:
  - 1. Date of issue
  - 2. Project title and number
  - 3. Name, address, and telephone number of testing agency
  - 4. Dates and locations of samples and tests or documentations
  - 5. Names of individuals making tests and documentations
  - 6. Description of the Work and test and documentation method
  - 7. Identification of product and Specification Section
  - 8. Complete test or documentation data
  - 9. Test and documentation results and an interpretation of test results
  - 10. Record of temperature and weather conditions at time of sample taking

11. Comments or professional opinion on whether tested or documented Work complies with the Contract Document requirements
  12. Name and signature of laboratory manager
  13. Recommendations on retesting and additional documentation
- B. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, documentation reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

#### 1.07 QUALITY ASSURANCE

- A. Owner and Engineer will arrange for construction oversight, inform of documentation and testing activities, to confirm that the construction activities and completed project complies with Technical Specifications and Drawings.
- B. Owner's documentation and testing activities will consist of following activities:
1. Daily observation and record of Contractor activities.
  2. Verifying compliance with Technical Specifications and Drawings and project changes by the Engineer.
- C. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- F. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- G. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar to those indicated for this Project in material, design, and extent.
- H. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists

shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- I. Testing Agency Qualifications: An independent agency with the experience and capability to conduct testing and documenting indicated in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
  1. Contractor responsibilities include the following:
    - a. Provide test specimens representative of proposed products and construction.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
  2. Testing Agency Responsibilities: Submit a certified written report of each test, documentation, and similar quality-assurance service to Engineer with copy to Contractor. Interpret tests and documentations and state in each report whether tested and documented work complies with or deviates from the Contract Documents.

#### 1.08 QUALITY CONTROL

- A. Contractor Responsibilities: Tests and documentations not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
  1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or documentation to be performed.
  4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report of each quality-control service.

5. Testing and documentation requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
  7. Perform work in strict accordance with Technical Specifications and Contract Drawings. Coordinate, supervise and oversee subcontractors as needed to perform construction activities.
  8. Perform testing as deemed necessary to satisfy requirements of Technical Specifications related to off-site materials prior to delivery to site. Contractor is required to continue locating new material sources and testing the material until the material is approved by Engineer. Materials that do not meet specifications and are not approved by Engineer shall be removed from site at Contractors expense.
  9. Cooperate with Engineer to furnish material sample, and provide assistance in on-site documentation and test activities.
- B. Engineer's Responsibilities.
1. Provide clarifications to Technical Specifications and Contract Drawings, as well as any necessary design changes requested by the Owner.
  2. Sample the bottom of excavation of soil and sediment to document sediment quality left in place.
  3. Sample the thickness of the capping material and conformance with the Contract Documents.
  4. Sample the thickness of the betterment material and conformance with the Contract Documents.
  5. Review Contractor's submittals and advise Owner on results of review of these items.
  6. Provide manifests for disposal or transport of contaminated soil and debris, and contact water, if necessary.
  7. Communicate any pertinent issues with the Owner and/or Contractor.
  8. Monitor construction progress, and report to Owner with respect to planned schedule.
  9. Provide photo documentation and daily written reports documenting construction according to the Technical Specifications and Drawings.
  10. Provide oversight of bathymetric survey when being completed by the contractor for submittal for payment

11. Sample contact water treatment system when required according to obtained permit.
- C. Owner's Responsibilities.
1. Perform Owner's engineering review and monitor construction progress and progress payment approval.
  2. Perform Owner's administrative and managerial responsibilities. Owner has authority to accept/reject materials and workmanship.
  3. Communicate any pertinent issues with Contractor and/or Engineer. Maintain communication with WDNR.
  4. Approve/reject Contactor's submittals and construction results.
- D. Retesting: Regardless of whether original tests or documentations were Contractor's responsibility, provide quality-control services, including retesting and documentation, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and documentations.
1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and documentations and state in each report whether tested and documented work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, documentation, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform any duties of Contractor.
- F. Associated Services: Cooperate with agencies performing required tests, documentations, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and documentations.

3. Adequate quantities of representative samples of materials that require testing and documentation. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. Delivery of samples to testing agencies.
  6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  7. Security and protection for samples and for testing equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and documentation.
1. Schedule times for tests, documentations, obtaining samples, and similar activities.
- H. Schedule of Tests and Documentations: Contractor shall prepare a schedule of tests, documentations, and similar quality control services required by the Contract Documents as a component of the Contractor's CQCP. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Engineer testing agencies, and each party involved in performance of portions of the Work where tests and documentation is required.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

**3.01 TEST AND DOCUMENTATION LOG**

- A. Prepare a record of tests and documentations. Include the following:
1. Date test or documentation was conducted.
  2. Description of the Work tested.
  3. Date test or documentation results were transmitted to Engineer.
  4. Identification of testing agency conducting test or documentation.
- B. Maintain log at Project site. Inform Engineer of operational changes and modifications as they occur. Provide access to test and documentation log for Engineer's reference during normal working hours.

**END OF SECTION**



## **SECTION 01410 PERMITS AND FEES**

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### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
1. Applicable permits, approvals and associated fees required for completion of the Work.
  2. Party responsible for obtaining the approvals and permits.

#### **1.02 PROJECT REQUIREMENTS**

- A. Permits and Approvals:
1. Owner and Engineer
    - a. Owner and Engineer will complete waste profiling and approval for landfill disposal of impacted special waste at an approved landfill.
  2. Contractor
    - a. Contractor shall obtain any applicable City of Milwaukee permits including but not limited to utility temporary use and connections (water and sanitary). Contractor shall review City permitting requirements with the Engineer and Owner.
- B. Fees:
1. Owner
    - a. Owner will pay for fees associated with all permits and approvals of their responsibility.
    - b. Owner will pay for discharge fees for wastewater disposal to MMSD, if required.
  2. Contractor
    - a. Contractor shall pay for fees associated with all permits and approvals of their responsibility.
    - b. Contractor shall pay for recycling of any demolition and clean construction debris.

- C. Copies of permits and approvals obtained by the Owner and Engineer will be made available to the Contractor.
- D. Copies of permits obtained by the Contractor shall be provided to the Owner and Engineer.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION**

## **SECTION 01500**

### **TEMPORARY FACILITIES AND CONTROLS**

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#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

##### **1.02 REFERENCES**

- A. National Electrical Contractors Association (NECA) latest version of NECA 200, Recommended Practice for Installing and Maintaining Temporary Electric Power at Construction Sites (ANSI)
- B. National Electrical Manufacturers Association (NEMA) latest standards for the design and manufacture of electrical equipment.
- C. Underwriters Laboratories Inc. (UL) latest standards and test procedures for products, materials, components, assemblies, tools, and equipment.
- D. National Fire Protection Association, NFPA 70: National Electric Code, latest edition.
- E. National Fire Protection Association, NFPA 241: Standard for Safeguarding Construction, Alteration, and Demolition Operations, latest edition.
- F. International Code Council/American Standards Institute ICC/ANSI A117.1, Accessible and Usable Buildings and Facilities, latest edition.
- G. United States Access Board Americans with Disabilities Act and Architectural Barriers Act (ADA-ABA) Accessibility Guidelines for Buildings and Facilities, latest edition.
- H. ASTM E136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C, latest edition.

##### **1.03 USE CHARGES**

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner, Engineer, testing agencies, Lead Agency, and authorities having jurisdiction.
- B. Sanitary Services:
  - 1. Provide sanitary facilities on site conforming to state and local health and sanitation regulations in sufficient number for use by all entities for construction operations.

2. Provide at time of mobilization and maintain facilities in sanitary condition at all times.
- C. Water Service:
1. Contractor shall provide anticipated water requirements for Work to be completed on the Site along with the bid documents.
  2. Provide and pay for suitable quality water service as needed to maintain specified conditions for construction operations. Connect to existing water source. Provide separate metering and reimburse Owner for cost of water used. Contractor shall protect water service from freezing during cold weather conditions.
  3. Contractor shall provide potable water, containers and ice for Contractor's employees.
- D. Electric Power Service:
1. The Contractor shall provide, at a minimum, access to 120V single and three phase electrical service and meter for Contractor, Engineer, and Owner use at the Site. The Contractor shall provide electrical requirements along with their bid documents.
  2. OSHA regulation require that employers shall use either ground fault circuit interrupters or an assured equipment grounding conductor program in addition to any other regulations for equipment grounding conductors.
- E. Gas Service:
1. Contactor shall provide gas requirements along with the bid documents, if required.
  2. Contractor shall provide, connect, and disconnect required gas lines to equipment.
- F. Telecommunication Service:
1. Contractor shall provide, maintain, and pay for high-speed internet service with wireless router for secure access by Owner, Engineer, and Agency from project start to completion.
  2. Cellular phone is required for the on-site superintendent or foreman.

1.04 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion Control and Surface Water Management Plan:

1. Show compliance with local, State and Federal requirements whichever is more stringent.
- C. Equipment Storage Locations:
  1. Park equipment and store materials only in areas proposed by Contractor and approved by Owner.

1.05 USE OF SITE FACILITIES

- A. Contractor shall consult with the Owner and Engineer regarding locations for offices, trailers, material storage, access roads and areas within the Work area for use by Contractor.
- B. Confine equipment, storage of materials, and operations of work persons to designated and Owner approved areas. Do not bring materials onto Site until reasonably required for progress of work.
- C. Contractor or subcontractors may not use area outside of the approved location areas at the Site for any purpose unless expressly approved by the Owner in writing.
- D. Store, place and handle material and equipment to protect from any damage. Contractor shall move materials sheds, or equipment, as necessary or when required for continuing construction at Contractor's expense.
- E. Owner assumes no responsibility for project material or equipment stored on-site or off-site. Contractor assumes full responsibility for damage due to storing of materials.
- F. Contractor is responsible to schedule work, storage of materials, etc., to minimize interference with construction activities.
- G. Contractor, prior to start of work, shall inspect Site with Owner and Engineer to determine existing conditions in conjunction with preconstruction meeting.
- H. Contractor is responsible for all snow removal necessary during duration of project, as necessary.

1.06 SECURITY

- A. Security is not provided by Owner for Contractor's property.
- B. Contractor is responsible for loss or injury to persons or property where his work is involved, and shall provide security and take precautionary measures as deemed necessary to protect Contractor's and Owner's interests.

1.07 PARKING

- A. Parking areas at the Site will be designated by Owner.

1.08 ARCHAEOLOGICAL OR HISTORIC RELICS

- A. Native American relics or items with an apparent archaeological or historical value discovered during construction shall not be touched, moved or otherwise disturbed.
- B. Report existence of these items to Engineer and Owner immediately upon discovery.

1.09 FIELD OFFICES AND STRUCTURES

- A. The Contractor will establish a field office at the site for the Owner and Engineer for project administration, project meetings, plan review, and equipment and sample storage. Office will have adequate light, heat, and air conditioning provided. The office shall be equipped with internet service.
- B. The Contractor will establish a work space (use of a desk, chair, water, and restroom facility) at the site for the Lead Agency. Work space will have adequate light, heat and air conditioning provided.
- C. Contractor shall post a map-clearly depicting route to nearest hospital as well as emergency numbers posted next to exit door.
- D. Contractor shall provide necessary temporary sheds or other storage facilities to accommodate Contractor's supply and storage needs.

1.10 CONSTRUCTION NOISE

- A. The Contractor shall take all necessary precautions to minimize construction noise for the Site. All equipment shall be fitted with suitable noise reduction devices such as mufflers, inlet and exhaust silencers and engine covers that shall be maintained in good working order.
- B. The Owner will decide on the adequacy of provision and maintenance of noise reduction equipment. When so instructed, in writing by the Owner, the Contractor shall immediately withdraw any item of plant or equipment from service and carry out all necessary additions, replacements, or repairs to the noise reduction equipment to the satisfaction of the Owner.

1.11 BARRIERS AND PROTECTION OF INSTALLED WORK

- A. Protect installed work and provide special protection as stated in Technical Specifications.
- B. Construction traffic shall be prohibited on completed and/or landscaped areas.
- C. Provide barriers to prevent unauthorized entry to construction and staging areas as necessary. Protect existing facilities and adjacent properties from damage during construction operations.

1.12 FUEL STORAGE AND HANDLING

- A. Store fuel according to local, state and federal laws.

- B. At no time, shall overtopping fuel tank or spillage to ground surface be allowed.

1.13 PROTECTION OF ENVIRONMENT

- A. Minimize air pollution by use of properly operating combustion emission control devices on construction vehicles and equipment. Encourage shutdown of motorized equipment not in use.
- B. Trash burning is not permitted on-site.
- C. All areas for handling and storage of fuels, oils and other potentially hazardous liquids shall have spill containment or release prevention measures. Maintenance of equipment on-site shall be with prior approval of the Engineer.
- D. All waste materials shall be recycled, hauled to a licensed solid waste landfill, or otherwise disposed of in an environmentally sound manner and in compliance with all applicable local, state, and federal rules as approved by the Engineer and Owner
- E. All hazardous waste shall be stored, handled, and disposed of in compliance with applicable local, state and federal rules.
- F. Other measures shall be taken, as necessary, to maintain work Site in an environmentally sound matter.
- G. All spills or leaks of fuels, oil, or other reportable liquids resulting from handling or equipment malfunctions shall be reported immediately to Owner and/or Engineer. Affected soils shall be properly removed from limits of construction and disposed in accordance with applicable local, state and federal rules as approved by the Owner and Engineer. A copy of manifests, if necessary, shall be provided to Owner/Engineer within 5 working days of disposal. Waste Generator Manifests shall not state Owner as Generator. Owner reserves right to order leaking equipment removed from Site.

1.14 PUBLIC ROAD REQUIREMENTS

- A. The Contractor shall conduct his operations on the Site in a manner that shall minimize interference with the normal operation of adjoining public roads and parks and shall implement all specified and other appropriate measures to ensure the safety of all users of the adjoining public roads and parks.
- B. During periods of heavy truck or equipment traffic near public roadways, the Contractor shall provide sufficient flag persons to direct construction equipment and safeguard vehicular traffic. At the close of each workday, the Contractor shall leave the Site in a safe condition.
- C. At no time during construction shall any soil be permitted to leave the Site without being fully contained and covered unless expressly approved by the Owner. All trucks shall be covered and covers shall be securely fastened without gaps and shall be approved by the Owner.

1.15 ADDITIONAL REQUIREMENTS

- A. Owner has first right of refusal for any items with an apparent historical or monetary value present or discovered during construction or items that can be salvaged and reused elsewhere (i.e., trees, planters, benches, signs). Notify Owner of items at least 5 days prior to removal.
- B. No firearms or explosives are allowed on-site.
- C. Possession and/or use of intoxicating beverages and nonprescription drugs are prohibited at all times. Persons caught in possession or under the influence of drugs or alcohol will be immediately dismissed and removed from the Site.
- D. Smoking will be allowed in designated areas only.
- E. No horseplay is permitted on the Site.
- F. Visitors or personnel not employed by the Contractor or his approved Subcontractors shall not be permitted on-site without prior approval by the Owner.
- G. Owner and Engineer reserve the right to require that any of the Contractor's personnel be excluded from work at the site at any time.

1.16 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.17 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

3.01 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.



3.02 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility Owner, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
  - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction. Protect water service from freezing during cold weather condition.
- D. Electric Power Service: Set up with the electric power service provider a power drop to the local existing electric power service for the project. Maintain equipment in a condition acceptable to Owner.
- E. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
- F. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel.
  - 1. At each telephone, post a list of important telephone numbers.
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's home office.
    - d. Engineers' office.
    - e. Owner's office.
    - f. Principal subcontractors' field and home offices.
  - 2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.03 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
  - 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E136. Comply with NFPA 241.

2. Maintain support facilities until after Substantial Completion inspection. Remove after Substantial Completion.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated and within construction limits indicated on Drawings.
1. Provide dust-control treatment that is nonpolluting and no tracking. Reapply treatment as required to minimize dust.
- C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
  2. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Provide, per the Owner's approval, temporary parking areas for construction personnel.
- F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
  2. Remove snow and ice as required to minimize accumulations.
- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as requested by Owner and Engineer.
  2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
    - a. Provide temporary, directional signs for construction personnel and visitors.
    - b. Provide temporary signage beneath 11th Street bridge.
  3. Maintain and touchup signs so they are legible at all times.

- H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.
- I. Lifts and Hoists: Provide facilities necessary for hoisting materials.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways.
- C. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- D. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

**END OF SECTION**

# **SECTION 01550**

## **MOBILIZATION, DEMOBILIZATION, AND DECONTAMINATION**

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### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section includes:
  - 1. Description of Work.

#### **1.02 DESCRIPTION OF WORK**

- A. Mobilization consists of the Work and operations necessary for the movement of personnel, equipment, supplies and incidentals to the project Site including work and operations which must be performed or for which costs must be incurred before beginning Work on the various items on the project site. Includes all labor, equipment and materials necessary to fulfill the requirements of all Division 1 Specifications. Demobilization shall include all Work and operations to vacate the Site, including movement of personnel, equipment, supplies and incidentals from the Site.
- B. Decontamination of personnel clothing, equipment and disposition of decontamination wastes is an integral part of the overall Health and Safety Program. The selection of protective clothing, respirators, and equipment to prevent human contact and the spread of contaminants shall be addressed in the Contractor's Health and Safety Plan. Decontamination consists of physically removing contaminants or changing their chemical nature to innocuous substances. This item consists of all Work and operations necessary for the Contractor to safely enter and exit the Site and perform the Work contained in these Contract Documents.
- C. Contractor shall submit a written plan for decontamination to the Engineer as part of the Work Plan for approval prior to proceeding with decontamination activities.

#### **1.03 SUBMITTALS**

- A. Provide Owner and Engineer written notice of construction start date at least 30 working days prior to beginning site activities.

### **PART 2 - PRODUCTS (Not Used)**

### **PART 3 - EXECUTION**

#### **3.01 DECONTAMINATION OPERATIONS**

- A. Trucks and heavy equipment with noticeable surface contamination or soil shall be decontaminated prior to leaving the sites and may include other vehicles not belonging to the Contractor.

- B. Decontamination shall first be conducted by scraping, brushing, or other mechanical means to the extent practical to remove soil and contaminants from equipment. Soil and debris removed during the decontamination operations shall be managed onsite and treated or transported to the landfill, as directed by the Engineer.
- C. Contractor shall provide high-pressure low-volume washing equipment with steam capabilities for the purpose of decontamination, unless approved otherwise by the Engineer. Equipment may also be used for decontamination of debris and structures encountered during excavation.
- D. Decontamination liquids shall be contained at all times and shall be pumped and/or transported to the furnished frac tanks for treatment

**END OF SECTION**

## **SECTION 01700 EXECUTION REQUIREMENTS**

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### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Progress cleaning.
  - 5. Starting and adjusting.
  - 6. Protection of installed construction.
  - 7. Correction of the Work.

#### **1.02 REFERENCES**

- A. National Fire Protection Association, NFPA 241: Standard for Safeguarding Construction, Alteration, and Demolition Operations, latest edition.

#### **1.03 CONTRACTOR'S RESPONSIBILITIES**

- A. Upon commencement of construction work, become familiar with the location of existing reference benchmarks, control points, and other necessary reference construction points. Maintain their accuracy and prevent disturbance or destruction. Contractor is responsible for re-establishing control points and benchmarks if such items are destroyed at no cost to Owner.
- B. Establish and verify grades, lines, levels, locations and dimensions as shown on Drawings and report any errors or inconsistencies to Engineer before commencing Work.
- C. Layout own work and be responsible for all surveys, lines elevations and measurements of structures and other Work executed under Contract. Exercise proper preparation to verify figures on Drawings within construction limits before laying out work. Any error resulting from failure to exercise such precautions or work done without being properly located may be removed at Owner's direction and corrected or replaced at Contractor's expense.

## 1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor and/or professional engineer.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

## 1.05 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

## 1.06 SURVEY DATA FOR CONSTRUCTION DOCUMENTATION

- A. Documentation Surveys: To be supplied to Engineer within four (4) working days following completion of survey for a particular surface or set of features.
- B. Contractor shall provide Engineer with weekly survey updates (hard copy and electronic compatible for import into AutoCAD) of the completed items listed below at each weekly progress meeting.
  - 1. Soil excavation areas
  - 2. Sediment excavation areas
  - 3. Water conveyance channel areas
  - 4. Subaqueous stabilization layer
  - 5. Subaqueous aggregate cap
  - 6. Betterment layer
  - 7. Backfill areas
  - 8. Riprap areas
  - 9. Riprap apron areas
- C. Survey data shall be supplied to Engineer in the following formats:
  - 1. Topographic map (hard copy and electronic compatible for import into AutoCAD Civil 3D 2011).
  - 2. Tabular (northing, easting, elevation).
- D. Contractor will be notified by Engineer of areas to be adjusted or will be given written approval of surveyed area within two working days of receiving survey data.
- E. Contractor shall obtain written approval from Engineer for each surveyed area prior to placement of any overlying materials.

**PART 2 - PRODUCTS (Not Used)****PART 3 - EXECUTION****3.01 EXAMINATION**

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Acceptance of conditions: Examine substrates, area, and conditions, with installer or applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with Work indicates acceptance of conditions.

**3.02 PREPARATION**

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Engineer. Indicate a detailed description of the problem encountered, together with recommendation for changing the Contract Documents.

**3.03 FIELD ENGINEERING**

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.



1. Do not change or relocate existing benchmarks or control points without prior written approval of Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Engineer before proceeding.
  2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on Project Site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Documentation Survey: On completion of major site improvements, and other work requiring field-engineering services, prepare a survey by registered land surveyor showing dimensions, locations, angles, and elevations of construction and Site Work for submittal to Engineer for review.

#### 3.04 CONSTRUCTION LAYOUT AND DOCUMENTATION

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Engineer promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
1. Establish benchmarks and control points for construction and elsewhere as needed to locate each element of Project. Contractor is responsible for re-establishing control points and benchmarks if such items are destroyed at no cost to the Owner.
  2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions. Report any errors or inconsistencies to Engineer before commencing work.
  3. Exercise proper preparation to verify figures on Contract Drawings within construction limits before laying out work. Any error resulting from failure to exercise such precautions or work done without being properly located may be removed at Owner's direction and corrected or replaced at Contractor's expense.
  4. Inform installers of lines and levels to which they must comply.

5. Check the location alignment and elevation of every major element as the Work progresses.
  6. Notify Engineer when deviations from required lines and levels exceed allowable tolerances.
  7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
  8. Bathymetric surveys for pay quantity purposes shall be performed by trained and experienced personnel under supervision by the Contractor.
  9. Rework grades at own expense if grades are altered by weather conditions before or after survey work or before final restoration is completed.
  10. Verify own work with respect to required grades prior to documentation surveys. Areas deficient will be corrected and resurveyed at Contractor's expense.
- C. Site Improvements: Locate and lay out site improvements, including pavements, backfill, riprap, and riprap aprons.
- D. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Engineer.

### 3.05 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produces harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

## 3.06 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F .
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- F. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.
- G. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- H. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- I. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.07 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

3.08 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

**END OF SECTION**

## SECTION 01770 CLOSEOUT PROCEDURES

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### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Final cleaning.

#### 1.02 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete at time of request for inspection.
  - 1. Prepare a list of items in conjunction with the Engineer to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  - 2. Advise Owner of pending insurance changeover requirements.
  - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 4. Prepare and submit Project Record Documents, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
  - 5. Submit test/adjust/balance records.
  - 6. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.03 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
  1. Submit a final Application for Payment using the EJCDC Form C-620.
  2. Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
  1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.04 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Prepare list of incomplete items in conjunction with the Engineer. Include name and identification of each area of the construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction
  1. Organize list of areas in sequential order.
  2. Organize by major construction elements element and categories.
  3. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Engineer.
    - d. Name of Contractor.
    - e. Page number.

1.05 RECORD DOCUMENTS

- A. Produce and maintain on-site, one set of the following record documents of all items or work; record actual revisions of all items of work:
  - 1. Contract Drawings.
  - 2. Technical Specifications.
  - 3. Change orders and other modifications to contact.
  - 4. Submittals.
  - 5. Other documents including Work Plan, CQCPP, HASP and SWPPP.
  - 6. A copy of approvals of work performed.
- B. Store record documents separate from documents used for construction.
- C. Record information concurrent with construction progress including changes made by addenda and modifications.
- D. Maintain a Daily Field Log documenting work times, personnel on-site, equipment used and other essential information of the operations progress.

1.06 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

3.01 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

- c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
- d. Remove tools, construction equipment, machinery, and surplus material from Project site.

**END OF SECTION**



# SECTION 01900 SITE HEALTH AND SAFETY

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## PART 1 - GENERAL

### 1.01 SUMMARY

- A. Section Includes:
  - 1. General Health and Safety Issues
  - 2. Disclosure – Chemical Characteristics
  - 3. Public Safety
  - 4. Accident Reports
  - 5. Fire Protection and Emergencies
  - 6. Working in Proximity to Overhead Transmission Lines

### 1.02 REFERENCES

- A. US Department of Labor Occupational Safety and Health Administration (OSHA) latest standards.

### 1.03 GENERAL HEALTH AND SAFETY ISSUES

- A. Contractor is responsible for implementation and enforcement of health and safety requirements and shall take necessary precautions and provide protection for the following:
  - 1. Personnel working on or visiting project Site, irrespective of employer.
  - 2. Work and materials or equipment to be incorporated in Work area on- or off-site.
  - 3. Other property at or adjacent to project Site.
  - 4. Public exposed to job-related operations or potential release of toxic or hazardous materials.
- B. Contractor shall prepare a Project specific Construction Health and Safety Plan (HASP). The HASP will be reviewed by the Engineer and Owner. Submit a signed copy to Engineer 14 days after Notice of Award. Prepare HASP in accordance with applicable OSHA guidance. HASP shall address all major elements of the Contractor Work. The Contractor's HASP does not supersede or in any way relieve the Contractor of obligations under any applicable OSHA regulations including 29 CFR 1910: Occupational Safety and Health Standards and 29 CFR 1926: Health and Safety

Regulations for Construction. At minimum, the Contractor HASP shall include the following:

1. Site description
2. Project activities and coordination with other Subcontractors
3. Hazards evaluation
4. Heavy equipment operation
5. On-site safety responsibilities
6. Work zones
7. Personnel training
8. Atmospheric (Work Zone) monitoring
9. Personal protection, clothing, and equipment
10. Emergency procedures
11. Spill control and countermeasures
12. Name of person who will be responsible in the event of an emergency incident
13. Plan for initial site safety orientation and training for all Contractor and subcontractor personnel
14. Listing of on-site health and safety equipment, supplies, and locations
15. Maps clearly depicting routes to closest emergency medical facilities and hospitals
16. Provisions for mitigating the potential for exposure to the community

C. Spill control and countermeasures shall include the following:

1. Contingencies for potential spills or discharges
2. Means, methods, and facilities to manage and prevent loss of contaminated soil, groundwater, and surface water to the environment
3. Descriptions of proposed personnel and equipment for conducting decontamination of personnel, equipment, and materials
4. Notification requirements to regulatory agencies in accordance with applicable Federal Clean Water Act and WDNR requirements
5. Emergency notification protocols and procedures to the Owner and the Engineer

- D. Contractor shall be and remain liable for compliance by employees, agents, and subcontractors with Contractor's HASP and procedures for Site and shall not hold Owner and/or Engineer accountable to any claims, damages, suits, losses, and expenses in any way arising from noncompliance with HASP. It is Contractor's responsibility to enforce all necessary safety rules.
- E. Engineer and Owner may adopt Contractors HASP for on-site Owner and Engineer personnel. Regardless, Contractor shall be responsible for its own health and safety at all times.
- F. Notify Engineer of any chemical products to be used by Contractor while on-site premises. Furnish Material Safety Data Sheets (MSDS) for chemical products, to Engineer before any such chemicals are brought on premises throughout duration of project. Comply with standards set in 29 CFR 1910.120 in providing such notifications and MSDS.
- G. Provide all necessary safety equipment needed to perform required Work. Provide and properly utilize adequate ventilation and personal protection equipment, including respirators as required according to OSHA regulations.
- H. Train personnel in use, limitations, and proper fit of all necessary safety equipment. General Site workers expected to be in contact with contaminated soil or water shall have received 40-hour Hazardous Waste Operations and Emergency Response training in accordance with 29 CFR 1910.120.
- I. Hard hats, eye protection, and traffic vests are required, as necessary, in all construction areas.
- J. Conform to OSHA Safety and Health Regulations for construction.

1.04 DISCLOSURE – CHEMICAL CHARACTERISTICS

- A. Owner will furnish or make available to Contractor documents listed in the Supplementary Conditions and information that relate to identity, location, quantity, nature, or characteristics of hazardous substances near work Site. Owner, however, assumes no responsibility or liability for accuracy or completeness of such documents or information, and all such documents and information will remain property of the Owner.
- B. Sediment and Soil in the Canal: The sediment and soil in the Canal consists of mainly silt and clay-sized particles with trace gravel. Copper was detected in the sediment as great as 14,100 mg/ kg, PAHs 1,292,400 µg/mg, and lead 1,680 mg/kg.

1.05 PUBLIC SAFETY

- A. Protect finished and unfinished work against any damage, loss, or injury during performance of and up to completion day of work.
- B. Provide adequate protection around all openings wherever required to safeguard work or public.

- C. Protect all openings and surface obstructions with fencing, barricades, signs, and warning devices in accordance with local, state and federal requirements.
- D. No smoking or eating will be allowed within Site boundaries except in locations agreed upon by Owner and Contractor.

1.06 ACCIDENT REPORTS

- A. If a death, serious injury, or damage occurs, the Contractor shall report the accident immediately by telephone to the local authorities, Owner, and Engineer.
- B. Report in writing to the Owner all accidents occurring in connection with the Work, giving full details, names and statements of witnesses.
- C. The summaries shall address the date/time of accident, agency/establishment named and location, and consequences, description of operation and the accident, causal factors, applicable standards and their effectiveness, and corrective/preventive actions.

1.07 FIRE PROTECTION AND EMERGENCIES

- A. Contactor shall execute all Work in a fire-safe manner. Furnish and maintain a suitable type and amount of portable fire extinguishers on-site and in each piece of equipment as applicable.
- B. Abide by Owner's emergency notification and operating practices for emergency situations. Practices will be discussed at the preconstruction meeting.

1.08 WORKING IN PROXIMITY TO OVERHEAD TRANSMISSION LINES

- A. Contractor shall conform, when, performed in proximity to energized electrical conductors, to the provisions and requirements, with any amendments hereto, of OSHA Safety and Health Regulations for Construction, in particular, but not limited to subpart 1926.550 and local and State electrical code and any amendments thereto.
- B. Contactor shall not stockpile below the transmission lines.
- C. No transmission line outage will be allowed.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION**

**DIVISION 02**

**SITE WORK**

## **SECTION 02050 SITE PREPARATION**

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### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

Site preparation shall be performed in accordance with the Contract Drawings and this section by the Contractor and includes the following:

- A. Section Includes:
  - 1. Preparation
  - 2. Protection of Utilities and Structures
  - 3. Clearing and Grubbing
  - 4. Sediment Stabilization Area
  - 5. Snow and Ice Management, and Freeze Protection
  - 6. Staging and Stockpile Areas
  - 7. Hauling Routes, Tracking Pads, and Transportation Routes
  - 8. Demolition of Surface Features

#### **1.02 REFERENCES**

- A. Wisconsin Department of Transportation (WisDOT), Standard Specifications for Highway and Structure Construction, current edition.
- B. Wisconsin Administrative Code (Wis. Adm. Code)

#### **1.03 DEFINITIONS**

- A. Structures and Surface Features: Existing structures and surface features including buildings, signs, posts, utility poles, monitoring wells and piezometers, bridges, fences, trees, shrubs, landscaped surface features, and other miscellaneous items.
- B. Utilities: Existing gas mains, water mains, electric lines, storm sewers and conduits, telephone and other communication lines and conduits, sewer pipe, cable television, other utilities, and appurtenances.
- C. Clearing and Grubbing: cutting, removal and disposal of trees, roots, brush, stumps, windfalls, logs, and other vegetation.

**1.04 SUBMITTALS**

- A. Contractor shall submit information that demonstrates the Contractor's means and methods for site preparation. This information shall be submitted as part of the Work Plan. The information shall include provisions for compliance with these specifications, including proposed fugitive dust and noise mitigation measures, engineering controls, equipment/application details, and the following:
  - 1. Ability to conduct operations and maintain Site at all times to minimize creation and dispersion of dust and mud.
    - a. Equipment necessary to control dust generation resulting from wind effects on open stockpiles, and from Contractor's vehicle and equipment traffic at all times.
    - b. The Engineer will monitor site conditions related to dust and mud generation on daily basis and direct Contractor to take actions as necessary to address observed deficient practices or conditions deleterious to construction and/or public.
  - 2. Overall site layout plan including all equipment, haul roads, support zones, stabilization pad layout, and bulk storage areas.
  - 3. Sediment stabilization area design, including proposed materials, manufacturer's installation and repair manual, appropriate cross-sections describing configuration of geosynthetic and soil layers.
  - 4. Indicate how public right-of-ways and streets will be cleaned as needed on a daily basis with commercial street sweepers.
- B. Engineer will take photographs or videotape of the site prior to commencement of Work to document existing conditions of adjoining construction and site improvements. Documentation shall include truck routes, fence, retaining wall, buildings, sidewalks, landscaping, ground surface of the equipment laydown, material management areas, and other elements that might be affected by the Work.

**PART 2 - PRODUCTS****2.01 MISCELLANEOUS MATERIALS**

- A. Riprap: As specified in Section 02300.
- B. 3 inch clear stone consisting of 3 to 6 inch diameter clear or washed stone. All material shall be retained on the 3 inch sieve.
- C. 16 ounce per square yard nonwoven geotextile fabric as specified in Section 02415.

## 2.02 LINER FOR TEMPORARY DECONTAMINATION AND SEDIMENT STABILIZATION AREAS

- A. Provide a minimum 30-mil thick scrim-reinforced polyethylene, polyvinyl chloride, flexible polypropylene, ethylene interpolymer alloy, or a similar geomembrane product approved by the Engineer.
  - 1. Where practicable, provide a continuous, factory seamed, geomembrane sheet, of the size necessary for the temporary sediment stabilization area to avoid field seaming.

## **PART 3 - EXECUTION**

### 3.01 PREPARATION

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site preparation operations.
- B. Utility Locator Service: Notify “Diggers Hotline” (1-800-242-8511) or 811 to locate underground utilities at least three business days before beginning any Site work.
- C. Do not commence clearing and grubbing activities until temporary erosion and sedimentation control and tree-protection measures are in place.
- D. Locate staging areas for construction equipment and for loading and hauling demolition debris.

### 3.02 DUST CONTROL

- A. Control dust by application of water to affected areas, such that surfaces are moistened to prevent dust from becoming a nuisance to public, neighbors and concurrent performance of other work at Site. Contractor shall prevent dusting 24 hours per day from project commencement to substantial completion of the Work.

### 3.03 PROTECTION OF UTILITIES AND STRUCTURES

- A. Preserve and protect benchmarks, existing building, and site improvements to remain. If damaged during construction, notify Engineer and Owner immediately. If determined by Engineer that the building or site improvement integrity is compromised, Contractor shall repair damage at Contractor’s expense under observation of Engineer.
- B. Protect, support, and maintain existing utilities (i.e., conduits, wires, pipes) that are to remain in place during work. If uncharted utilities are encountered during excavation, stop work in a safe condition, and notify Engineer. Locate existing underground utilities by hand excavation, as necessary.
- C. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:



1. Notify Engineer not less than two days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without Engineer's written permission.
- D. Chain link fence along the Canal maybe removed and replaced as necessary to complete the Work.

3.04 CLEARING AND GRUBBING

- A. Remove trees, shrubs, rubbish, debris, and other perishable or objectionable matter from locations shown on Contract Drawings to facilitate remediation and betterment activities.
1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
  2. Dispose of materials removed by clearing and grubbing in accordance with applicable local, state, and federal regulations.

3.05 SEDIMENT STABILIZATION AREA

- A. Suggested location for sediment stabilization area is shown on the Contract Drawings, and is to be used for stabilizing excavated sediment and, if necessary, for decontamination of contaminated debris and earthwork equipment. Contractor may locate sediment stabilization area in another area of the site if reflected in Work Plan submitted by Contractor and approved by Engineer, or as otherwise pre-authorized by Engineer in writing.
- B. The pad shall be placed over existing paved surface, broom clean the surface to remove any objects that may damage the geomembrane.
- C. A geomembrane liner shall be used in the construction of the pad. Provide puncture protection, such as a cushion geotextile, on each side of the geomembrane (upper and lower).
- D. If practicable, geomembrane liner shall be continuous. If not a continuous section, geomembrane liner shall be seamed in accordance with the Manufacturer's recommendations. Prior to seaming, the seam area shall be clean and free of moisture, dust, dirt, debris of any kind, and foreign material.
1. Field seams shall be nondestructively tested in accordance with the manufacturer's recommendations.
- E. Repair geosynthetics in accordance with manufacturer's recommendations. All repairs shall be made by trained technicians.
- F. Contractor shall designate a truck decon area with truck ramps for access within the area.
- G. Following completion of use, remove and transport stabilization area materials to the designated landfill.

3.06 SNOW AND ICE MANAGEMENT, AND FREEZE PROTECTION (AS NEEDED)

- A. Non- Contact Snow: As necessary, throughout the course of the Work, snow shall be plowed and removed to maintain access to the site and the haul road to and from the Work areas. As required to maintain access, accumulated snow shall be transported to an onsite location approved by the Owner.
- B. Contact Snow: Accumulated snow in excavation areas and in contact with contaminated materials shall be removed, if required, and transported to the debris management pad.

3.07 STAGING AND STOCKPILE AREAS

- A. Contractor shall construct a staging and stockpile area in a location agreed upon by Owner.
- B. Stockpiles of non-contaminated soil shall not exceed 12 feet in height, unless approved otherwise by the Engineer, and shall be surrounded with a minimum 9-inch high berm at the perimeter or as necessary to contain runoff.
- C. Inactive stockpiles susceptible to precipitation erosion shall be covered with plastic and inspected.

3.08 HAUL ROUTES, TRACKING PADS, AND TRANSPORTATION ROUTES

- A. Haul routes shall be maintained for truck traffic throughout the duration of excavation activities. Contractor shall receive approval from Engineer and Owner prior to construction or placement of haul routes. The haul routes shall be cleared of debris and soil on a regular basis to prevent tracking of soils onto public roads. Contractor shall maintain a minimum 15-foot wide route onsite.
- B. Tracking pads shall be constructed with 3 inch clear stone atop a minimum 16 ounce per square yard nonwoven geotextile fabric. The pad must be at least 18-inches thick and shall be maintained for the duration of the work.
- C. The transportation routes including public roads and site entrance shall be maintained throughout the duration of the project. Clean public right-of-ways, streets, and entrance onsite as needed with commercial street sweepers.
- D. Control mud and tracking of mud onsite access roads and public roads along haul routes. Provide stone surfaces at entrances and exists to prevent tracking.

3.09 DEMOLITION OF SURFACE FEATURES

- A. Remove and store onsite sign, riprap, fence, and other miscellaneous items to be reused at project completion, as directed by Engineer. Otherwise, miscellaneous items identified by Engineer or Owner as construction waste to be disposed of at the designated landfill. The size of all debris shall meet the requirements of the designated landfill.

**END OF SECTION**

**SECTION 02111**  
**EROSION AND SEDIMENT CONTROL AND**  
**SURFACE WATER MANAGEMENT**

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**PART 1 - GENERAL**

1.01 SECTION INCLUDES

- A. Erosion control measures necessary to prevent runoff, tracking, or loss of soil materials by water or mechanical action from areas at the site.
- B. Management of clean (non-contact) surface water within construction limits including protection of any catch basins within the construction limits and construction of surface water diversion berms.

1.02 REFERENCES

- A. State of Wisconsin Storm Water Construction and Post-Construction Technical Standards (WDNR Technical Standards).
- B. State of Wisconsin, Department of Transportation (WisDOT), Standard Specifications for Highway and Structure Construction (SSHSC), current edition.
- C. US Federal Water Pollution Control Act (Clean Water Act)

1.03 QUALITY ASSURANCE

- A. All Work shall be in accordance with applicable manufacturer's instructions and local, state, and federal codes, regulations, laws, and ordinances.
- B. Contractor shall comply with applicable requirements of Section 404 of Clean Water Act and Navigable Waters Protection.

1.04 SUBMITTALS

- A. Submit with and as part of the Work Plan an Erosion Control and Surface Water Management Plan including, but not limited to, locations of temporary surface water diversion berms and temporary culverts. Measures shall be taken to minimize surface water intrusion into exposed areas where possible.
- B. Contractor shall document condition of erosion control measures during inspections and provide Owner with copies of erosion control inspection and maintenance records weekly at each progress meeting.

1.05 PERFORMANCE REQUIREMENTS

- A. Turbidity downstream of erosion and sediment control features shall not exceed 70 NTU above baseline turbidity measurements.

1. Engineer shall establish baseline turbidity value and measure turbidity downstream of erosion and sediment control features
2. Engineer will notify Contractor of turbidity readings.
3. When turbidity measurements exceed the allowable maximum reading, Contractor shall immediately adjust operations or improve erosion and sediment control features as necessary to achieve acceptable water quality.

**PART 2 - PRODUCTS**

2.01 MATERIALS (AS NEEDED)

- A. Silt Fence: Comply with WDNR Technical Standard 1056 and Contract Documents.
- B. Tracking Pad: Comply with WDNR Technical Standard 1057 and Contract Documents.
- C. Filter Fabric for Inlet Protection: Comply with WDNR Technical Standard 1060 and Contract Documents.
- D. Silt Curtain: Comply with WDNR Technical Standard 1070 and Contract Documents.

**PART 3 - EXECUTION**

3.01 GENERAL

- A. The erosion and sediment control measures shown on the plans represent a minimum requirement. The Contractor is responsible for determining whether additional erosion and sediment control measures are needed to minimize soil erosion and prevent the migration of sediment from the Work Area for the protection of adjacent properties and water bodies.
- B. Silt fence, surface water trench, and other erosion control measures shall be established prior to exposing any erodible material. Site grading and drainage operations are to be conducted in a manner to prevent or lessen excessive soil erosion of construction-site work area.
- C. Contractor shall establish and maintain erosion control features until site is stabilized from erosion without the use of temporary controls and accepted by Owner.
- D. Contractor shall undertake erosion control and surface water management measures as shown on the Contract Drawings including but not limited to:
  1. Intercept and divert surface drainage away from the sediment stabilization pad by the use of dikes, curbswalls, ditches, or other means.
  2. Install surface drainage systems so that they do not cause erosion on or offsite.
  3. Install and maintain silt fence as needed. Provide and maintain tracking pad and roads for access to site and management areas as needed.
  4. Protect project adjacent storm sewer inlets with woven geotextile as needed.

5. Cover stockpiles with plastic and secure to prevent wind erosion. Contractor shall maintain stockpiles throughout the duration of project.
  6. Install and maintain silt curtains as necessary.
- E. The following general practices shall be used where applicable:
1. Minimize disturbed areas and sequence work to minimize exposure time.
  2. Use temporary vegetation, mulch, or other cover to protect areas during construction. Utilize dikes, brush, straw bales, or silt fence to trap sediment.
  3. Reduce volume and velocity of water crossing disturbed areas by utilizing diversion dams, straw bales, berms, or other facilities.
  4. Remove and replace erosion control measures to accommodate the sequencing and progression of work.
- F. The Owner and the Engineer have authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow, and placement operations. Contractor shall provide immediate temporary or permanent erosion control measures when directed. Contractor shall incorporate all permanent erosion control features into project at earliest practicable time to minimize need for temporary controls.

### 3.02 ADDITIONAL CONTROL MEASURES

- A. Contractor shall respond to erosion and sediment control maintenance requirements or implement additional measures to control erosion and sediment migration ordered by Owner/Engineer or governing authorities within 24 hours. Maintenance shall be performed at no additional cost to the Owner.
- B. Contractor shall provide measures daily to prevent tracking of sediment from site onto public or private roadways, parking lots, and paved areas.
- C. Soil loss control measures, in addition to those outlined in these documents and deemed necessary by Owner or Engineer shall be implemented immediately.
- D. Additional control measures required by regulatory agencies as a result of improper maintenance or installation of the specified control measures will be the responsibility of the Contractor.

### 3.03 MAINTENANCE

- A. Contractor shall inspect erosion control measures within 24 hours of the end of each rainfall event of 0.5 inches or more, or daily during periods of prolonged rainfall, and weekly during periods without rainfall. Contractor shall immediately repair or replace damaged, failed or inadequate erosion control measures. Contractor shall document condition of erosion control measures during such inspections and provide Owner with copies of inspection records.
- B. Sediment deposits should be removed after each storm event.

- C. Contractor shall inspect planned entrances and adjacent public streets daily when traffic is occurring and remove tracked and eroded soils daily or as deemed necessary by Owner with a commercial street sweeper.
- D. Contractor to maintain erosion control measures through completion of the site work and remove materials as directed by Engineer.

**END OF SECTION**

## SECTION 02241 CONTACT WATER MANAGEMENT

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### PART 1 - GENERAL

#### 1.01 WORK INCLUDES

- A. Control, handling, and storage of all water derived from excavation and stabilization of soils and sediments at the site and from stockpile areas.
- B. Treatment of contact water using Contractor provided mobile treatment system.
- C. Treatment of contact water as necessary to meet the Substantive Requirements of a Wisconsin Pollution Discharge Elimination System (WPDES) Permit. A project-specific WPDES Permit is pending from the Wisconsin Department of Natural Resources (WDNR) as of the date these specifications were released. Therefore, an example WPDES Permit is provided in Appendix D which was obtained from another project from WDNR and is expected to be similar for this project.
- D. Management, transportation, and disposal of treatment residuals (e.g., settled solids in tanks, filter media).

#### 1.02 REFERENCES

- A. WPDES Discharge Permit

#### 1.03 PERFORMANCE REQUIREMENTS

- A. Provide method of control, handling, and storage of water from within the excavation and grading areas at the site by whatever means necessary and in conformance with this Section to obtain satisfactory working conditions and maintain progress of Work.
- B. Provide a mobile water treatment system which may include portable tanks, carbon vessels, and bag filters, as necessary to treat water to meet the WPDES discharge permit requirements. Water treatment additives are prohibited under the WPDES permit, unless approved by WDNR.
- C. System shall include an effluent flow meter and sample taps between each treatment step and after the final treatment step. An additional sample tap shall be provided on the effluent line for the Engineer to install a flow proportional sampling device provided by Engineer; Contractor shall provide electric power.
- D. Perform storage and gravity settling using a frac tank of adequate volume. Multiple tanks may be required. Provide pipe connection to Canal for discharge of treated water.
- E. If required and as directed by Engineer and Owner, Contractor shall provide an operator to maintain and operate the Contractor-provided mobile water treatment system throughout the duration of the Contractor's operations as necessary to meet the WPDES discharge permit.

- F. System shall include a real-time, continuous-recording turbidity meter (NTU) on the effluent line and will be readily available for Engineer to observe and document readings.
- G. Contractor shall comply with the applicable rules and regulations of the Municipality and the WDNR relative to construction site dewatering and discharge.
- H. Provide adequate backup systems to accomplish control of water and to prevent removal, loosening, or softening of in-situ materials.
- I. The system may operate continuously or in batch mode, as determined by the Contractor.
- J. Exercise reasonable means for diverting run-on water away from material management and stockpile areas to minimize contact water volumes.
- K. Contractor shall comply with the substantive requirements of the example WPDES Permit (Appendix D) until such time the WDNR issues substantive requirements of a WPDES Permit specifically for the Burnham Canal Remediation and Betterment project.
  - 1. In addition to the requirements in the example permit, the Burnham Canal Remediation and Betterment Permit will require an oil & grease effluent limit of 15 mg/L.
  - 2. Certain other requirements in the Permit may be modified or eliminated for the Burnham Canal Remediation and Betterment Permit, which is anticipated to be received before Contractor selection and award. No substantive changes are anticipated, which would cause a material change in the scope or related Bid pricing.

#### 1.04 SUBMITTALS

- A. Submit with as part of the Work Plan a description of proposed Contact Water Control Plan, including, but not limited to:
  - 1. Methods, procedures, equipment, and power supply to be used for the following activities:
    - a. Contact water removal from dredged material
    - b. Contact water clarification
    - c. Treated contact water discharge to the Burnham Canal
    - d. Loading and transport of stabilized dredge material to approved landfill
    - e. Loading and transport of dredge material recovered by contact water treatment system to approved landfill
  - 2. Construction details of typical dewatering sumps and conveyance facilities, if necessary.



- 3. Methods of controlling fines and meeting the substantive requirements of the WPDES Permit.
- 4. Schedule of installation and operation.
- B. If changes occur prior to construction, submittal shall be revised no later than five (5) days prior to start of construction or installation of water control systems.
- C. At the end of each day of operation, submit effluent line NTU readings to Engineer as a CSV, XLS, or other electronic format approved by Engineer.

1.05 WORK BY OTHERS

- A. Owner will obtain the WPDES discharge permit.
- B. Engineer will perform compliance monitoring.
- C. Owner will pay water disposal fees and fees for transportation and disposal of residuals and spent treatment media.

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A. Pumping, conveyance, and temporary sump equipment and materials are to be selected by Contractor to accomplish Work of this Section.

2.02 PUMPING EQUIPMENT

- A. Utilize equipment specifically applicable to dewatering work.
- B. Equipment shall be operated and maintained in an efficient manner to meet the substantive requirements of the WPDES permit.
- C. The Contractor shall have on hand, at all times, sufficient pumping equipment and machinery in good working condition for emergencies and shall have available, at all times, competent workmen for the operation of the pumping equipment.

**PART 3 - EXECUTION**

3.01 SURFACE DRAINAGE

- A. Remove surface drainage systems when no longer needed.
- B. Prevent any and all discharge of untreated site runoff.

3.02 EQUIPMENT INSTALLATION AND INITIAL TESTING

- A. Install water treatment system and facilities in general conformance with Contractor's approved Work Plan.

- B. Test all equipment, piping, and fittings for leaks prior to operation. Repair all leaks discovered during inspection prior to operation.
- C. Perform initial operation of water treatment system in accordance with agency requirements to prove compliance.

3.03 CONTACT WATER CONVEYANCE

- A. Provide closed conveyances for contact water (piping or hoses). Conveyance in open troughs or ditches will not be allowed.
- B. Inspect contact water conveyances for leaks daily when in operation. Immediately repair leaks when discovered and clean up impacted areas as appropriate.
- C. Discharge to and from storage tanks shall be done in a manner that minimizes resuspension of solids.

3.04 WATER TREATMENT SYSTEM OPERATION

- A. Contractor shall provide adequate equipment and manpower to operate the water treatment system throughout the duration of the project. All costs associated with the operation and maintenance are the responsibility of the Contractor.
- B. If batch operation is planned, Contractor shall give Engineer notice at least 24 hours before initiating operation so Engineer can prepare for necessary sample collection and QA monitoring.
- C. Upon completion of the Work, Contractor shall demobilize and decontaminate contact water treatment system, equipment, and materials. Disposal of any decontamination wash waters shall be properly handled and disposed in accordance with all applicable laws, regulations, rules, and standards.

3.05 MANAGEMENT OF WATER TREATMENT RESIDUALS

- A. Contaminated filter media or other waste products shall be stored and managed in accordance with all applicable laws, regulations, rules, and standards.
  - 1. Spent sorbent pads may be disposed with stabilized sediment.
  - 2. Sand filter media may be disposed with stabilized sediment.
  - 3. Granular activated carbon shall be regenerated.

3.06 DISCHARGE OF TREATED WATER

- A. The exact location of discharge point shall be determined in the field by the Contractor and approved by the Engineer and Owner. The discharge point shall be determined based on WPDES discharge permit requirements.

- B. Contractor shall install and maintain conveyance from water treatment system to discharge point. Erosion protection shall be provided at discharge point if discharged back into the Canal.

**END OF SECTION**

## SECTION 02300 EARTHWORK

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### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Earthwork shall be performed by the Contractor and includes the following:
1. Excavation, temporary stockpiling (as needed and as approved), loading and transportation of contaminated soil, stabilized sediment, and debris offsite to a Subtitle D landfill for disposal as special waste.
  2. Mechanical dredging/excavation of soil and sediment on the west end of the Canal and in areas designated for riprap or select crushed material placement.
  3. Placement and compaction of backfill within the soil and sediment dredge/excavation area and water conveyance channel area to achieve design grades at the site.
  4. Subaqueous stabilization layer placement.
  5. Placement of a 12-inch thick subaqueous aggregate cap.
  6. Placement of betterment material on top of the cap.
  7. Provide and/or place backfill.

#### 1.02 REFERENCES

- A. Latest edition of ASTM International standards:
1. ASTM D422 Standard Test Method for Particle-Size Analysis of Soils
  2. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³))
  3. ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
  4. ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
  5. ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- B. US Army Corps of Engineers (USACE). *Engineering and Design - Hydrographic Surveying*, Publication Number: EM 1110-2-1003.

- C. Natural Resource Technology, Inc. Construction Quality Assurance Project Plan, Burnham Canal Site, Milwaukee, Wisconsin. Provided in Appendix C.

### 1.03 SUBMITTALS

- A. Submit as part of the Work Plan a description of proposed excavation and stockpiling activities, including, but not limited to:
  - 1. Methods and equipment.
  - 2. Temporary staging/laydown area, sediment stabilization area, and stockpile locations.
  - 3. Onsite egress and ingress truck routes and haul routes.
  - 4. Methods of advancing and stabilizing the excavation.
  - 5. Measures to protect existing utilities and pavement.
  - 6. Sequence of excavation of soils, excavation of saturated soil, grading, backfilling, and material staging and replacement.
- B. Work Plan shall include considerations for mechanical dredging/excavation, water conveyance channel construction, and cap and betterment material placement, including the following:
  - 1. All planned dredging/excavation equipment (e.g., mechanical backhoe or crane size/capacity and manufacturer; mechanical bucket type and capacity; number and size of barges and scows; etc.).
  - 2. Means and methods for sediment/soil stabilization, including planned location of stabilization activities, additives to be used (product, product source, and mix percentage), and stabilization production rate.
  - 3. Location within Work Area for Canal access for mobilization and demobilization of equipment, as well as for unloading of excavated sediments/soils and loading of excavation backfill materials.
  - 4. Dredging/excavation process steps, including means and methods of removing sediment from the Burnham Canal and transfer to the sediment stabilization area and/or trucks that will transport stabilized sediment to the designated disposal facility, including locations within Work Area where trucks will be staged for loading of stabilized sediment.
  - 5. Sequence of dredging/excavation operations.
  - 6. Measures to contain dredged/excavated sediments in the water column, protect uncontaminated areas, and decontaminate equipment following completion of dredging/excavation operations.
  - 7. Anticipated dredging/excavation rates.

8. Anticipated truck loading rate, and number and type of trucks to be used.
  9. Procedure for removal of debris encountered in dredging/excavation areas.
  10. Methods for achieving specified dredging depth and tolerance.
  11. Method of Contractor QC and QA bathymetry surveys.
  12. Means, methods, and equipment utilized to backfill dredged/excavated areas, and water conveyance channel area, including measures to demonstrate compliance with specified tolerances for backfill depth and/or elevation.
  13. Means and methods for placing the subaqueous aggregate, including equipment to be used, aggregate to be used (product, product source, gradation, and chemical analysis), and placement rate, including measures to demonstrate compliance with specified tolerances for cap and betterment thicknesses.
  14. Number of Contractor personnel including equipment operators, their specific roles and responsibilities, and qualifications to perform the work. Provide resumes of key staff.
  15. Anticipated schedule for operations, including daily working hours and number of days to be worked per week.
  16. Other information as needed to fully explain dredging and sediment stabilization means and methods, including those activities that will be self-performed and those that will be subcontracted.
- C. If changes are made, submittal shall be revised no later than five (5) days prior to project start. Re-submittals shall be made during course of construction if Work Plan is modified during construction.
- D. Submit for documentation: certificates and/or test results for one sample of each source material, indicating compliance with Specifications prior to start of construction. Engineer may take random samples or request additional information of the material upon delivery or placement to verify compliance with the Specifications.
- E. Daily Dredging, Water Conveyance Channel Construction, Capping, and Betterment Placement Reports:
1. Contractor shall submit reports summarizing daily dredging/excavation, water conveyance channel construction, capping, and betterment placement operations to the Engineer no later than 11:00 A.M. local time on the following work day. Daily Dredging/Excavation, Water Conveyance Channel Construction, Capping, and Betterment Placement Report shall contain:
    - a. Day and date of report
    - b. Project name
    - c. Weather conditions

- d. Location/area of dredging/excavation, water conveyance channel construction, capping, and betterment placement (i.e., a figure)
- e. Crew size and hours worked
- f. Approximate volume and character of materials dredged/excavated and capped, particularly any changes in sediment characteristics and/or debris encountered
- g. Approximate volume and character of materials placed
- h. Approximate volume, surface area, character of the stabilization layer, aggregate cap, and betterment
- i. Quality control depth soundings taken, including Canal surface water elevation.
- j. Quality control turbidity measurements and observations
- k. Accidents, spills, and mishaps, etc. and actions taken in response to these incidents
- l. Names of any visitors to the site
- m. Name of individual making report

F. Weekly Reports

- 1. In addition to the Daily Dredging/Excavation, Water Conveyance Channel Construction, Capping, and Betterment Placement Reports, Contractor shall also submit weekly reports summarizing progress, productivity, and monitoring data.
- 2. Construction drawings shall be utilized to reflect progress.
- 3. Transportation/disposal manifests and weight/truck tickets associated with stabilized sediment transported to the approved disposal facility during the previous week shall be included.

G. Surveys

- 1. Submit to the Engineer a listing of benchmarks and/or control points established at the site by Contractor, which National Geodetic Survey (NGS) monument(s) they are referenced to, and their horizontal and vertical positions. Implement the same grid and elevation reference presented on the Drawings.
- 2. The condition survey shown on the Contract Drawings was performed in 2017. The Contractor shall perform a new preconstruction survey prior to the start of Work. Submit preconstruction QA bathymetric survey to Engineer within 4 days following completion of survey.

3. Submit for Engineer verification final surveys of completed Work with quantity calculations for the following Work items:
    - a. Mechanical Dredging/Excavation
    - b. Backfill
    - c. Stabilization Layer
    - d. Subaqueous Aggregate Cap
    - e. Betterment Layer
  4. Survey submittals shall include electronic files in a format compatible with AutoCAD Civil3D software.
- H. Landfill Manifest: Engineer to provide Contractor with manifest for disposal to Owner approved Subtitle D landfill as special waste. Contractor shall provide Engineer with copy of the manifest from the landfill, as a receipt and acceptance of special wastes by the landfill.

#### 1.04 PERSONNEL REQUIREMENTS

- A. Provide competent personnel to perform the work. Personnel shall be trained and have prior experience using all of the equipment, meeting environmental requirements, and achieving dredging tolerance limits.

#### 1.05 PERFORMANCE REQUIREMENTS

- A. Excavation and grading shall be done without damage to adjacent property or structures and without interference to public pedestrian and vehicular traffic.
- B. Provide adequate backup systems to accomplish the earthwork.
- C. Contractor shall employ best management practices and conduct dredging operations in a manner to minimize turbidity in the Work Area and recontamination of dredged areas.
- D. Complete Work to required grades as indicated in the Contract Drawings (Sheet C045).
- E. Additional excavation/dredging may be required, based on sample results, as directed by Engineer in accordance with the Construction Quality Assurance Project Plan (CQAPP, Appendix C).

#### 1.06 PROJECT CONDITIONS

- A. Historical geotechnical investigations are provided in Appendix A and B. The sediment descriptions are representative of the subsurface conditions at the sample locations. Variations in the type of materials encountered may occur which do not differ materially from those indicated in this contract.
- B. Contractor shall be prepared to dig materials of varying nature and consistency, which may include hard materials. Contractor shall also expect debris within dredge prism.



Contractor must achieve required grades throughout the dredging area and must be able to do so efficiently with equipment mobilized for Work.

1. Debris should be expected during dredging. Debris is defined as any material other than sediment, such as logs, wood, metal, wire rope, cable, chain, steel bands, rocks, concrete debris, anchors, piling stubs, piling (loose on ground or driven vertically), timber training wall remains, lockers, desks, construction materials, and other miscellaneous materials that may be found in urban, industrial, and marine construction environments.
- C. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- D. Utility Locator Service: Notify Diggers Hotline and a private locator (as needed) for utility locates before beginning earth moving operations. Verify utility location by means of potholing and by hand, as necessary.
- E. Do not commence earth moving operations until temporary erosion and sedimentation control measures are in place.

#### 1.07 QUALITY CONTROL (QC) AND QUALITY ASSURANCE (QA)

- A. Comply with conditions and substantive requirements of all applicable permits, and permit equivalency.
- B. Dredging/Excavation and Backfilling/Capping/Betterment Placement equipment shall be equipped with real-time kinematic global positioning system (RTK GPS) equipment that continuously measures and records the horizontal and vertical position of the equipment in accordance with the following tolerance requirements, or as approved by the Engineer:
1. Horizontal Tolerance: 0.5 feet
  2. Vertical Tolerance: 0.2 feet
  3. Horizontal and vertical positions/elevations shall be referenced to National Geodetic Survey (NGS) monuments with a classification of 3rd Order, Class 1 or higher.
- C. Site control points shall be established from NGS monuments and be accurate within 0.05 feet horizontally and 0.01 feet vertically as determined by GPS equipment using static observations or by kinematic techniques.
1. Horizontal positions shall be referenced to the North American Datum of 1983 Harn Wisconsin Coordinate Reference System (WISCRS) Milwaukee County Feet.

2. Elevations shall be referenced to the City of Milwaukee Vertical Datum (CMVD).
    - a. The CMVD is equal to the National Geodetic Vertical Datum of 1929 (NVD 29) less 580.603 feet.
    - b. Site control points shall be clear of obstacles that may cause GPS multi-path problems or radio signal interference such as fences, buildings, and radio masts to the extent possible.
  3. Contractor shall demonstrate compliance with specified tolerance intervals once per day or as directed by Engineer, by calibration with a site benchmark or control point.
- D. Contractor QC Bathymetric Surveys:
1. Perform, at minimum, weekly QC bathymetric surveys to track progress in achieving target elevations.
- E. Contractor QA Bathymetric Surveys:
1. Perform and provide a pre- and post-dredging, water conveyance channel construction, capping, and betterment placement bathymetric survey(s).
  2. Bathymetric surveys shall be performed in accordance with US Army Corps of Engineers (USACE) Engineering Manual No. 1110-2-1003 (Engineering and Design – Hydrographic Surveying).
  3. Single or multi-beam surveys may be used, with surveying transects located between 10 and 25 feet apart. If there are portions of the project area that are not accessible for the marine survey equipment to access (i.e., water is too shallow), bathymetric measurements may be collected using conventional survey methods (e.g., a survey rod).
  4. If it is determined that the post-dredge QA bathymetric survey has not achieved the target design elevation in 90% or more of the work area, additional dredging will be performed to reach the target elevation. If additional dredging is performed, the post-dredge QA survey will be performed again.
  5. Multiple QA surveys may be performed as work progresses to identify/demonstrate progress and establish related pay quantities to facilitate monthly invoicing. If progress surveys overlap, pay quantity calculations shall clearly identify how surveys were utilized to calculate pay quantity to facilitate verification by Engineer.
  6. Engineer will observe QA surveys, and contractor shall provide 24-hour notice prior to performing survey.
- F. Sediment and Cap Confirmation Sampling:

1. Provide access and boat for Engineer to collect sediment confirmation samples for analysis of residual contaminant concentrations.

**PART 2 - PRODUCTS**

2.01 GENERAL SOIL MATERIALS

- A. Provide borrow soil materials when sufficient satisfactory soil materials are not available from Owner.

2.02 GENERAL BACKFILL

- A. Provide and place satisfactory soil material imported from offsite or reused from onsite (i.e., aggregate from debris management pad) for use as fill or to fill an excavation.

1. Satisfactory Soils:

- a. ASTM D2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, vegetation, and other deleterious matter.
- b. Imported material shall meet the chemical requirements prescribed in Figure 5 of the Construction Quality Assurance Project Plan (Appendix C).

2. Unsatisfactory Soils: ASTM D2487 soil classification groups GC, SC, MH, ML, CH, OL, OH, and PT, or a combination of these group symbols.

2.03 STABILIZATION LAYER, AGGREGATE CAP, AND FULL-THICKNESS BETTERMENT MATERIAL

- A. Furnish material from an approved borrow source as follows:

1. Aggregates that entirely pass the 1.5 inch sieve and no more than 15 percent passing the No. 200 sieve.
2. The total percentage of coal, clay lumps, shale, and other deleterious substances shall not exceed 3.0 percent by weight. There is no requirement to wash aggregate if produced otherwise to conform to all specified requirements. When used, the aggregate shall not contain any of the following: frozen material, and foreign material like wood, hay, burlap, paper, or dirt.

- B. The engineer may prohibit using aggregates from any source, plant, pit, quarry, or deposit if the character of the material or method of operation makes it unlikely to furnish aggregates conforming to specified requirements; or from deposits or formations known to produce unsound materials.

- C. Before use, furnish samples of materials from previously untested sources and from previously tested sources if the engineer requires.

- D. Imported material shall meet the chemical requirements prescribed in Figure 5 of the Construction Quality Assurance Project Plan (Appendix C).

2.04 CONVEYANCE CHANNEL LINING AND FULL-THICKNESS BETTERMENT TOPPING MATERIAL

- A. Furnish material from an approved borrow source conforming to the following WisDOT Specification Section 606, Select Crushed Material Spec:

SIEVE	PERCENT PASSING (by weight)
5-inch	90 – 100
1 ½-inch	20 – 50
No. 10	0 – 10

- B. The engineer may prohibit using aggregates from any source, plant, pit, quarry, or deposit if the character of the material or method of operation makes it unlikely to furnish aggregates conforming to specified requirements; or from deposits or formations known to produce unsound materials.
- C. Before use, furnish samples of materials from previously untested sources and from previously tested sources if the engineer requires.
- D. Imported material shall meet the chemical requirements prescribed in Figure 5 of the Construction Quality Assurance Project Plan (Appendix C).

2.05 RIPRAP

- A. Furnish durable field or quarry stone that is sound, hard, dense, resistant to the action of air and water, and free of seams, cracks, or other structural defects. Use stone pieces with a length and width no more than twice the thickness. Do not place material without the engineer's approval of the stone quality, size, and shape.
- B. The Engineer will determine the average dimension of stone pieces by averaging measurements of thickness, width, and length. Furnish stones conforming to the size requirements for the specified riprap.
- C. Minimum size requirements are expressed as the percent of the gross in-place riprap volume occupied by stones within average dimension size. Conform to the following gradation requirements, equivalent to WisDOT Specification Section 606, medium riprap:

ROCK SIZE (inches)	PERCENT PASSING (by weight)
18	70 – 100
14	50 – 70
10	35 – 50
3	2 – 10

- D. The contractor may substitute waste concrete slabs for stone. Furnish sound concrete, free of protruding reinforcement, and conforming to the size requirements specified for stone.

**2.06 TOPSOIL**

- A. Topsoil shall be approved by the Engineer and shall conform to the following:
  - 1. Topsoil shall be classified as a natural loam, sandy loam, silt loam, silty clay loam soil or clay loam (ASTM D2487) or as approved by Owner and/or Engineer.
  - 2. Contractor shall submit recent tests for imported topsoil or perform testing on topsoil material, and submit to Engineer for approval, prior to site delivery as follows:
    - a. Analyze for physical classification, percent organic matter, pH, chemical analysis as required by the Engineer, and available phosphorous, potassium, and nitrogen.
    - b. Use results to determine soil amendment requirements.
- B. Contractor shall provide Engineer a representative topsoil sample two weeks prior to delivery to site. Engineer may submit the sample for gradation (ASTM D422) and classification (ASTM D2487) to verify compliance with Technical Specifications

**PART 3 - EXECUTION****3.01 SEQUENCE OF OPERATIONS**

- A. Contractor shall provide sealed tailgates, truck bed liners, and/or absorbent material, as needed. Trucks must be covered with tarps prior to transporting materials.
- B. No material is allowed on streets, haul roads, or truck side rails of loaded trucks. If spillage occurs, Contractor shall immediately remove material from the clean surface(s).
- C. Contractor shall inspect entrances and adjacent public streets daily when traffic is occurring and remove tracked and eroded soils daily or as deemed necessary by Engineer with a street sweeper.
- D. Dredging operations shall be performed in a sequenced and logical manner as indicated in the Contractor's Work Plan.
- E. Engineer will collect post-dredge samples from the west end dredge area in accordance with sampling procedures outlined in the Construction Quality Assurance Project Plan (CQAPP) provided in Appendix C.
- E. After Engineer approval, place backfill in a timely fashion in areas as shown on Contract Drawings.

**3.02 PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

- B. Trucks shall be staged within the work area shown on the Contract Drawings and as indicated in the Contractor's Work Plan to be approved by the Engineer. Temporary staging of trucks on City of Milwaukee streets is not allowed.
- C. Dredged/excavated sediment must be adequately dewatered and/or stabilized prior to transportation for disposal per disposal requirements. Contractor shall provide truck bed liners, tarps, and/or absorbent material, as needed.
- D. Dredged/excavated sediments and debris may only be stockpiled within the upland portion of the excavation area or in a Work Area following construction of a containment system consisting of a bottom liner and perimeter dikes (sediment stabilization area), as approved by Engineer.
- E. Protect and maintain erosion and sedimentation controls during earth moving and placing operations.
- F. Provide controls necessary to limit the re-suspension of sediments within the water column during excavation and riprap, stabilization layer, cap and betterment placement.
- G. Environmental Protection:
  - 1. At least daily, inspect equipment for operating fluid leaks. Remove from service all equipment having fluid leaks in any system immediately.
  - 2. Provide necessary facilities to comply with Federal, State and local requirements concerning air, noise, and water pollution.
  - 3. Protect against discharge of any oils, fuels, bitumens, garbage, trash, sewage, or other materials which may be harmful to fish, wildlife, or vegetation into waters of the State. Should the Contractor spill, dump, lose, throw off the dredge or sink any material, plant, machinery or appliance, which in the opinion of the Engineer or Owner, may be dangerous to the environment or hazardous to navigation, the Contractor shall promptly recover or correct any fuel or oil leaks in equipment at Contractor expense.
- H. Contractor shall perform, as necessary, additional survey and layout to establish location, line, and grades for controlling the work.
- I. Vicinity Controls
  - 1. Storm water: Contractor is responsible for management of storm water and maintaining adequate berms and drainage to contain contact storm water runoff within limits of Site.
  - 2. Barrier Fencing: Place temporary construction fence around excavations, as necessary or if instructed by the Engineer or Owner.
  - 3. Dust Controls: Dust shall be kept to a minimum at all times. Appropriate engineering controls shall be maintained that include, but are not limited to, using a light water spray to minimize offsite migration of fugitive dust.

**3.03 SITE GRADING, GENERAL**

- A. Site Rough Grading: Slope grades to direct water away from buildings and excavations and to prevent ponding.
- B. Uniformly grade all areas to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.
- C. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- D. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- E. Flatten or shore and brace slopes as required to maintain stability.
- F. Manage removal of debris or other deleterious material encountered during excavation.
- G. Notify Engineer of unexpected subsurface conditions and discontinue work in affected area until notified to resume Work.
- H. Contractor shall remove/replace silt fence as necessary during excavation and grading operations.

**3.04 SUBGRADE INSPECTION**

- A. Notify Engineer when excavations or constructed surfaces have reached required subgrade.
- B. Engineer may take chemical analysis samples to document the material left in-place at the bottom of the excavation.
- C. If Engineer determines that unsatisfactory soil is present, continue excavation and/or replace with compacted backfill or fill material as directed.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Engineer, without additional compensation.

**3.05 DREDGING AND EXCAVATION**

- A. Contractor shall field locate and mark all underground public and private utilities.
- B. Excavation activities shall be sequenced to limit the amount of open excavation for the duration of project. Excavations shall be sloped or shored as required to maintain stability.
- C. Prior to excavating soils on the west end of the canal, riprap shall be salvaged and stockpiled onsite to be used during site restoration.
- D. The dredging must be performed by wet excavation with a dredge equipped with an environmental bucket or other approved bucket. Means and methods shall be provided to

move dredged sediments to upland stabilization area or on-water barge for stabilization as approved by Engineer.

E. Dredging Limits and Target Depth:

1. The dredge area limits and approximate thicknesses are shown on Contract Drawings.
2. Preserve stable side slopes and avoid leaving residual sediment above the target elevations in any areas where dredging has been performed.
3. If it is determined that the post-dredge QA bathymetric survey has not achieved the target design elevation in 90% or more of the work area, additional dredging will be performed to reach the target elevation.
4. If it is determined that additional dredging required to achieve removal objective of the west end dredge area, additional dredging will be performed in accordance with CQAPP (Appendix C).

F. Dredging Operations:

1. When working at night, Contractor shall provide and maintain adequate lighting from sunset to sunrise to allow for safe and proper observation and control of dredging operations.
2. Do not disturb sediments outside the dredge area.
3. Immediately stop dredging and notify the Engineer in the event that something is encountered which is unanticipated or outside the scope of this specification.
  - a. If debris is encountered when dredging, it is expected that this material will be left in place to the extent possible, unless it interferes with dredging. Debris removed from the Canal must be handled in accordance with the Mechanical Dredging/Excavation Plan and not returned to the Canal.
4. The Engineer will be present on site during dredging activities.
5. Blasting will not be permitted.
6. Unless otherwise directed, dredge in a manner that prevents sloughing of impacted sediments into dredged areas.
7. Control dredge speed and operations to minimize the re-suspension of sediment into the water column and to minimize the settling out of re-suspended solids in areas previously dredged.
8. Overlap dredge cuts to avoid leaving ridges or windrows of impacted sediments between adjacent cuts.



9. Establish final sideslopes to preconstruction line and grade and assures stability and to avoid subsequent sloughing of residual material.
10. For all dredging, the Contractor shall complete each cycle of the bucket and shall not stockpile material in the water. Leveling of the completed dredging surface by dragging a beam or the environmental bucket is not permitted.

### 3.06 STORAGE OF SOIL MATERIALS AND STOCKPILING

- A. Stockpile materials onsite at locations approved by the Engineer and as indicated in Contract Documents.
- B. Stockpile in sufficient quantities to meet project schedule and requirements.
- C. Dredged sediment stockpiles not actively being worked by the Contractor for a period of 24 hours shall be covered with minimum 12-mil thick temporary plastic or as directed by the Engineer.
- D. Separate differing materials and stockpile apart to prevent mixing.
- E. Direct storm water away from stockpile sites to prevent erosion or deterioration of materials and to minimize generation of contact water.

### 3.07 GENERAL BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
  1. Remaining conditions samples collected by Engineer.
  2. Surveying locations of underground utilities and historical structures for Record Documents.
  3. Removing trash and debris.
  4. Removing temporary shoring and bracing, and sheeting.
  5. Backfill excavations below the groundwater table with select crushed material prior to placement and compaction of general backfill above the water line.
- B. Place backfill on subgrades free of mud, water, frost, snow, or ice.
- C. Imported backfill materials shall be preapproved by the Engineer before delivery to the site.
- D. Materials placed which are not conforming to the Technical Specifications, shall be reworked or removed. Replacement material and fill surfaces upon which it is placed shall conform to all requirements of this specification. All reworking or removal and replacement will be performed at Contractor's expense.
- E. Mechanical tamping around structures (e.g. CSO outfall) shall be done in no greater than 6-inch thick lifts unless below the waterline.

## F.      Compaction of Soil Backfills and Fills

1.      Place in layers in essentially horizontal lifts not more than 12-inches in loose depth for material compacted by heavy compaction equipment, and not more than 6-inches in loose depth for material compacted by hand-operated tampers.
2.      Place evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
3.      Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

## 3.08    STABILIZATION LAYER, SUBAQUEOUS AGGREGATE CAP, AND BETTERMENT MATERIAL

## A.      Contractor shall place the stabilization layer, subaqueous aggregate cap, and betterment material in a controlled manner to prevent bearing capacity failure of the Canal sediments.

1.      The Contractor shall use low impact backfill placement methods, as approved by Engineer.
2.      The placement of the stabilization layer, subaqueous aggregate cap, and betterment material shall be conducted in a careful and well-executed manner to avoid displacing the subsurface sediment. In defined areas of the site, completion of the stabilization layer will be documented before placing the cap layer, and completion of the cap layer will be documented before placing the betterment layer.
3.      Place material in several thin lifts as necessary to stabilize the sediment surface and reach final cap and betterment thickness. Material placement rates will be controlled to place discrete lifts. The initial lift shall be no greater than six inches. Subsequent lift thickness may be increased based on Remedial Contractor performance and observations of the Engineer.
4.      During placement of materials, monitor site conditions to assure the material placement is stabilizing the sediment or accumulating on the stabilized sediment surface in a controlled fashion. Modify placement techniques, or grain size ratios of the stabilization, cap, or betterment materials may require adjustments, based on observed field conditions. Suspend material placement if the observed effects of material placement is not promoting cap and betterment construction.
5.      In addition to providing cap and betterment support, the intent of the stabilization layer is to prevent canal sediment from reaching the aggregate cap. Placement of the stabilization layer will be complete when the stabilization layer adequately prevents the upward migration of canal sediment as determined by the Engineer.
6.      Monitor sediment strength as necessary to minimize and address the potential effects of sloughing, sudden settlement, and mixing of the Canal sediments.

7. Contractor will not be compensated for placement of stabilization, cap, or betterment materials using methods that are not approved by Engineer. Additionally, if sloughing, sudden settlement, and/or mixing of the Canal sediments results from placement methods that are not approved, Contractor will remedy the effects of the un-approved Work at no cost to others, including replacement of lost materials.
- B. Utilize equipment necessary to provide specified stabilization layer, aggregate cap, and betterment layer including, but not limited to:
1. Direct placement with a mechanical clamshell bucket
  2. Surface release from a barge or hopper
  3. Spreading with hydraulic pipeline and baffle box or plate
  4. Submerged diffuser or tremie
  5. Washing off barge with high powered jet

### 3.09 RIPRAP

- A. Place riprap by mechanical means that produce a completed job within tolerances of the Contract Documents. Placement of riprap shall be conducted in a careful and well-executed manner to avoid displacing or penetrating the betterment fill, subaqueous aggregate cap, and underlying sediment. Limit handwork to the amount necessary to fill large voids or to correct segregated areas.
- B. Place riprap over geotextile fabric, as specified in the Contract Documents.
- C. Unless specified otherwise, make riprap at least 18-inches thick.

### 3.10 PROTECTION

- A. Protecting Graded Upland Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by the Engineer; reshape and recompact.
- C. Where settling occurs that adversely diminishes the performance of the cap or betterment, and before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
- D. Restore appearance, quality, and condition of finished upland surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### 3.11 EXCAVATED SEDIMENT STABILIZATION

- A. Contractor shall provide means and methods to stabilize dredged/excavated sediment to meet disposal and handling requirements. Stabilization methods may be passive (e.g., gravity dewatering in a stockpile) or active (e.g., blending with solidification additives such as Portland cement or lime). Dust shall be controlled if additives are used. Upland sediment stabilization areas shall be lined to prevent contact of dredged/excavated sediment with upland soils, and to control and capture sediment contact water for treatment. Dredged/excavated sediment stabilization, if performed in contractor work barge or scow or within the excavation area, must be done in a controlled manner to prevent releases to the Canal.
- B. Cover stabilized sediment stockpiles at the end of each work day with plastic covers or other approved materials to prevent precipitation from entering the dewatered sediment if large amounts of precipitation are anticipated and if the stabilized sediment is not sloped to shed water.

### 3.12 TOLERANCES

- A. Dredging/Excavation Tolerance
  1. Complete Work to required grades as indicated in the Contract Documents.
  2. Existing bathymetry (top of sediment) and dredge target elevations are shown on the Contract Drawings. Estimated dredge quantities are shown on the Bid Form. These are estimates only, and payment will be made for actual quantities based on pre- and post-dredge QA bathymetric surveys.
  3. Contractor is allowed up to 0.5 feet of dredge overcut beyond the target elevations.
  4. Over-dredging greater than 0.5 feet below target elevations, based on QA bathymetry surveys, will not be compensated. Further, landfill disposal tonnage corresponding to dredging below the 0.5-foot over-dredge allowance will be deducted from Contractor's payment, including an applicable swell factor due to stabilization.
  5. Dredging of sediments/soil will be considered complete when sediments have been removed to target elevations (or a maximum of 6 inches below target elevation), QA bathymetry surveys have been performed, post-dredge samples have been collected and analyzed for comparison to target concentrations, and the Engineer approves the Contractor to proceed with backfilling.
- B. Stabilization Layer Tolerance:
  1. Place material in a controlled manner to stabilize the sediment. Monitor placement to identify when sediment surface is adequately stabilized by the aggregate for cap placement to proceed without sediment displacement and as determined by the Engineer.
- C. Subaqueous Aggregate Cap Tolerance:

1. Tolerance on 1-foot thick aggregate cap is plus or minus 0.25 feet. The average of the measured cap thickness must be no less than 12-inches thick (subject to referenced tolerance).
  2. Construct aggregate cap surface with slopes no steeper than 4H:1V.
- D. Water Conveyance Channel Tolerance:
1. Tolerance on 2-foot thick channel lining is plus or minus 0.25 feet.
  2. Construct water conveyance channel side slopes no steeper than 4H:1V.
- E. Full-Thickness Betterment Layers Tolerance:
1. Tolerance on full-thickness betterment layers, including 4.5-foot betterment layer and 0.5-foot betterment topping, to be placed over the aggregate cap surface is plus or minus 0.25 feet.
  2. Construct full-thickness betterment surface with slopes no steeper than 4H:1V.

### 3.13 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property. Impacted materials shall be disposed at the designated Subtitle D landfill.
- B. Sediment in areas identified on the Contract Drawings to be excavated may be dredged/excavated and stabilized together.
- C. Sediment must be stabilized before loading into trucks so that it contains no free liquids (i.e., passes paint filter testing, SW846 Method 9095A). Further, stabilized sediment must be "workable" and meet any landfill prescribed physical criteria, including strength and friction angle requirements.
- D. Contractor shall load sediment into appropriate and licensed trucks, and transport sediment to an approved landfill. Contractor shall provide sealed tailgates, truck bed liners and/or absorbent material, as needed. Trucks must be covered with tarps prior to leaving the site.
- E. Engineer may collect samples of stabilized sediment, and perform QA paint filter testing.

### 3.14 CLEANUP

- A. Upon completion of the Work, pressure-wash all equipment that has handled or made contact with contaminated sediments, including, but not limited to, the excavation bucket, material barge, stabilization equipment, and upland stabilization area. Wash water shall be appropriately handled and disposed, and material residue (solids) shall be disposed with the stabilized sediments.

- B. All marine equipment removed from the Canal shall be cleaned in accordance with WDNR requirements before leaving the site to prevent the spread of viral hemorrhagic septicemia (VHS) and invasive species.
- C. Contact the Engineer for inspection and approval of intermediate and final clean-up of equipment and work areas. Engineer approval does not relieve Contractor from laws governing proper marine equipment clean-up.

**END OF SECTION**

## **SECTION 02415 GEOTEXTILE**

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### **PART 1 - GENERAL**

#### **1.01 WORK INCLUDES**

- A. As necessary, furnish all labor, materials, tools, supervision, transportation, and installation equipment necessary for installation of geosynthetic fabrics, as specified herein, under riprap.

#### **1.02 REFERENCES**

- A. Latest edition of the ASTM International standards:
  1. ASTM D123 Standard Terminology Relating to Textiles
  2. ASTM D276 Standard Test Methods for Identification of Fibers in Textiles
  3. ASTM D4354 Standard Practice for Sampling of Geosynthetics for Testing
  4. ASTM D4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
  5. ASTM D4439 Standard Terminology for Geosynthetics
  6. ASTM D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity
  7. ASTM D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles
  8. ASTM D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
  9. ASTM D4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile
  10. ASTM D4759 Standard Practice for Determining the Specification Conformance of Geosynthetics
  11. ASTM D4833 Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
  12. ASTM D4873 Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples
  13. ASTM D5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles

- B. Geosynthetic Accreditation Institute - Laboratory Accreditation Program (GAI-LAP).
- C. International Standards Organization (ISO) 9002 - Quality System Certification.

### 1.03 DEFINITIONS

- A. Minimum Average Roll Value (MARV): Property value calculated as typical minus two standard deviations. Statistically, it yields a 97.7 percent degree of confidence that any sample taken during quality assurance testing will exceed value reported.
- B. Typical Roll Value: Property value calculated from average or mean obtained from test data.

### 1.04 SUBMITTALS

- A. The Contractor shall provide the Engineer a certificate stating the name of the geotextile manufacturer, product name, style, chemical compositions of filaments or yarns and other pertinent information to fully describe the geotextile.
- B. The Manufacturer is responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the specification. Documentation describing the quality control program shall be made available upon request.
- C. The Manufacturer shall provide a geotextile sample, list of minimum property values and a manufacturer's certificate that states the furnished geotextile meets MARV requirements of the specification as evaluated under the manufacturer's quality control program. The certificate shall be attested to by a person having legal authority to bind the Manufacturer. Manufacturing Quality Control (MQC) test results shall be provided upon request.

### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Geotextile labeling, shipment and storage shall follow ASTM D 4873.
- B. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.
- C. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.
- D. Each geotextile roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.
- E. The protective wrapping shall be maintained during periods of shipment and storage. If the wrapping is damaged prior to installation, the outer wrap of geotextile material must be discarded before installation.
- F. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: Site construction damage, extended exposure to ultraviolet (UV) radiation, precipitation, chemicals that are strong acids or strong bases, flames, sparks, temperatures in excess of 71 deg C (160 deg F) and any other environmental condition that might damage the geotextile.



**1.06 QUALITY ASSURANCE SAMPLING, TESTING, AND ACCEPTANCE****A. Geotextile:**

1. Geotextiles shall be subject to sampling and testing to verify conformance with this specification. Sampling for testing shall be in accordance with ASTM D 4354.
2. Acceptance shall be in accordance with ASTM D 4759 based on testing of either conformance samples obtained using Procedure A of ASTM D 4354, or based on manufacturer's certifications and testing of quality control samples obtained using Procedure B of ASTM D 4354.

**B. Sewn Seams:**

1. Field Seams: The Contractor shall provide at least a 6 foot length of sewn seam for sampling by the Engineer before the geotextile is installed.
2. Factory Seams: The Engineer shall obtain samples of the factory seams at random from the roll of geotextile that is to be used on the project.
3. If seams are to be sewn in both directions, samples of seams from both directions shall be provided.
4. For seams that are field sewn, the seams sewn for sampling shall be sewn using the same equipment and procedures as will be used for the production seams.
5. The seam assembly description shall be submitted by the Contractor along with the sample of the seam. The description shall include the seam type, sewing thread, and stitch density.

**PART 2 - PRODUCTS****2.01 MATERIALS****A. Geotextile:**

1. Furnish geotextile fabric of 16 ounce per square yard nonwoven polyester, polypropylene, stabilized nylon, polyethylene, or polyvinylidene chloride. All fabric shall have the minimum strength values in the weakest primary direction. The contractor shall use nonwoven fabric that is one or a combination of the following: needle punched, heat bonded, or resin bonded.
2. Resistant to ultraviolet degradation and biological and chemical environments normally found in soils.
3. Quality Control: Manufacturing Quality Control: Testing shall be performed at a laboratory accredited by GAI-LAP for tests required for the geotextile, at frequency exceeding ASTM D 4354, with following minimum acceptable testing frequency:

Property	Test Method	Value
Minimum Grab Tensile Strength	ASTM D 4632	315 lb.
Minimum Puncture Strength	ASTM D 4833	240 lb.
Minimum Apparent Breaking Elongation	ASTM D 4632	50%
Maximum Apparent Opening Size	ASTM D 4751	No. 100
Minimum Permittivity	ASTM D 4491	0.57/sec

- B. Furnish geotextile fabric that is insect, rodent, mildew, and rot resistant.
- C. Furnish the geotextile fabric in a wrapping that protects the fabric from ultraviolet radiation and from abrasion due to shipping and hauling. Keep the geotextile dry until installed.
- D. Clearly mark the geotextile fabric rolls to show the type of fabric.
- E. The Engineer may obtain samples of fabric for testing from the job site as specified below, or as the Engineer determines.
- F. If using sewn seams, furnish a field sewn seam sample produced from the geotextile fabric and thread and with the equipment proposing to use on the project, before incorporating into the work.
- G. Sewing Thread:
  - 1. Sewing thread shall consist of high strength polypropylene or polyester (Nylon shall not be used).
  - 2. The thread shall be of a contrasting color to the geotextile.

### **PART 3 - EXECUTION**

#### **3.01 PREPARATION**

- A. Prepare surfaces to receive geotextile to smooth condition as indicated or as directed by Engineer.
- B. Fill depressions; remove debris and obstructions that could damage the geotextile.

#### **3.02 INSTALLATION**

- A. Install geotextile at the elevations and alignment as indicated in the Contract Drawings.
- B. On side slopes, anchor geotextile at top, then unroll to prevent wrinkles and folds.
- C. Cross seams (i.e. seams which join the ends of contiguous panels) shall not be placed on any slopes that exceed 10% grade.

- D. Use sandbags or equivalent to provide resistance against wind uplift.
- E. Overlap fabric edges a minimum of 4 inches and field seam. Alternatively, overlap a minimum of 1 foot if not seamed.

3.03 PROTECTION

- A. Atmospheric exposure of the geotextile to the elements following laydown shall be limited to 14 days to prevent damage.
- B. Vehicles and construction equipment shall not be operated directly over installed geosynthetics without approval of the Engineer.

**END OF SECTION**

## SECTION 02930 SEEDING

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### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Preparation of subsoil
- B. Placing salvaged and imported topsoil
- C. Seeding
- D. Herbicides/pesticides
- E. Mulching/Erosion Control Mat
- F. Fertilizing
- G. Maintenance

#### 1.02 REFERENCES

- A. State of Wisconsin, Department of Transportation (WisDOT), Standard Specifications for Highway and Structure Construction, current edition.
- B. Federal Seed Act. Importation of seed and screening under the federal seed act. Animal and plant health inspection service. U.S. Department of Agriculture. Code of Federal Regulations. 7 CFR 361.

#### 1.03 WORK INCLUDES

- A. Furnish all labor, materials, tools, supervision, transportation, and installation equipment necessary for seeding all disturbed areas within the Work Area, as specified herein, and as shown on Contract Drawings.

#### 1.04 DEFINITIONS

- A. Weeds: Vegetative species, other than specified species, established in given area.

#### 1.05 QUALITY ASSURANCE

- A. Seed
  - 1. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging and location of packaging. Containers or packages shall be new and unopened.
  - 2. Seed shall not be used one year later than the test date appearing on the label.

- B. Fertilizer
  - 1. Each container shall be plainly marked with the analysis of the contents showing the minimum percentages of total nitrogen, available phosphorous, and soluble potash. Containers or packages shall be new and unopened.
- C. Seeding Contractor's Qualifications:
  - 1. The work of this section shall be performed by a qualified Contractor specializing in seeding and maintenance procedures for native species.
  - 2. The Seeding Contractor shall have a minimum of three years of experience in seeding and maintaining similar projects.

1.06 REGULATORY REQUIREMENTS

- A. Comply with applicable regulations for fertilizer and herbicide composition and application. Include evidence of compliance from applicable agencies having jurisdiction over herbicide/pesticide application and copies of applicator's current license.
- B. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Grass seed shall be provided in supplier's sealed water-tight/rodent proof containers labeled in accordance with Federal Seed Act. Seed in damaged containers is not acceptable.
- B. Contractor shall store and protect products. Deliver materials at time of application. Do not store on site.
- C. Contractor shall deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.08 SUBMITTALS

- A. Product Data: Submit data for seed mix, fertilizer, mulch, and other accessories at least 5 working days prior to use.
  - 1. Topsoil: Provide data on imported topsoil. Imported topsoil shall be tested as specified to verify compliance with specified requirements. The testing results shall include recommended fertilizer application rates.
  - 2. Seed: Provide data on seed mixture showing name of seed supply Owner and percentage of seed mix.
  - 3. Fertilizer: Provide data on fertilizer showing type, manufacturer, and composition.
  - 4. Herbicides/pesticides: Provide data on herbicides/pesticides.

- 5. Mulch: Provide data on mulch including supplier and assurance that mulch is free of weed seeds.
- 6. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.09 WARRANTY

- A. Contractor shall warranty growth for a period of 1 year following planting.

**PART 2 - PRODUCTS**

2.01 SEED MIXTURE

- A. Seed shall comply with the requirements of Section 630 of the WisDOT Standard Specifications for Highway and Structure Construction.
- B. WisDOT Seed Mix No. 40: proportion by weight as below.

Species	Percent Germination	Percent Mixture
Kentucky Bluegrass	85	35
Red Fescue	85	20
Hard Fescue	85	20
Improved Fine Perennial Ryegrass	85	25
<b>Total</b>		<b>100</b>

2.02 SOIL MATERIALS

- A. New or imported topsoil shall meet the requirements of Paragraph 625.2 (1) of the WisDOT Standard Specifications for Highway and Structure Construction; free of objectionable debris such as sod, stones, roots and twigs.
- B. Salvaged topsoil shall meet the requirements of Paragraph 625.2 of the applicable WisDOT Standard Specifications; free of objectionable debris such as sod, stones, roots and twigs.

2.03 MULCHES (Slopes less than 3%)

- A. Straw
  - 1. Provide stalks from oats, wheat, rye, barley or rice that are free of weeds, mold, or other objectionable material.
  - 2. Straw shall be in an air-dry condition and suitable for placing with commercial mulch blowing equipment.

B. Cellulose Fiber

1. Provide cellulose fiber for use with hydraulic application of grass seed and fertilizer consisting of 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 materials. Provide wood cellulose fiber containing not more than 12 percent moisture on an air-dry weight basis, plus or minus 3 percent at time of manufacture, with a pH range from 3.5 to 5.0. Provide wood cellulose fiber manufactured so that:
  - a. After addition and agitation in slurry tanks with fertilizers, grass seeds, water and other approved additives, the fibers in the material will become uniformly suspended to form a homogeneous slurry.
  - b. When hydraulically sprayed on the ground, the materials will form a cover impregnated uniformly with grass seed.
  - c. The cover will allow the absorption of moisture and allow rainfall or applied water to percolate to the underlying soil.

2.04 EROSION CONTROL MATTING (Slopes greater than 7%)

- A. Provide a product that exhibits the following properties: 100 Percent degradable composition (photo-degradable, bio-degradable) sufficient to stabilize 4H:1V (maximum) slopes, such as North American Green S150 or similar.
- B. Erosion control mat (ECM) shall conform to the requirements of the WisDOT Product Acceptability List (PAL) for Erosion Control Revegetative Mat (ECRM).
- C. Anchoring devices shall be biodegradable. Anchoring devices shall substantially degrade within 3 to 6 months during warm soil conditions. Steel wire pins or staples shall not be allowed.
- D. Netting shall be bonded sufficiently to the parent material for the life of the product.

2.05 ACCESSORIES

- A. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.
- B. Fertilizer: Granular, slow release type meeting the following requirements, or other as approved by Engineer:
  1. Nitrogen 20%
  2. Phosphoric Acid 0%
  3. Potash 3%

**PART 3 - EXECUTION****3.01 SEEDING**

- A. Prepared seedbed areas shall be inspected and approved by Engineer and/or Owner prior to seeding. Failure to comply may result in rejection of seeding work.
- B. Apply seed at rate of 2 lbs per 1000 sq. ft., evenly.
- C. Do not seed areas in excess of that which can be mulched on same day.
- D. Planting Seasons: Spring, April 1st through June 1st; Fall, August 15th through October 1st. Seeding outside the specified time periods requires written approval from Engineer.
- E. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.
- F. Roll seeded area with roller not exceeding 150 lbs./linear foot.
- G. Immediately following seeding and compacting, apply mulch to thickness of 1/8 inch. Maintain clear of shrubs and trees. All straw mulch material is to be machine crimped into topsoil.
- H. Apply water with fine spray immediately after each area has been mulched. Saturate soil to depth of 4-inches.
- I. Seeding shall comply with the requirements of Section 630 of the WisDOT Standard Specifications for Highway and Structure Construction.
- J. Seed may be sown by either Method A or Method B as defined in Section 630.3.3 of the WisDOT Standard Specifications. Preferred equipment for Method A shall be a multi-packer type seeder. Light rolling or compacting will be required after seeding by Method A if it is not accomplished by the seeding equipment.

**3.02 FERTILIZING**

- A. Apply fertilizer at a rate recommended by manufacturer.
- B. Do not apply fertilizer at same time or with same machine used to apply seed.
- C. Mix fertilizer thoroughly into upper 2 inches of topsoil.
- D. Comply with the requirements of Section 629 of the WisDOT Standard Specifications for Highway and Structure Construction.

**3.03 MULCH (Slopes less than 3%)**

- A. Mulch seeded areas where erosion mat will not be placed (areas with less than 3% slope). Mulch must be free of weeds. Hand spread or power blow mulch to uniformly cover seeded surface. Seat mulch into subgrade using crimp-mulching technique. Use construction methods specified in Section 627 of the WisDOT Standard Specifications for Highway and Structure Construction.



3.04 EROSION CONTROL MATTING (Slopes greater than 3%)

- A. The application area shall be inspected prior to the installation of the ECM to verify it is properly graded, compacted and generally free of ruts and projecting stones or clods. The surface shall be seeded prior to the placement of the ECM as specified in this section.
- B. The Contractor shall place the ECM as recommended by the manufacturer. The ECM shall be laid on the prepared base in the direction of flow without wrinkles, folds and minimal void spaces between the ECM and the ground surface. Successive sheets of ECM shall be overlapped a minimum of 12-inches, with the upstream sheet overlapping the downstream. Longitudinal overlaps must be a minimum of 4-inches along the overlap length. Anchoring shall include the use of trenches and fasteners that are biodegradable.
- C. The ECM shall be inspected and approved by the Engineer after installation. Damaged sections shall be repaired immediately with a patch of the same material of sufficient size to permit attaching to or anchoring through the parent blanket beyond the damaged area at the Contractors cost.

3.05 ESTABLISHMENT

- A. Establishment Period shall be one year.
- B. Acceptable Establishment: At the end of the establishment period the grass shall be healthy, uniform in density and color, and substantially free of weeds with uniform coverage of at least 70 percent of a representative one square yard plot and bare spots not exceeding 6 inches by 6 inches.
- C. Re-seed areas that fail to grow within Establishment Period.
- D. Repair washouts or gullies that occur during Establishment Period.
- E. Protect all seeded areas with temporary warning signs, fences, etc. to prevent trampling and/or damage during Establishment Period.

3.06 FINAL ACCEPTANCE

- A. Payment for seeding will be based on the Acceptable Establishment. If Acceptable Establishment is not produced within the Establishment Period, Owner or Engineer reserves right to perform seeding and cost of this work will be deducted from the Contract.

**END OF SECTION**

## **SECTION 02940 SITE RESTORATION**

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### **PART 1 - GENERAL**

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. General Site Restoration.
  - 2. Final Erosion Controls and Final Cleanup.

#### 1.02 REFERENCES

- A. State of Wisconsin, Department of Transportation, (WisDOT) Standard Specifications for Highway and Structure Construction (SSHSC), current edition.

### **PART 2 - PRODUCTS (Not Used)**

### **PART 3 - EXECUTION**

#### 3.01 GENERAL SITE RESTORATION

- A. Restore sidewalk, topsoil, landscaping, fencing, roads, and utilities which are disturbed during the performance of the Work to preconstruction condition, as necessary and as directed by Engineer.
- B. Place riprap along shore where riprap was disturbed for soil and sediment excavation activities.
- C. Install riprap apron at the Milwaukee Metropolitan Sewer District (MMSD) discharge point for the combined sewer outfall CSO-211, located at the west end of the Canal, as shown on the Contract Documents.
- D. Contractor to remove the tracking pads, debris/soil management areas, and surface water diversion berms. Transport impacted materials to the landfill as special waste, and non-impacted material to be reused as backfill within the Remediation and Betterment Area, as directed by Engineer. Geotextile shall be transported to an approved construction landfill as construction debris, unless impacted to be disposed as special waste at approved landfill, as directed by Engineer.

#### 3.02 FINAL EROSION CONTROLS AND FINAL CLEANUP

- A. Restore pavement, topsoil, landscaping, and utilities which are disturbed during the performance of the Work to preconstruction condition.
- B. Contractor shall remove and dispose of the tracking pad(s), upland sediment stabilization area, decontamination area, access road, and other soil or gravel material used during construction activities. These materials shall be transported to an approved waste disposal facility.

- C. Contractor shall remove and transport sediment stabilization area liner components, and other project wastes (e.g., silt fence, turbidity curtain, etc.), as necessary to an approved waste disposal facility as construction debris.
- D. Streets or drives adjacent to the site shall be swept and/or high pressure washed to remove any residuals, dust or debris.
- E. Trash, rubbish or other debris shall be removed and transported off-site for disposal.
- F. Contractor to remove the silt fence used during placement of backfill, cap, and betterment material and install interim site restoration silt fencing, as shown on the Contract Drawings.
- G. Contractor to remove inlet protection above the storm sewer catch basins following completion of interim grades at the site.
- H. Contractor shall correct, at no expense to the Owner, any damage to buildings, telephone or other cables, overhead and underground utilities or their structures as a result of his construction, whether or not the item is shown on the Contract Drawings.
- I. All Contractor equipment and materials shall be removed from the site.

**END OF SECTION**

## **APPENDIX C**

### **HEALTH & SAFETY PLAN**

# SITE-SPECIFIC HEALTH AND SAFETY PLAN

**BURNHAM CANAL SUPERFUND ALTERNATIVE SITE  
MILWAUKEE, MILWAUKEE COUNTY, WISCONSIN  
EPA ID: WIN000510222**

**Miller Compressing Company  
1640 West Bruce Street  
Milwaukee, WI 53204**

August 2020

O'BRIEN & GERE ENGINEERS, INC.

SECTION A HEALTH AND SAFETY PLAN SUMMARY

A copy of this Health and Safety Plan (HASP) will be maintained on site during field activities and updated as determined necessary by the Project Manager.

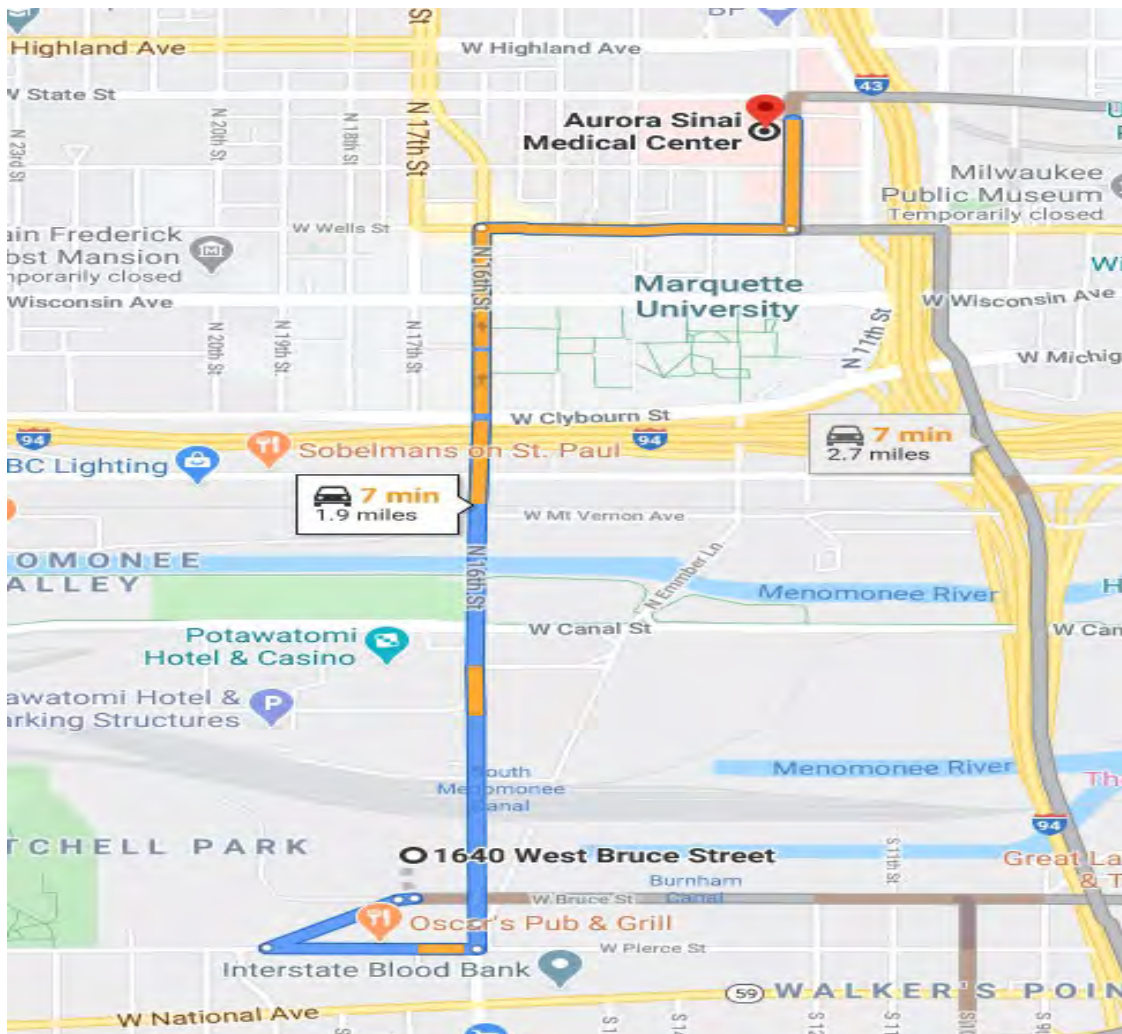
SITE INFORMATION

**Site Address:** 1640 West Bruce Street, Milwaukee, WI 53204  
**Municipality / County:** Milwaukee County  
**Major Cross Roads and/or Geographic Features:** W Bruce Street and S Muskego Ave

HOSPITAL INFORMATION

**Hospital Name:** Aurora Sinai Medical Center  
**Hospital Address:** 945 North 12th Street, Milwaukee, WI 53233

Route to Hospital Map, detailed description on next page



**HOSPITAL ROUTE DESCRIPTION (ALL SITE PERSONNEL MUST DRIVE THE HOSPITAL ROUTE)**

1. Head west on West Bruce Street toward West Reynolds Place
2. West Bruce Street turns slightly left and becomes West Reynolds Place
3. Sharp left onto West Pierce Street
4. Turn left onto South Muskego Avenue
5. Continue onto North 16th Street
6. Turn right onto West Wells Street
7. Turn left onto North 12th Street. The hospital will be on the left.

**Activity(s):**

Construction quality assurance including sediment poling and sediment/soil sampling; and oversight during Burnham Canal remedial action. Sampling and water quality monitoring will likely occur by boat.

**Description of Site:**

The canal is surrounded by industrial buildings. Miller Compressing Co. resides along the west and north sides of the canal up to the 11th Street bridge. Miller is a metals recycling facility.

Contaminants of concern in the sediment and soils on the west end of the canal include copper (metals) and polycyclic aromatic hydrocarbons (PAHs). Typical routes of exposure include inhalation, ingestion, dermal, and injection (eye contact).

**Health/Safety Hazards on Site:**

Chemical / Material	Media	Maximum Concentration	Routes of Exposure
Metals and PAHs	Sediment, soil, and surface water	Unknown	inhalation, ingestion, dermal, and injection (eye contact)

Safety data sheets (SDS) for chemicals and materials anticipated on site are provided in Appendix A. New chemicals or materials brought on site must be accompanied by an SDS and be approved by the Project Manager (PM) and/or the Site Safety Leader (SSL).

**Protective Equipment/Instruments:**

In general, personal protective equipment (PPE) will be used as specified on Table 1 for the anticipated project tasks. The project manager may require additional PPE based on field conditions or additional data collection.

Air monitoring for particulates and naphthalene will be performed during entire duration the excavation of soil and sediments. Air monitoring for particulates will be performed using a DataRAM 4 or similar instrument to measure particulate matter less than 10 micrometers in diameter (PM₁₀) concentration in the breathing and work zones. PM₁₀ concentration to be below the National Ambient Air Quality Standards of 0.15 mg/m³. Engineering controls will be taken to mitigate particulates if particulate concentrations exceed 0.15 mg/m³. Air monitoring for volatile organic compounds (VOCs) will be performed using a photoionization detector (PID), MiniRae 2000 or similar instrument, to measure total VOC concentrations. Note both the DataRam dust monitor and MiniRae PID are hand held portable instruments which will be used by the SSL to monitor for worker exposure in the breathing and work zones.

If additional field activities (drilling, test pit, soil sampling) are to be performed this HASP may be

amended to include additional appropriate air monitoring.

**Safety Equipment:**

Fire extinguisher and first aid kit in OBG field vehicles and in the field office trailer.

**EMERGENCY CONTACT LIST**

	<b>Agency Name and Address (if applicable)</b>	<b>Contact Number(s)</b>
<b>Fire Dept:</b>	Milwaukee Fire Department	911 / 414.286.8948
<b>Police:</b>	Milwaukee Police Department	911 / 414.933.4444-
<b>Sheriff:</b>	Milwaukee County Sheriff's Department	911 / 414.454.4080
<b>Local Utilities:</b>	Diggers Hotline (Wisconsin)	877.500.9592 emergency only 800.242.8511
<b>OBG PM</b>  <b>SSL</b>	Todd Lewis Email:  To Be Determined at Start of Work	773.796.4608 office 708.870.0531 cellular
<b>Ambulance</b>	911	911
<b>Hospital:</b>	Aurora St. Luke's Medical Center 945 North 12 th Street Milwaukee, WI 53233	911 Emergency General (414) 219-2000 Emergency Center (if Applicable)

The SSL will be O'Brien & Gere Engineers, Inc., part of Ramboll (OBG) staff personnel supervising the field investigation/work.

**CORONAVIRUS DISEASE 2019 (COVID-19)**

Coronavirus disease 2019 (COVID-19) is discussed in the Project Coronavirus Response Plan. This plan is consistent with the approach currently utilized by OBG/Ramboll for our offices and is aligned with recommendations published by various public health organizations which includes communication, exposure risk management, and case management.

**DISTRACTED DRIVING ACTIVITY PROHIBITIONS**

OBG prohibits all driving distraction activities; including eating, grooming, reading, text messaging, taking notes, internet access, and media viewing related activities when driving OBG-owned or rented vehicles, whether driving for business or personal reasons.

The use of cellular phones for conversation should be reserved as a non-driving activity or limited with the following guidelines:

- The first priority during cell phone use is safe driving. Never allow a phone conversation to distract you from concentrating on driving.



- Always follow restrictions and bans for the state and municipality you're traveling in; the following link has a summary of State laws  
[http://www.ghsa.org/html/stateinfo/laws/cellphone_laws.html](http://www.ghsa.org/html/stateinfo/laws/cellphone_laws.html).
- If it's unsafe for you to answer a call, let your voicemail pick it up.
- Use a headset while driving or pull over to use a handheld phone. OBG will provide a hands-free accessory of OBG's choosing, for your cell phone if the accessory did not come with your cell phone.
- Keep conversations short and suspend the call in serious circumstances (e.g., heavy traffic, stop-and-go traffic, maneuvering around hazards, severe weather conditions).
- Avoid placing calls while moving; use speed dialing when making calls and strive to plan calls before driving is started. When dialing manually without the speed-dialing feature, dial only when the vehicle is stationary.
- When receiving a call, inform the caller that you are driving and will suspend/end the call without notice if traffic conditions become hazardous in any way. If possible, ask a passenger to make the call for you or at least dial the number for you.
- If you're talking while driving, keep your head up, your eyes on the road, and frequently check the side and rearview mirrors.
- To obtain roadside assistance or report emergencies, use 911 and give exact location, nature of emergency, name, and number.

## **REPORTING**

Report all cell phone near-misses and accidents on the OBG Accident/Near-Miss Reporting Form attached as Appendix B.

Table 1. Summary of PPE By Sampling Activities

PPE Required	Site Reconnaissance/Field Mobilization	Drilling (monitoring wells/bore holes)	Monitoring Well Development and Conductivity Testing	Groundwater Levels and Sampling	Soil Sampling (heavy equipment or drill rig)	Soil Sampling (hand augers or shovels)	Test Pit Excavation/Trenching	Surface Water Sampling (from land, shallow wading, or through the ice)	Surface Water Sampling (water craft)	Sediment Sampling (shallow wading)	Subaqueous Sediment Capping	Soil and Sediment Removal (west end)	Sediment Sampling (water craft)
Steel-Toed Boots (Rubber)		Av	Av	Av	Av	Av	Av	Av	Av	Av	Av	Av	Av
Steel-Toed Boots (Leather)	X	X	X	X	X	X	X	X	X	Av	X	X	X
Hard Hat (required at all times while on site)	X	X	X	X	X	X	X	X	X	X	X	X	X
Safety Glasses/Goggles	X	X	X	X	X	X	X	X	X	X	X	X	X
Gloves-Inner (Nitrile)	Av	X	X	X	X	X	X	X	X	X	X	X	X
Gloves-Outer (Nitrile)		X	X	X	X	X	X	X	X	X	X	X	X
High-Vis Safety Vest	X	X	X	X	X	X	X	X	X	X	X	X	X
Personal Floatation Device								X	X	X	X	X	X
Tyvek Coverall		Av			Av	Av	Av			Av	Av	Av	Av
Half-Face Respirator					Av	Av	Av					Av	
Respirator Cartridge (Hepa or Organic Vapor) (a)					Av	Av	Av					Av	
Photoionization Detector (PID)		X			X	X	X			X		X	X
Draeger Tubes and Pump (benzene and naphthalene)		Av			Av	Av	Av			Av		Av	Av
DustTrac or DataRAM monitor (PM10) (b)		X			X	X	X					X	
Facemask/Face Shield (c)	X	X	X	X	X	X	X	X	X	X	X	X	X

Key:

X = PPE Required

Av = Have available at work site

Glove types may be altered based on field conditions to include Vinyl, Neoprene, and/or Latex

"Other" required or to be available PPE will be identified for each task in the Site-Specific Work Plan.

(a) PID concentrations >5 ppm require use of respirators. See flow chart in Appendix C for use of Draeger tubes and respirators .

(b) Dust concentrations >150 ug/m³ require the use of respirators.

(c) A facemask or face shield is required when individuals cannot separate 6 feet or more

**FIELD HEALTH & SAFETY REVIEW**

**FIELD HEALTH & SAFETY PLAN REVIEW**

*I HEREBY CERTIFY THAT I HAVE READ AND UNDERSTOOD ALL HEALTH AND SAFETY PROCEDURES AS STATED HEREIN:*

Name and Affiliation (printed)	Signature	Date
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

***Daily Health and Safety Tailgate Meeting***

Date _____

Time _____

Site _____

Job Number _____

Work to be Performed _____

_____

Health and Safety Topics Discussed _____

_____

***Attendees***

Name (printed)	Signature	Company
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Safety Officer Conducting Meeting (print)	Signature	Company
_____	_____	_____

# SECTION B - HEALTH AND SAFETY PLAN

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## **APPENDICES**

<b>Appendix A:</b>	<b>Chemical Information and Safety Data Sheets (SDSs)</b>
<b>Appendix B:</b>	<b>Accident / Injury or Near Miss Report Form</b>
<b>Appendix C</b>	<b>Respirator Use Flow Chart</b>
<b>Appendix D</b>	<b>Activity Hazard Analysis</b>

# 1 INTRODUCTION

---

## 1.1 Purpose and Scope

This document describes the health and safety procedures and requirements for the installation of borings/wells, test pit excavations, sampling of soil (surface and subsurface), groundwater, surface water and sediment and subsurface structure inspection (from ground surface). This document is intended to serve as a Multi-Site Health and Safety Plan (HASP) to ensure that the fieldwork performed by OBG is done in compliance with applicable federal occupational safety and health regulations. Subcontractors shall be made aware of the requirements of this plan; however, subcontractors are required to have their own plan for the health and safety of their own employees and for following all applicable federal, state, and local regulations.

In compliance with HAZWOPER, a comprehensive work plan will be developed for each site to evaluate the logistics and resources needed to reach work objectives for site operations. The work plan will identify cleanup activities, methods for accomplishing the objectives (sampling plans), and normal operating procedures. Site-specific work plan(s) will be available on location at the site.

## 1.2 Health and Safety Plan Modification Procedures

Due to varying site conditions or the finding of unanticipated hazards, it may be necessary to revise the health and safety plan. Necessary plan changes that call for more stringent procedures or a higher level of PPE may be made at any time by the Project Manager (PM) or Task Leader in cooperation with the Project site safety leader (SSL). The PM should be notified at the soonest available opportunity.

Plan changes that would make safety procedures or PPE requirements less stringent may be made only upon approval of the PM after consultation with the Health, Safety, and Security (HSS) Operations Manager. Plan changes must always be put in writing and communicated to all field personnel.



## **2 KEY PERSONNEL/IDENTIFICATION OF H&S PERSONNEL**

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### **2.1 Key Personnel**

Responsibilities for health and safety compliance issues associated with hazardous waste operations are primarily vested in the project organization, with support from appropriate health and safety professionals on OBG's technical and administrative staffs.

### **2.2 Site-Specific Health and Safety Personnel and Organizational Responsibility**

#### **2.2.1 Health, Safety, and Security Operations Manager**

The HSS Operations Manager acts as a technical resource to all OBG offices on health and safety matters. This person is responsible for ensuring that all OBG health and safety programs comply with applicable federal, state, and local statutes for safety and health protection; executive orders; operating orders; permits and regulations; and company policies and procedures. The HSS Operations Manager is also responsible for review and approval of all site-specific Health and Safety Plans, serves in a consultation capacity to the technical staff on health and safety-related issues, and has the authority to conduct health and safety audits.

In addition, all OBG staff and subcontractors must adhere to Miller Compressing Company's health and safety requirements as stated in *Miller Compressing Company Contractor Environmental and Safety Rule Notification* document. This document is included as Appendix D of the Technical Specifications in the Design Plan.

#### **2.2.2 Project Manager**

The Project Manager (PM) is accountable for health and safety compliance on his or her projects. The PM is responsible for the technical and financial execution of the project, and has the authority to commit resources, adopt program policies and procedures, and approve expenditures and subcontracts. The PM will ensure that adequate resources are budgeted and available to implement a sound health and safety program and that appropriate technical resources are brought in to support the health and safety needs of

the project. The PM will ensure that health and safety is a high priority in planning fieldwork and or lab studies, and that adequate resources are available to develop and implement an appropriate project-specific health and safety plan.

### **2.2.3 Site Safety Leader**

The Site Safety Leader (SSL) is responsible for developing and implementing the project or Site-Specific Health and Safety Plan. In the event an SSL has not been identified for a specific project, the PM will assume those responsibilities. The PM is ultimately responsible for health and safety for the project. It is the responsibility of the PM to report any unsafe conditions reported by the project staff to the HSM and to work cooperatively to mitigate unsafe conditions. The SSL will also try to ensure compliance with health and safety requirements presented in this Plan. The PM will serve as the SSL unless site-specific hazards are identified create the need for assignment of an SSL to the project. To meet these responsibilities, the PM/SSL may:

- Act as a health and safety consultant to the project field staff
- Provide site-specific training to staff assigned to work at the site
- Review and confirm any changes in personal protective clothing or respiratory protection requirements
- Provide oversight of decontamination procedures used at the site
- Require the specific health and safety precautions be taken before personnel enter a site
- Restrict access to the site or a portion thereof
- Perform necessary personnel monitoring
- Stop work when the health or safety of project personnel are jeopardized and order the immediate evacuation of personnel from any area of the site
- Require personnel to obtain immediate medical attention if warranted
- Provide health and safety briefings to site visitors
- Enforce the requirements stated in the Corporate Health and Safety Manual and the project- or site-specific Health and Safety Plan

### **2.2.4 Field Team Members**

OBG personnel must know, understand, and comply with the requirements of this Plan developed for their projects. Field personnel will:

- Read and understand all applicable health and safety plans

- Perform their work safely
- Be aware of and alert for signs and symptoms of work-related injuries and illnesses
- Promptly report any unsafe conditions that may occur on site to the SSL, PM, and/or HSS Operations Manager

### **2.2.5 Subcontractors**

Subcontractors have primary responsibility for the health and safety of their own employees. However, OBG is required by OSHA standards (e.g., 29 CFR 1910.120) to provide information to its subcontractors on known or potential workplace hazards, as well as the methods proposed to manage the identified hazards.

It is currently OSHA policy to issue citations to prime contractors if their subcontractor is found to be out of compliance with regulatory requirements. OBG may incur civil penalties as a result of non-compliance with regulatory requirements by its subcontractors and/or injuries or illnesses incurred by the subcontractor's staff. Personal injury suits have been successfully brought against prime contractors in instances where a subcontractor's employee has demonstrated that the lack of health and safety oversight on the part of a prime contractor played a role in his or her sustaining an injury or illness.

OBG intends to manage its subcontractors to protect the health and well-being of OBG staff. OBG's objective is to manage subcontractors in a way that limits OBG's and our client's liabilities related to subcontractor performance, including management of health and safety issues. To achieve this objective, a minimum level of subcontractor surveillance, with respect to health and safety issues is required.

When required by OBG, the subcontractor must review project-specific health and safety information and hazards, and develop and implement a health and safety plan. This plan must comply with all applicable health and safety regulations and any project-specific requirements that OBG has specified. The subcontractor must provide OBG with a copy of this plan before the start of work. OBG acceptance of the subcontractor's plan does not mean that OBG concurs with the adequacy of the plan for protection of the health and safety of the subcontractor's employees. That responsibility rests solely with the subcontractor. OBG's review of subcontractor health and safety plans will be for the purposes of: 1) assessing potential health and safety impacts to OBG personnel and 2) meeting OBG legal responsibilities as a prime contractor. Any deficiencies in the subcontractor's plan or inconsistencies in proposed work practices between OBG and its subcontractor should be identified. If appropriate, these deficiencies or differences should be resolved before the work begins.

## **2.3 Communication**

Field staff and subcontractors are both permitted to call 911 in an emergency. As part of preparing the Health and Safety Plan Summary, 911 services will be verified for each site location. Assuming the PM is not on-site, the field staff should contact the PM as soon as possible regarding the on-site situation. It is then up to the discretion of the PM to contact the Client if the on-site situation requires.

## **3 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS**

---

### **3.1 Historical Overview of Site**

A historical overview of the site along with details of the project description is provided in the project Work Plan. Specific protocols for sampling, sample handling and storage, chain-of-custody, and laboratory and field analyses to be performed are described in OBG's NRT SOPs. QA/QC procedures are structured in accordance with applicable technical standards, regulations, guidance, technical standards.

### **3.2 Risk Analysis-General**

Personnel in the vicinity of the drilling, excavation, and sampling operations are not only subject to the hazards of direct exposure, but also to dangers posed by machinery operation. In addition, stresses due to working in protective clothing will be encountered. Physical, chemical, and biological hazards are present at most job sites.

Activity hazard analysis (AHA) is a process that focuses on the activity or job task as a method to identify hazards before they occur. The AHA focuses on the relationship between the worker, the job task, the tools, and the environment. The AHAs applicable to the project are provided in Appendix D.

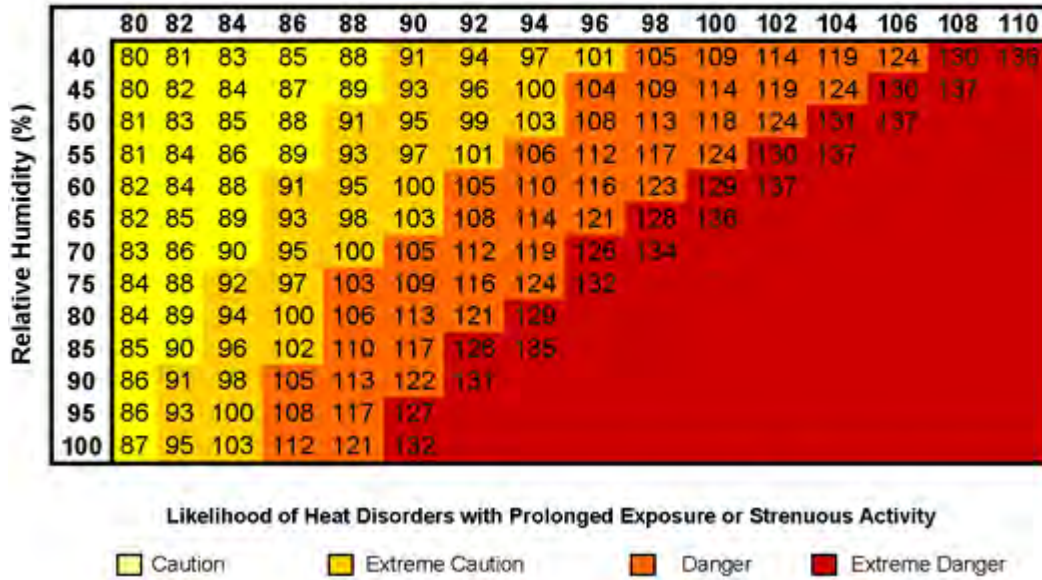
#### **3.2.1 Heat/Cold Stress**

##### ***3.2.1.1 Thermal Stress– Heat***

At times OBG personnel are required to work in hot and humid weather conditions, when temperatures and or humidity create a heat index which may be dangerous to work in. Field personnel must dress appropriately for the weather conditions and drink fluids to stay hydrated. In addition, more frequent breaks to cool down are required when temperatures and the heat index are high. Site personnel should take breaks as often as necessary to prevent the conditions listed below. It is also very important that field staff work together (i.e., "buddy system") so that they can monitor each other for signs of heat stress. The table below calculates the heat index and provides a guide to potentially dangerous working conditions.

## NOAA's National Weather Service

### Heat Index Temperature (°F)



**IMPORTANT:** Since heat index values were devised for shady, light wind conditions, **exposure to full sunshine can increase heat index values by up to 15°F.** Also, **strong winds**, particularly with very hot, dry air, can be extremely hazardous.

### 3.2.1.2 Heat Stress

The SSL shall determine the extent to which heat stress monitoring and control is needed based on the guidance provided in this section. The stress of working in a hot environment can cause a variety of illnesses including heat exhaustion or heat stroke; the latter can be fatal. PPE (i.e., Environmental Protection Agency (EPA) Level C protection [respirators]) can increase heat stress significantly. To reduce or prevent heat stress, frequent rest periods and beverage consumption to replace body fluids and salts is required. It should be noted that heat stress can occur in people wearing regular, permeable work clothing.

Quantitative physiological monitoring for heat stress may be conducted. Physiological monitoring for heat stress includes heart rate as a primary indicator and oral temperature as a secondary indicator. The frequency of monitoring depends on the ambient temperature and the level of protection used on site. To determine the initial monitoring frequency, after a work period of moderate exertion, use the table below (source, NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities):

<i>Adjusted Temperature*</i>	<b>Level D</b>	<b>Level C</b>
90 °F or above	After 45 minutes	After 15 minutes
87.5 to 90 °F	After 60 minutes	After 30 minutes
82.5 to 87.5 °F	After 90 minutes	After 60 minutes
77.5 to 82.5 °F	After 120 minutes	After 90 minutes
72.5 to 77.5 °F	After 150 minutes	After 120 minutes

°F – Degrees Fahrenheit

*Adjusted air temperature (°F) = observed temp + (0.13 x percent sunshine)

Observed temp = air temperature measured with bulb shielded from radiant heat.

Percent sunshine = the time sun is not covered by clouds thick enough to produce a shadow (100 percent = no cloud cover and a sharp, distinct shadow; 0 percent = no shadows).

**Heart rate:** Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle one-third and keep the rest period the same. If the heart rate exceeds the 110 beats per minute at the next rest period, shorten the following work cycle by another one-third and also monitor oral temperature.

**Oral temperature:** Use a clinical thermometer (3 minutes under the tongue), temperature strip or ear thermometer to measure the temperature at the end of the work period (before drinking). If the temperature exceeds 99.6 °F, shorten the next work cycle by one-third without changing the rest period. If the temperature exceeds 99.6 °F at the beginning of the next rest period, shorten the following work cycle by one-third. **DO NOT** allow a field team member to wear EPA Level C protection when the measured temperature exceeds 100.6 °F.

Personnel will pay particular attention to the information in this section in order to recognize the symptoms of heat stress and the appropriate action to take upon recognition. Even though physiological monitoring is not always necessary, it is essential that personnel understand the significance of heat stress and its recognition.

Symptoms that indicate **heat exhaustion** are:

- Clammy skin
- Weakness, fatigue
- Lightheadedness
- Confusion
- Slurred speech

- Fainting
- Rapid pulse
- Nausea (vomiting)

If these conditions are noted, the following steps should be taken:

- Remove the victim to a cool and uncontaminated area
- Remove protective clothing
- Give water to drink, if conscious.

Symptoms that indicate **heat stroke** include:

- Staggering gait
- Mental confusion
- Hot skin, high temp (yet may feel chilled)
- Convulsions
- Unconsciousness
- Incoherent, delirious

If heat stroke conditions are noted, immediately perform the following steps:

- Remove victim to a cool, uncontaminated area
- Cool the victim, whole body, with water, compresses and/or rapid fanning
- Give water to drink, if conscious
- Transport the victim to the designated medical facility for further cooling and monitoring of body functions. **HEAT STROKE IS A MEDICAL EMERGENCY!**

**Sunburns** are another hazard of performing outdoor work. Many weather reports now include an ultraviolet index to aid in the determination to apply sunscreen. When using sunscreen it is important to get one with a sun protection factor of at least 30. Apply the sunscreen at least 30 minutes prior to going outdoors and reapply during the day. The SSL is responsible for ensuring that sunscreen is brought to the site and available for use.



It is also important to stay hydrated by drinking water and sports drinks with electrolytes to replenish salts lost through perspiration. Avoid caffeinated drinks when trying to stay hydrated because caffeine is a diuretic which is counter-productive to hydration.

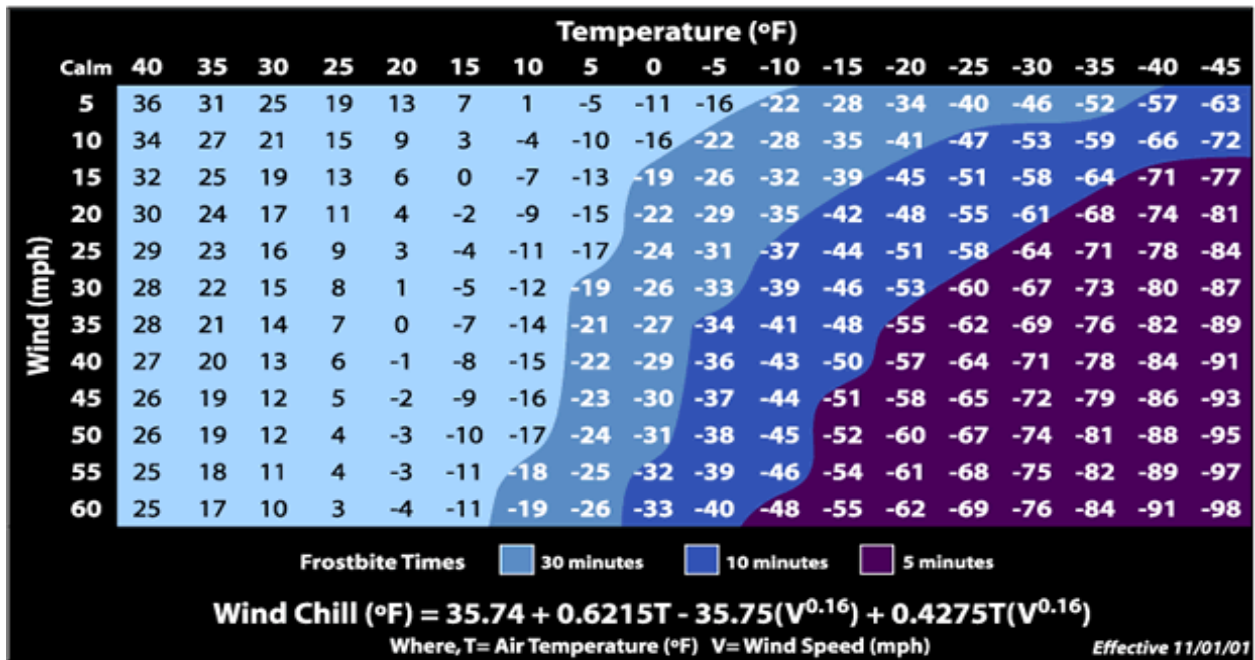
### **3.2.1.3 Thermal Stress - Cold**

On days with low temperature, high winds, and humidity, anyone can suffer from the extreme cold. Severe cold exposure can be life threatening. Several factors increase the harmful effects of cold: being very young or very old, wet clothing, having wounds or fractures, smoking, drinking alcoholic beverages, fatigue, emotional stress, and certain diseases and medications.

Cold weather injuries may be local or systemic. Local cold weather injuries include chilblains (chronic injury of the skin and peripheral capillary circulation) and frostbite. Frostbite occurs in three progressive stages: frostnip, superficial frostbite, and deep frostbite. Systemic cold injuries, due to hypothermia, affect the entire body system. Hypothermia is caused by exposure to cold and is aggravated by moisture, cold winds, fatigue, hunger, and inadequate clothing or shelter. Precautionary measures that will be taken include the following:

- Providing field shelters or windscreens
- Monitoring temperature and wind speed to determine appropriate cold stress personal safety measures
- Adjusting work schedule based on weather conditions and temperature
- Providing insulated clothing for field workers
- Adhering strictly to the buddy system so that workers can assess cold stress symptoms in their co-workers
- Providing chemical hand and feet warmers

The following table provides temperature, wind, and wind chill relationships:



Field personnel must be cognizant of wind chill factors and take necessary precautions to prevent frostbite. The following are work/warm-up guidelines for working in cold temperatures and with associated wind chill factors. Please note these are only guidelines and field personnel should take warm-up breaks as often as necessary to prevent cold stress situations.

<b>THRESHOLD LIMIT VALUES WORK/WARM-UP SCHEDULE FOR FOUR-HOUR SHIFT*</b>											
Air Temperature Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
° C (approx)	° F (approx)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-26° to -28°	-15° to -19°	(Norm breaks) 1		(Norm breaks) 1		75 min.	2	55 min.	3	40 min.	4
-29° to -31°	-20° to -24°	(Norm breaks) 1		75 min.	2	55 min.	3	40 min.	4	30 min.	5
-32° to -34°	-25° to -29°	75 min.	2	55 min.	3	40 min.	4	30 min.	5	↓ Non-emergency work should cease ↓	
-35° to -37°	-30° to -34°	55 min.	3	40 min.	4	30 min.	5	↓ Non-emergency work should cease ↓			
-38° to -39°	-35° to -39°	40 min.	4	30 min.	5	↓ Non-emergency work should cease ↓					
-40° to -42°	-40° to -44°	30 min.	5	↓ Non-emergency work should cease ↓							
-43° to below	-45° & below	Non-emergency work should cease ↓				↓ Non-emergency work should cease ↓					

Source: Adapted from Threshold Limit Values (TLV) and Biological Exposure Indices (BEI) booklet: published by ACGIH, Cincinnati, Ohio, 2008

**Frostbite Monitoring:** Frostbite is a potentially crippling condition that can occur when inadequately protected skin or body parts are subjected to freezing weather. All team members should continually be alert for signs of frostbite in coworkers and bring it to the attention of the SSL). A cold feeling, pain, and numbness precede the onset of frostbite. Frostbite usually appears as gray or white waxy spots on skin. Areas most susceptible are nose, ears, and cheeks. The following steps should be taken to avoid frostbite:

- Dress warmly (avoid cotton, wear polypropylene, wool, Gore-Tex, or other moisture wicking materials instead)
- Wear at least three layers of clothing. An inner layer of wool, silk, or synthetic to wick moisture away from the body. A middle layer of wool or synthetic to provide insulation even when wet. An outer wind and rain protection layer that allows some ventilation to prevent overheating.
- Wear a hat or hood. Up to 40% of body heat can be lost when the head is left exposed.
- Keep boots and gloves loose fitting
- Stay dry; carry extra clothing
- Avoid touching cold metal with bare hands
- Avoid spilling cold fuel, alcohol, or other liquids that freeze below 32 °F on your body or clothing

If a person suffers frostbite, get them to a hospital as soon as possible. If transport to a hospital is not immediately available, get the person to a warm shelter and immediately perform the following:

- Cover exposed areas with additional clothing while still exposed to the elements
- Wrap the person in blankets or a sleeping bag
- Give the person warm drinks (no liquor)
- Undress the frozen part and submerge the frozen part in a tub of warm water (102 °F to 105°F), or put the frostbitten person in a large tub of warm water, if available, and stir the water.
- Warm with skin to skin contact, such as placing warm hands on frozen nose or ears, but do not rub
- Get the person to a hospital as soon as possible

Do **not** allow the following to occur:

- Do not rub the frozen part
- Do not give the person liquor
- Do not allow the person to walk on thawed feet
- Do not let the person smoke
- Do not break any blisters that may form
- Do not let the thawed part freeze again
- Do not warm the frozen part in front of a source of dry heat (e.g., open fire or oven)

**Hypothermia Monitoring:** Hypothermia is a lowering of the body’s temperature due to exposure to cold or cool temperatures. All team members should continually be alert for signs of hypothermia in co-workers and bring it to the attention of the SSL. Most cases of hypothermia occur at temperatures between 30 °F and 50 °F. If not properly treated, hypothermia can cause death. Safety equipment for hypothermia should include a synthetic sleeping bag and a hypothermia thermometer. ***HYPOTHERMIA IS A MEDICAL EMERGENCY!*** Transport to a hospital as soon as possible, even if victim appears to be recovering.

**To prevent hypothermia:**

- Eat well prior to exposure.
- Dress warmly (avoid cotton, wear polypropylene, wool, Gore-Tex, or other moisture wicking materials instead).
- Avoid becoming wet due to sweating, rain or snow, or falling in water.

**Early signs of hypothermia may include:**

- Violent shivering.
- Slurred speech.
- Decrease in coordination.
- Confusion, inability to answer simple questions.
- Unusually irritable behavior.
- Strange behavior.
- Tendency to drop or lose clothing or equipment.

**As hypothermia progresses into more serious stages, victims typically:**

- Develop trouble seeing clearly.
- Become sleepy and numb.
- Move with difficulty.
- Eventually become unconscious if not properly cared for.

**The following actions should be taken to treat a hypothermia victim:**

- Get the victim to a warm, dry shelter as soon as possible
- Remove any wet or cold garments and dry the person thoroughly
- Wrap the victim in blankets, sleeping bags, or dry clothing to prevent more heat loss
- If a warm area is not available:
  - Build a shelter and put the victim in the warmest, driest area available
  - Remove any wet or cold garments
  - Have one or more persons remove their clothing and lay next to the victim, providing skin to skin contact
- Wrap the victim and rescuers in dry warm blankets, sleeping bags, or clothing
- When the victim becomes conscious, place warm objects along the victim's sides to warm vital areas.
- When the victim is able to swallow easily, provide warm, sweetened drinks and food (preferably candy or sweetened food)
- Do not give the victim alcohol or allow smoking
- Do not rub the victim's skin
- Keep checking the victim and give additional assistance as needed

### **3.2.2 Slips, Trips and Falls**

The most common hazards that will be encountered will be slips, trips, and falls. Common sense will be used to avoid these hazards. When working on slippery surfaces, tasks will be planned to decrease the risk of slipping. Slippery surfaces will be avoided, work and travel will not be hurried, and good housekeeping will be maintained. Personnel must vigilantly observe where they are working and walking to avoid slips, trips, and falls.

### **3.2.3 Vehicular Traffic**

Another common hazard that will be encountered at many sites will be vehicle traffic, including cars, trucks, drilling rigs and heavy machinery. When it is necessary to move a vehicle, site drivers must be mindful that pedestrians are present on site. If appropriate, site personnel on foot may guide site drivers while moving vehicles to alert and protect non-site personnel. Site personnel on foot must avoid standing in blind spots or in high traffic areas, be aware of vehicle locations, and make eye contact with site drivers if crossing the path of vehicles is necessary. Site personnel on foot must vigilantly observe where they are working and walking to avoid being struck by vehicles which, for one reason or another, are moving. Finally, when working in high traffic areas (e.g., on the edge or in the middle of city streets, heavily used parking areas) site personnel are required to set up traffic cones and wear orange traffic safety vests to alert drivers to their presence.

Work performed in rail yards or along railroad tracks poses an additional hazard. Numerous incidents have occurred when working between or alongside rail lines and have resulted in serious injury or death. Therefore, the following rules must be followed when working near rail lines:

- Never walk or step on a railroad track. The tracks can be slick and injury due to slipping off a track is possible.
- Never run over tracks - Always Walk. Tripping injuries can occur when running over the tracks which can result in serious head injuries.
- Never stand between the tracks. When necessary, walk across the railroad tracks and stand to one side or the other of a rail line.
- Always wear a hard hat, eye protection, steel-toed boots, and an orange reflective vest for personal protection.

In addition to these rules, whenever work is done near railroad tracks or in a railroad right-of-way, the railroad company must be contacted and a flagman requested to monitor work activities. No work will be done without a railroad flagman being present unless the railroad company expressly permits it.

### **3.2.4 Hunting Season**

It is possible field activities will be conducted during hunting seasons and may pose a risk to site workers. The hunting season dates will be reviewed prior to conducting field activities in non-urban areas. During hunting season, site workers will wear a minimum of at least 50% of the outer clothing above the waist in 100% blaze orange (faded blaze orange is not acceptable) to alert potential hunters to their presence. If site work is performed in densely vegetated locations, site personnel may post signs along access locations to indicate their presence.

### **3.2.5 Exposure to Excessive Noise**

Overexposure to noise can result in hearing loss. If it is difficult to hear normal speech when the speaker is 3 to 4 feet from the listener, and that condition is present for more than four hours a day, it will be assumed that the noise level exceeds 85 dBA and appropriate hearing protection will be used. The disposable "ear plug" type hearing protectors are recommended.

### **3.2.6 Chemical Hazards**

PPE requirements are stated in Personnel Protection Section 5 of this Plan. Safety Data Sheets (SDSs) for suspected contaminants are contained in Appendix A.

### **3.2.7 Biological Hazards**

During warm weather months, potential biological hazards include venomous insects, snakebites, and poisonous plants. Appropriate safety measures, such as the use of insect repellent and probing of possible nesting areas, will be taken to prevent exposure to biological hazards. Long sleeves and pants will provide protection from contact with poisonous plants.

### **3.2.8 Thunderstorms and Rain**

Drilling/excavation, sediment capping, monitoring, and sampling activities during electrical storms poses a hazard of electrocution by lightning strike, and adverse working conditions, as well as high winds tipping the equipment. Drilling/ excavation and sampling activities will stop and the drilling rig mast will be lowered at the approach of a thunderstorm. Work activities during rainstorms can cause not only slippery conditions but also excess friction on cathead pulleys. This can cause dangerous conditions during drive sampling operations. Therefore, drive sampling operations will cease and, depending on the SSL's assessment, drilling may be halted.

Risk Analysis-Task-by-Task

Table 1. Anticipated Task Hazards

	Chemical	Biological	Explosive	General Safety	Heat	Cold	Traffic	Noise	Slip, Trips, Falls	Heavy Equipment	Underground utilities	Overhead Power Lines	Trench/Excavation
Site reconnaissance/field mobilization	X	X	X	X	X	X	X	X	X	X	X	X	
Well and bore hole drilling	X	X	X	X	X	X	X	X	X	X	X	X	
Monitoring well development	X	X		X	X	X	X		X				
Groundwater level measurements	X	X		X	X	X	X		X				
Groundwater and soil sampling	X	X		X	X	X	X		X				X
Test pits and excavation	X	X	X	X	X	X	X	X	X	X	X	X	X
Surface water sampling	X	X		X	X	X	X	X	X	X		X	
Sampling solid material, wipe sampling, surface sampling, ACM sampling	X	X		X	X	X	X	X	X	X	X	X	
Sampling shallow wading or through ice	X	X		X	X	X	X	X	X	X		X	

### 3.2.9 Preparation

There are preparation measures personnel need to perform prior to beginning work to ensure safe operation once work commences.

#### 3.2.9.1 Walk Through and Visual Inspection

Upon arriving at the site, verify that it is safe to enter and set up on the site. It is important to:

- Look for overhead and underground power and other utility lines. If present, verify the equipment is being set up a safe distance from these lines.
- Check boring locations for proximity to any overhead lines, investigate and note all overhead obstructions.



- Maintain required clearance from electrical lines.
- Consider having lines in the work area covered to provide a greater safety margin.
- If necessary, contact someone to verify that these lines are safe to work near (that they have been de-energized provided that they were supposed to have been de-energized). Assume a line is energized until you have verified it isn't. If in doubt, do not raise the mast.

Examine the actual location where the equipment is to be set. If possible, it is best to have a level and clean area. Remove rock and other debris that may interfere with the construction/sampling operation or pose safety hazards. Be sure to follow the instructions contained in the site health and safety plan. This includes use of any specific PPE or equipment identified by the site owner and other sections of this HASP before moving into location.

### ***3.2.9.2 Traffic Control***

Traffic control devices may consist of items such as:

- Traffic cones
- Flags
- Caution tape
- Other devices such as signs, barricades, amber flashing lights, or fencing

It is recommended each work area be cordoned off with traffic cones or other traffic control devices as appropriate to site-specific conditions. It is also recommended that work vehicles be used to shield field personnel from traffic hazards when practical. In addition, high-visibility clothing should be worn by workers.

### ***3.2.9.3 Storage and Material Handling***

The key for a safe and smooth startup is to organize the work area prior to commencing construction/sampling operations:

- Do not attempt to commence work before everything is unloaded and organized. Work will progress smoothly and accidents will be less likely if personnel take the time to properly set up and organize first.
- The first requirement for safe field operation is that everyone understands and fulfills the responsibility for maintenance and housekeeping.
- Suitable storage locations should be provided for all tools, materials, and supplies so they can be conveniently and safely handled without hitting or falling on the crew or a visitor. Store

items so the work can proceed in an orderly fashion, with sufficient room in the work area to move about without tripping over supplies or equipment. Do not store equipment in places that would interfere with escape routes in an emergency.

- Avoid storing or transporting tools, materials, or supplies in areas other than those specifically designated for storage.
- Every crewmember must inspect their work site upon arrival to verify that equipment is in safe condition and the job site is in proper order. Return the job site to proper order prior to proceeding with work.
- Drill rod, casing, augers and similar tools should be stacked orderly on racks to prevent sliding, rolling, spreading, or falling. When stationed on the ground prior to use, these tools may need to be chocked to prevent inadvertent or unanticipated rolling.
- Work areas, platforms, walkways and other access-ways should be kept free of obstructions such as materials and tools, and substances such as debris, grease, ice, and mud, in order to minimize the tripping, slipping and falling hazards.
- All unattended boreholes must be adequately covered or otherwise protected to prevent personnel, visitors, or animals from stepping or falling into the hole.
- Use approved cleaning materials in place of flammable liquids as cleaning agents.
- Never use compressed air for the purpose of cleaning clothes.
- All trash should be placed in bags and stored in areas outside of the immediate work area.
- All controls, meters, dials, and operational and warning lights should be kept free of dirt, grease, and mud.
- Keep all flammable liquids in proper containers and stored away from heat and spark sources.
- All fluids must be contained and disposed off-site.
- Penetration or other drive hammers should be placed at a safe location on the ground or be secured to prevent movement when not in use.
- Work areas, platforms, walkways, scaffolding, and other access-ways should be kept free of materials, debris, and obstructions and substances such as ice, grease, or oil that could cause surfaces to become slick or otherwise hazardous

### **3.2.10 Start Up**

The following sections discuss safe operations during construction/sampling activities.

### **3.2.10.1 Equipment Setup**

It is the operator's responsibility to verify the equipment is properly set up. The stability of the equipment is critical to assure safe construction operations. Some things to consider when setting up are provided below:

- Inspect the equipment when it first arrives onsite and then at least daily for structural damage, loose bolts and nuts, proper tension in chain drives, loose or missing guards or protective covers, fluid leaks, damaged hoses, damaged pressure gauges, and pressure relief valves.
- Whenever possible, the operator should choose a dry, level, and reasonably smooth working site.
- All personnel and visitors should be instructed to stand clear of moving equipment.
- Before start-up, check that all brakes are set, all gear boxes are in neutral, all hoist levers are disengaged, all hydraulic levers or air controls are in the correct position, and the cathead rope is not on the cathead.
- Prior to lowering the leveling jacks, it is recommended that a timber or plank be placed beneath the jack.
- Check and test all safety devices such as kill switches at least daily and preferably at the start of a shift.
- Verify all gauges, warning lights, and control levers are functioning properly.
- Verify nothing is loose on the mast that would fall when the equipment is operated.

### **3.2.10.2 Overhead Hazards**

Contact with overhead obstructions can result in property damage, injury, and, most importantly, loss of life. Additionally, contact with overhead power lines can result in electrical shock and electrical burns. Work should not commence without first determining the risk posed by obstructions such as tree limbs, protruding objects and structures, and overhead power lines. The proposed work location should be inspected by the contractor prior to operating equipment to ensure that all such obstructions have either been removed or the risk of contacting such obstructions has otherwise been mitigated. Specific items to consider include the following:

#### **Structures**

- Prior to work, review location for the presence of overhead structures, such as canopies, trees, or piping racks.
- Maintain sufficient horizontal space (approximately 10 ft) between overhead structures and equipment.

**Overhead Power Lines**

- Contact the power company for expert advice on working in the vicinity of overhead power line(s) at a specific location and to determine if the power line(s) can be de-energized during construction/sampling operations. Never assume a line is de-energized. If in doubt, do not work near power lines.
- Inspect location for sagging power lines before making entry. Never lift power lines to gain entry to location.
- Note location of overhead utilities on all site work plans. Whenever possible, locate work/sample locations to avoid any possibility of contact with power lines. Walk completely around equipment to determine what the distance will be between the nearest power line and the equipment.
- When working near overhead power lines is unavoidable, allow sufficient space between the mast and the overhead lines. Because of the difficulty in estimating distances from the ground and the effects of wind on the power lines, it is advisable to maintain a 20-foot clearance.
- Never work near power lines without a designated spotter.
- Except where electrical distribution and transmission lines have been de-energized and visibly grounded at point of work or where insulating barriers, not a part of or an attachment to the equipment or machinery, have been erected to prevent physical contact with the lines, equipment or machines shall be operated proximate to power lines only in accordance with the following per 29 CFR 1926.550(ii):

Unless a more conservative spacing requirement is stipulated by state or local regulations, use the following table as minimum spacing guidance:

<b>Spacing Guidelines for Electrical Service</b>	
<b>Nominal Voltage (Phase to Phase)</b>	<b>Minimum Required Clearance (feet)</b>
≤ 50,000	10
Over 50,000 to 75,000	11
Over 75,000 to 125,000	13
over 125,000 to 175,000	15
over 175,000 to 250,000	17
over 250,000 to 370,000	21
over 370,000 to 550,000	27
over 550,000 to 1,000,000	42

Adapted from Code of Safe Drilling Practices, California Dept. of Transportation, Division of Engineering Services, Revised April 30, 2004

**If contact between equipment and power line occurs:**

- Assume the equipment is electrified.
- Do not attempt to enter or leave the equipment or touch any part of it. Although people in the equipment may not be affected, anyone touching the equipment while in contact with the ground is in danger of being electrocuted.
- Call 911 and the local electric utility.

**3.2.10.3 Auger Drilling**

Auger drilling uses direct power to rotate (screw) flighted augers into the ground. Drill rigs must have kill switches in operable condition. Familiarize yourself with their location and operation. At least two persons must be present when operating the rig. Do not wear loose clothing, jewelry, hair, or equipment near the auger.

The operator and tool handler should establish a system of responsibility for the series of various activities required for auger drilling, such as connecting and disconnecting auger sections, and inserting and removing the auger fork. The operator must assure the tool handler is well away from the auger column and the auger fork is removed before starting rotation. Be aware of the following hazards which may be unique to this type of drilling:

- Clean the auger's male and female ends with a wire brush. Do not clean out bolt holes with your fingers. When applicable, couple the rig to the next auger while that auger is on the ground, then allow the machine to pick it up and place it on the down-hole string. Idle the machine down before engaging the rotation.
- Only use the manufacturer's recommended method of securing the auger to the drill drive coupling. Do not touch the coupling or the auger with your hands, a wrench, or any other tools during rotation.
- Whenever possible, use tool hoists to handle auger sections.
- Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground, or over other hard surfaces such as the drilling rig platform.
- Never allow feet to get under the auger section that is being hoisted.
- Prepare to start an auger boring with the drill rig level, the clutch or hydraulic rotation control disengaged, the transmission in low gear, and the engine running at low RPM.
- Use low-profile auger pins.
- When rotating augers, stay clear of the rotating augers and other rotating components of the drilling rig. Never reach behind or around a rotating auger for any reason whatsoever.

- Never place your hands between the drill rig and an auger, even when attempting to free damaged or bound sampling equipment from the auger.
- Use a long-handled shovel to move auger cuttings away from the auger. Never use hands or feet to move cuttings away from the auger. It is preferable to move cuttings while the auger is inactive.
- Augers should be cleaned only when the drill rig is in neutral and the augers have stopped rotating.
- After loosening the top auger from the down-hole string, allow the machine to pick up the auger off of the string and set it on the ground, then uncouple from the machine.
- Care should be taken to ensure augers are properly stored and secured when not in use and during transport.

When using bolt-together augers, consider the following:

- Do not use bolts with excessively rounded heads or worn out threads.
- Do not use a worn out socket or breaker bar.
- Pull on the breaker bar to tighten bolts. Do not push.
- Drillers should remove their hands from the rotation lever or clutch handle while auger bolts are removed and the auger catcher is positioned.
- If the top auger will not disengage from the string, strike the auger with a hammer on the thick area of the female coupling end.
- Do not strike the flights, bolt holes, or the body (tube) of the auger.
- If the auger cap bolt will not loosen by hand, tap it with a hammer or use the breaker bar and socket.
- If the top cap will not disengage from the auger, strike the cap with a hammer.

When using solid stem flight augers, consider the following:

- Place the C-pin so the movement of cuttings up the flights will not disengage it.
- Drillers should remove their hands from the rotation lever or clutch handle while allowing the helper to remove the C-pin and put the auger catcher in place.
- When hoisting a string of augers from the borehole, use the proper top adapter that will not allow the string to become disengaged from the hoist line.

### **3.2.10.4 Rotary Drilling**

The term *mud rotary* means direct rotary drilling using mud slurry or water circulation to remove cuttings and keep the borehole wall stabilized. Be aware of the following hazards which may be unique to this type of drilling:

- Lifting heavy equipment (such as drill rods, flight augers)
- Rotating equipment and parts and flight augers
- Slippery or dangerous work areas caused by messy mud pits or troughs (workers could fall in); keep the work area clear
- Water swivels and hoisting plugs should be lubricated and checked for frozen bearings before use.
- Do not hold on to the discharge hose, or allow it to coil around your feet, while the tools are rotating.
- When unscrewing a side-mount water swivel from the drill string, be sure the string is sitting on the bottom of the borehole. Do not hold on to the back-up wrench while tools are rotating.
- Use the proper size wrench to makeup and breakout joints of casing. Put yourself in a stable position and pull, do not push, on the wrench.
- Keep hands away from the bottom of the bit assembly when removing it from, or inserting it into, the casing or boring. Set the assembly on the ground and remove it from the overshot - do not allow it to hang from the wire line.
- Use full grip circle wrenches to assemble and disassemble core barrels.
- Keep hands away from the bottom of the core barrel or inner tube when removing it from, or inserting it into, the casing, augers, or drill rods.

Air rotary is direct rotary drilling using high pressure air circulation to remove cuttings and keep the bit cool. Be aware of the following hazards which may be unique to this type of drilling:

- Rotating/lifting equipment
- High pressure air lines
- Air discharge of cuttings at high velocity (use a cover to control discharge of cuttings)
- Heavy drill rods being lifted
- High noise levels, wear hearing protection
- Space limitations (large drill rig and support vehicle)
- Dust generation in dry formations (move upwind and use a cover or water spray for dust control).

Listed below are general rotary (air and mud) drilling hazards:

- Do not break drill rods during their lowering into the hole with drill rod chuck jaws.
- Drill rods should not be held or lowered into the hole with pipe wrenches.
- If a string of drill rods is accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.
- In the event of a plugged bit or other circulation blockage, high pressure in the piping and hose between the pump and the obstruction should be relieved or bled down before breaking the first tool joint.
- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use your unprotected hands to clean drilling fluids from drill rods.
- If work must progress over a portable drilling fluids (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with a rough surface or cover panels of adequate strength to hold drilling rig personnel.
- Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends (cradle) of the drill rod sections for safe vertical storage or lay down the rods in a safe area.
- The capacities of hoists and sheaves should be checked against the anticipated weight of the drill rod string plus other expected hoisting loads.
- Only the operator of the drill rig should brake or set a manual chuck so that rotation of the chuck will not occur prior to removing the wrench from the chuck.

**Adding and removing drill rods:**

- Only the drill operator will brake or set the chucks, to eliminate the possibility of engaging the transmission prior to removing the chuck wrench.
- Do not use the chucks as a brake on a string of drill rods that are being lowered into a hole. Breaking the drill string with the chuck will result in metal slivers on the drill rod and consequent hand injuries, and could result in losing the drill rod down the hole.
- Check the chuck jaws periodically and replace them as necessary.
- Never place hands on wrenches where they can get trapped between the wrench and the drill rig.
- Ensure that wrenches are removed from rods before starting to drill.
- Do not take hold of the male thread end of drill rod. Watch for sharp burrs on rods and casing, and file sharp edges off rods when necessary.



- Do not use extension leverage (cheaters) on pipe wrenches to break drill rod. If extension leverage is needed, the wrong tool is being used.
- Clean drill rods with a rubber wiper or other suitable device when being removed from a hole.
- Allow drilling fluids to drain from drill rods into the mud pit before setting the rod to the side, to minimize the amount of mud around the work area.
- The operator knows the capacity of the hoist and mast, and the weight of the drill rod, to prevent the hoist capacity from being exceeded.
- Do not extend for than 10 ft of drill rod (two five ft sections) through the top of the mast cradle. When this occurs the drills rods must be broken down into smaller sections.
- The drill rig operator must exercise care to lower the hoist slowly while the drill rod is being carried away from the hole.
- There should be at all times at least three wraps of hoisting line on the hoist drum to prevent a line load from being applied directly to the fastening clamp.
- Do not guide or hold onto moving wire line work cables with bare hands.

### **Pressurized Systems**

No repair or maintenance will be performed on pressurized systems until all pressure has been relieved. Extreme caution will be used when opening any valve. All relief valves will be installed so that any discharge will be directed away from workers and equipment. Extensions necessary for proper venting of relief valves will be secured against whipping and incorporate whip checks.

### **3.2.11 Personnel Protective Equipment**

Certain PPE must be worn because of the physical hazards posed by construction/sampling operations. For most projects, individual protective equipment must include a safety hat, safety shoes, safety glasses, and close fitting gloves and clothing. The Site-Specific Health and Safety Plan will dictate other PPE and precautions necessary to address site related hazards and risks.

#### ***3.2.11.1 Hard Hats***

Hard hats must be worn by everyone working or visiting the site. All hard hats must be kept clean and inspected each working day to assure they are in good repair with the headband and crown straps properly adjusted for the individual worker or visitor. A hard hat is the number one piece of safety equipment. They should be worn on all sites, shop, or yard areas where work might be performed under heavy objects, or where there is the possibility of injury from falling objects. A hard had protects you from falling objects.

### ***3.2.11.2 Safety Shoes or Boots***

Steel-toed safety shoes or boots should be worn by all personnel and all visitors to the site that observe construction/sampling operations. All safety shoes or boots must meet the requirements of ANSI.

### ***3.2.11.3 Gloves***

All personnel should wear gloves for protection against cuts and abrasions that could occur while handling wire rope or cable and from contact with sharp edges and burrs on sampling tools. All gloves must be closefitting and not have large cuffs or loose ties that can catch on rotating or translating components.

Gloves should be worn when work activities involve handling the drilling equipment, sampling devices or even when servicing the equipment. The type of glove will be dependent upon the task being performed and potential for chemical or other contaminants. At a minimum leather gloves should be worn when assembling tooling or servicing and repairing the equipment. If dexterity is an issue (small bolts or screws), cotton or nitrile gloves maybe adequate.

### ***3.2.11.4 Clothing/ High Visibility Clothing***

The clothing of the individual worker is not generally considered protective equipment, however, the worker's clothing should be comfortable but must be close fitting, without loose ends, straps, draw strings, belts or otherwise unfastened parts that might catch on rotating or translating equipment components. Rings and jewelry must not be worn during a work shift. In addition to loose clothing, hair should be tied back, as loose long hair can catch in mechanical equipment. All jewelry, including rings must be removed before beginning each shift. All personnel should wear clothing appropriate for the weather conditions.

High visibility clothing is required when working in environments that are regulated by Department of Transportation and or when working on active roadways or other high traffic areas such as service stations. It is also required for night work operations.

### ***3.2.11.5 Eye Protection***

All personnel should wear ANSI approved safety glasses. General prescription glasses and sunglasses are not safety glasses. All safety glasses must meet the requirements of ANSI. Use safety glasses whenever using a hammer, chisel, power tool or any other tool that can cause particles to fly.

### ***3.2.11.6 Hearing Protection***

Hearing protection devices such as ear plugs and ear muffs should be worn as required when the noise exposure is 85 decibels (dB) or greater over an 8-hour workday. Although noise levels vary with the type of equipment used, potentially hazardous noise levels are likely to be generated during sampling and drilling. Typically, speech at normal conversational levels becomes difficult at 2 to 3 feet when noise levels are in excess of 85 dBA. When appropriate, each worker must wear noise-reducing hearing protection that meets the requirements of ANSI.

### ***3.2.11.7 Fall Protection***

Fall protection is required when working at heights of greater than 6 feet (guard rails or a personal fall arrest system). Establish a good solid footing and that walking and working surfaces are as clean and dry as possible. Work to be done above three feet on the mast should require use of a safety harness, or the mast must be lowered. At a minimum fall protection must be used in accordance with applicable regulatory or client requirement.

### ***3.2.11.8 Other Protective Equipment***

For some construction/sampling operations, the environment or regulations may dictate other protective equipment be used. The requirement for such equipment must be determined jointly by the management and the safety supervisor. Such equipment might include face mask/shield when a person cannot maintain at least 6 feet from another individual (Refer to Project Coronavirus Response Plan), respirator, insect repellent, etc. When work is performed in chemically or radiological contaminated environment, special protective equipment and clothing will, be required. The design and composition of the protective equipment and clothing must be determined jointly by the management and the client who requests the services, and under some circumstances, with the concurrence of a health and safety professional.

## **3.2.12 Test Pits and Excavation**

Test pits and excavations pose a serious threat of injury resulting from falls or excavation wall collapses. During excavation or digging activities an exclusion work zone will be established around excavating machinery. Bystanders and on-lookers will be prohibited from entering this work zone while the excavating machinery is in operation. The work zone will be large enough so that the excavating machinery (e.g., excavator) can rotate 360-degree without extending out of the work zone. After the excavation is completed it should either be backfilled immediately or the entire excavation will be encircled with a physical barrier (e.g., barricades, orange excavation fencing), which will limit access to

the excavation and decrease the likelihood of injury resulting from falls. Any excavation greater than four feet deep will NOT be entered unless the walls of the excavation have been reinforced to prevent wall collapse. Entry into any excavation greater than four feet deep will constitute a confined space entry procedure. Therefore, no excavation entrance is allowed.

A PID may be used to monitor air quality in the breathing zone of the work area for VOC vapor levels and in an excavation (See Section 7 of this plan) if required in the Health and Safety Plan Summary. Prior to Contractor Personnel entering any excavations to install piping or any other equipment, the PID will be lowered into the excavation to determine air quality in the excavation. Confined spaces will not be entered.

### **3.2.13 Operations on Surface Waters**

The procedures specified in this subsection are designed to protect OBG staff when conducting work activities involving water craft vessels on surface waters. Governmental laws and regulations regarding onshore waters are under the jurisdiction of the United States Coast Guard (USCG) and the state regulatory agency and its regulations will be adhered to. Always Work In Pairs – Never Conduct Work Activities Alone.

#### ***3.2.13.1 Scope and Applicability***

The procedures specified in this subsection apply to all work activities involving surface waters (including sediment sampling). The highest ranking OBG staff member (e.g., Project Manager, Field Task Leader) at the work site is responsible for implementing this plan. The work activities will not be initiated prior to receiving approval from the PM.

- Work activities can be conducted in “open water” or “ice” conditions.
- Each OBG staff person at the site is responsible for following these procedures.

#### ***3.2.13.2 Watercraft***

The following procedures will be observed when OBG staff conducts work activities in “open water” conditions in a watercraft vessels (including drill rigs mounted on barges):

- Work will not be initiated prior to meeting approval from the PM.
- Work activities conducted on surface waters will be conducted in accordance with the requirements of the USCG and the appropriate state agency.

- Personal Flotation Devices (PFD) that are USCG approved must be worn at all times when on surface waters. One adult size PFD (wearable style) for every person on the watercraft is required.
- A minimum of two (2) PFDs must be on board on the watercraft at all times.
- Have on board a “throwable” flotation device w/attached line.
- Distribute weight evenly across the beam of the watercraft.
- Only allow one person to stand at a time in a small watercraft vessel.
- Do not exceed manufacture’s capacity plate load limits.
- Attach a lanyard or safety line which can be tied to the sampling personnel when water surface conditions are rough. This will enable easier retrieval of the person should he/she fall over the side of the watercraft.
- Check running condition of the outboard motor prior to launching (e.g., ample supply of fuel/oil mix, fuel line condition, integrity of the propeller, EXTRA SHEER PINS).
- Equipment to have on board include oars, anchor w/line (100-foot minimum line on inland waters) and mooring lines of adequate length.
- Wear work gloves when using equipment that could injure hands.
- Wear hard hat at all times.
- Secure overboard equipment to vessel.
- Use proper lifting techniques when retrieving heavy equipment.

### ***3.2.13.3 Shallow Water***

Site-Specific Work Plan and the site reconnaissance will evaluate the best approach to sampling in shallow water. If wading is necessary, work activities in shallow water along the shore line shall consider the following hazards:

- Use waders to minimize exposure to water, sediment contaminant exposure and heat loss.
- Proceed carefully – water currents and falling can cause the waders to fill creating a very serious condition. In addition to wearing a PFD, a safety line should be tethered to the person walking in water currents.
- Fatigue can occur more rapidly from walking through the water.

### **3.2.13.4 Sampling Through Ice**

Collection of samples through frozen rivers/lakes presents the difficulties of working on ice. Precautions for slips, trips, and falls will be observed. Ice thickness will be at a minimum of 9-inches thick before work activities will commence.

The following procedures will be observed when OBG staff conducts work activities on “ice” conditions:

- Work activities will not be initiated prior to meeting approval from the Environmental Health & Safety Manager (EHSM).
- Know the ice (e.g., thickness) and proceed with extreme caution. Ice thickness at a minimum should be 18 to 24 inches (when conducting drilling operations) and inspected for integrity. Check ice thickness regularly when traversing across ice to assure adequate support exists. Be especially cautious when approaching pressure cracks, areas of open water or areas of rivers where water velocity may be higher.
- Wear PFDs at all times.
- Warm weather causes ice thinning and potential for slipping (drilling holes on thinning ice can cause flooding of ice surface and can accelerate ice thinning and breakage).
- Equipment may be required to be hauled between work stations (use sleds).
- Fatigue can occur from walking and drilling holes.

Based on water currents, water temperature and the amount of clothing worn by OBG staff, the threat of being swept downstream or drowning is possible. Extreme caution must be used when conducting these types of work activities. If a OBG staff employee should fall into the water, the employee will be retrieved and all warranted precautions shall be taken to ensure the safety and well being of that individual. Work activities will be immediately suspended and the person brought to shore. Wet clothing shall be removed and the person shall be dried and dressed in a set of dry clothes. If the possibility of hypothermia exists, seek medical attention immediately.

Persons sampling contaminated or potentially contaminated materials should wear the same PPE as listed for monitoring well sampling. The required PPE will be carried along on the sediment sampling watercraft. PPE can add to heat stress during warm conditions and can cause decreased mobility dexterity.

**3.2.13.5 Subcontractors**

It is the responsibility of the PM to require subcontractors assisting in the work activities, to adhere to state and federal governmental laws and regulations related to onshore and inland waters. Any refusal on behalf of the subcontractor will mandate shutdown of the project.

## **4 PERSONNEL TRAINING REQUIREMENTS**

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### **4.1 General**

OBG and subcontractor employees performing field work on this project are required to have appropriate safety training as specified in the OSHA Standards, particularly the HAZWOPER Standard 29CFR1910.120. All personnel working on the site are required to have the 40-hour HAZWOPER training and be up to date on their 8-hour HAZWOPER refresher requirements. OBG personnel performing fieldwork on this project meet the necessary general training requirements. Subcontractors are responsible for supplying OBG's PM with written statements certifying that their project personnel meet the necessary general training requirements.

### **4.2 Site-Specific**

Site-specific hazard and hazard control information is contained in this health and safety plan. OBG personnel will be provided with a copy of this plan prior to the beginning of fieldwork. Each person will be required to "sign off" that they have read, understood, and will follow the procedures set forth in the plan.

### **4.3 Informational Briefings**

It is the responsibility of each OBG staff member directing field operations to keep their crew members apprised of site conditions relative to health and safety, and of any approved modifications to the plan. This will be accomplished through ongoing "tailgate" meetings. OBG personnel are required to report injuries, illnesses, and unsafe conditions to their immediate supervisor. The supervisor is required to report in writing any such accidents to the PM and SSL within 24 hours of occurrence.



## 5 PERSONAL PROTECTIVE EQUIPMENT

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Listed in the health and safety plan summary at the very beginning of this plan are hazardous substances that have been found or are suspected to be present at the site. Hazardous substances are most likely found in soil and groundwater. Routes of exposure include inhalation, ingestion, and absorption. Proper PPE should be worn when applicable.

### 5.1 Site Recon/Field Mobilization

- Normal work clothes
- Bib style rain pants where wet operations exist
- Safety glasses with side-shields (REQUIRED AT ALL TIMES)
- Steel-toed boots (REQUIRED AT ALL TIMES)
- Reflective orange vest (worn as the situation warrants)
- Hearing protection (as required – see note below)
- Face shield/mask, as needed

### 5.2 Drilling/Test Pit Excavation/Installation of Wells

Persons handling contaminated or potentially contaminated equipment, soils, sediment, or water must wear the following PPE:

- Long sleeve coveralls (light or heavy weights subject to ambient temperature)
- Bib style rain pants where wet operations exist
- Nitrile gloves
- Vinyl gloves for sample handling
- Safety glasses with side-shields (REQUIRED AT ALL TIMES)
- Hard hat (REQUIRED AT ALL TIMES)
- Steel-toed boots (REQUIRED AT ALL TIMES)

- Reflective orange vest (worn as the situation warrants)
- Hearing protection (as required – see note below)
- Face shield/mask, as needed

**NOTE:** Guidance on the requirements of ear protection is as follows: if you must raise your voice to converse with persons three feet away from you, you are probably being overexposed to noise. In these instances, the wearing of hearing protection is required. The muff or "EAR" type disposable earplugs will suffice.

### 5.3 Groundwater/Surface Water and Soil/Sediment Sampling

Persons sampling contaminated or potentially contaminated materials, soil, sediment, or water must wear the following PPE:

- Long sleeve coveralls (light or heavy weights subject to ambient temperature)
- Bib style rain pants where wet operations exist
- Nitrile gloves
- Vinyl gloves for sample handling
- Safety glasses with side-shields (REQUIRED AT ALL TIMES)
- Steel-toed boots (REQUIRED AT ALL TIMES)
- Hearing protection (as required)
- Face shield/mask, as needed

Persons whose skin or inner clothing comes in contact with contaminated soils or liquids should remove such clothing, shower or clean as appropriate, then re-suit for continued work activities.

**NOTE:** Outer gloves should be changed between samples if contact to the sample occurs. This will preserve sample integrity.

## **6 MEDICAL SURVEILLANCE REQUIREMENTS**

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### **6.1 Medical Surveillance**

The hazardous substances known or suspected to be present at the site are not known to produce injury or illness that would not be detected by the medical examination specified in the OBG Standard Practices Manual, Section 6, Health and Safety, Number 06-10. The medical monitoring program established in this section of the Standard Practices Manual complies with all OSHA guidelines regarding and necessitating medical monitoring in the work place.

## **7 FREQUENCY AND TYPES OF AIR MONITORING/SAMPLING**

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### **7.1 Site Air Monitoring**

A photoionization detector (PID), a dust monitor, and possibly a combustible gas indicator (CGI) may be used to measure air contaminant concentrations in the breathing and work zones if required in the Health and Safety Plan Summary. Readings are to be recorded on the logs and in the project logbook. Monitors will be calibrated per the air monitoring action plan below. If a CGI is also used to detect combustible conditions at the work site, the monitoring will also follow the plan below.

### **7.2 Sampling Air Monitoring**

A PID may be used to measure air contaminant concentrations at the well head or soil sample location during sampling if required in the Health and Safety Plan Summary. If measurements are collected, they should be recorded in the project logbook. The PID will be calibrated at the start of each day of use. Air monitoring should follow the action plan below.

### **7.3 Air Monitoring Action Plan**

A PID will be calibrated and checked on a minimum basis at least three times per day: 1) before work activities begin; 2) during lunch break or approximately half way through the working day; and 3) following work activities at the end of the day. These calibration checks will be used to ensure accuracy of VOC readings. Calibration procedures will follow those outlined in the PID manual and OBG's SOPs.

The PID will be used to monitor air quality in the breathing zone of the work area for the presence of VOC vapor levels if required in the Health and Safety Plan Summary. Prior to Contractor Personnel entering any excavations to install piping or any other equipment, the PID will be lowered into the excavation to determine air quality in the excavation. Confined spaces will not be entered. Besides using the PID to monitor VOC vapors in the breathing zone, an oxygen meter may also be used. The oxygen meter may be used to measure percent oxygen in any excavation. Calibration of the combustible gas meter is required based on use to ensure accuracy.

Calibration procedures and frequency for the dust monitors will follow those outlined in the manufacture's operation manuals. At a minimum, perform automatic zeroing each day to ensure optimal operation and to indicate any significant deviations requiring maintenance.

The VOCs "action level" for unknown contaminants is considered when a reading is sustained on the PID when the PID is held at a constant height, whether in the excavation or the breathing zone. If specific compounds are known to exist at the site (i.e benzene, vinyl chloride trichloroethene) actions levels will be set for the specific compound present or if several compounds are present the most conservative action level will be used. Reaching the VOC action level will require use of either full-face or half-face respirators utilizing organic vapor cartridge filters. Additionally, further air quality monitoring will be required to ensure that the PID readings do not exceed the upper limit. This will be done under the direction of the SSL who will determine specific modifications to work practices and PPE requirements. Draeger tubes or a compound specific meter may be used to identify specific compounds present onsite. If it is determined a specific compound is not present the PID screening action level may be changed for the specific compound present. In addition, if engineering controls at the site (i.e ventilation, moving upwind, use of foam or other cover) mitigates the PID readings to below the action levels than respirators will not be required. Refer to Appendix C for the respirator use flow chart.

If the upper limit is achieved, all activities on the site will immediately stop. The OBG PM will be contacted prior to taking any further action on the site, unless a situation exists which requires immediate action. Options such as nitrogen purging will be considered based on the most current information available.

## 8 SITE CONTROL MEASURES

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### 8.1 Buddy System

Each worker will maintain visual contact with another worker at all times. The buddy system will ensure against an employee becoming stressed with a co-worker being aware of his or her condition. Workers should watch out for each other while working close to potential chemical and physical hazards. For example, all work in the exclusion zone should be scheduled so that no employee works alone in this zone at any time.

### 8.2 Safe Work Practices

To prevent accidental ingestion of chemical contaminants, the following rules must be compiled with when working within the exclusion/contamination reduction zones, and when taking or handling samples.

- No eating, drinking, or smoking is allowed in work areas.
- No fires are allowed at work locations unless approved by the Project Health and Safety Officer on a site-specific, task-specific basis. If fires or propane torches are used, fires will be maintained away from potential ignition sources and site personnel will not leave the fire unattended and a fire extinguisher will be immediately available.
- OBG and contractor personnel must wash their hands, arms, face, and neck immediately after leaving the exclusion/contamination reduction zones. This must also be done after taking samples and prior to eating, drinking, smoking, or using the restroom.

### 8.3 Work Zone Definition

Work crews, whether drilling, excavating, or performing other activities, must prevent the uncontrolled movement of contaminated or potentially contaminated soil and water. All soil and water removed from its natural setting should be considered contaminated unless proven otherwise by chemical analysis or specifically known to be clean material in which verification sampling is occurring. Work crews will prevent migration of removed materials by establishing work zones and decontamination procedures. Work zones will be delineated. Only persons certified as having the necessary training and medical qualifications will be allowed in the Exclusion Zone (EZ) or Contamination Reduction Zone (CRZ). The following describes the zones to be established during drilling or excavation:

- Exclusion Zone – An EZ will be established surrounding the drilling or excavation site, if necessary. The EZ will comprise an area of at least as large as a circle having a diameter equaling one half the mast height of the drilling equipment or arm of excavating equipment. The size and shape of the EZ will be determined by the SSL. No personnel will be permitted in the EZ unless they are in full compliance with the site health and safety plan.
- Contamination Reduction Zone - A CRZ is to provide a controlled area for performing decontamination. If a CRZ is necessary for the job, the size and the shape of the CRZ will be determined by the SSL.

## 8.4 Daily Start-up and Shutdown Procedures

The following protocols will be followed daily prior to the start of work activities:

- The SSL will review site conditions to determine if modifications of the work and safety plans are needed.
- Personnel will be briefed and updated on any new safety procedures based on the previous day's findings and the planned work activity for that day.
- All safety equipment will be checked for proper function.
- The SSL will ensure that the first aid equipment is readily available.
- The SSL will initiate appropriate monitoring.

The following protocol will be followed at the end of daily operations and before breaks:

- All personnel will proceed through appropriate decontamination procedures and facilities.
- The work site will be left clean. Drums will be properly labeled and staged.
- All PPE must be removed prior to eating, drinking, smoking, or using the restroom.

## 8.5 Equipment

Drilling rigs and heavy equipment should be inspected at the start of each day to detect equipment problems. Particular attention should be paid to cables and hydraulic lines. Examine them for evidence of stretching, fraying and cracking. The fuel system should be in good repair (free from leaks) to avoid the potential for fire or explosion. The drill rig and heavy equipment should be equipped with or have stationed in the area two 20-pound type BC fire extinguishers.

## **8.6 Work Area**

The work area should be located away from overhead electrical lines. The location of buried water, electrical, telephone, and gas utility lines must be determined and staked. Slope of terrain, stability of embankments, soil load bearing ability, etc. should be evaluated in selection of the drilling/excavation locations.



## 9 DECONTAMINATION PLAN

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### 9.1 Decontamination Procedures

Personal decontamination will be accomplished by using good personal hygiene. Personal contamination should not occur if the protection methods specified in this plan are used. However, the following procedures must be complied with to ensure that contamination does not remain on equipment, sample containers, or in contact with personnel.

- While in the EZ clean gross contamination off equipment by scraping or brushing. Collect all contaminated soil with the drill cuttings and transport the cuttings in an appropriate manner to the staging area on site (e.g., placed in DOT approved 55-gallon drums).
- If steam cleaning of equipment is required it will occur at the designated area on site. If capture of decontamination water is required, it will be placed in DOT approved 55-gallon drums.

After equipment and sample container decontamination is accomplished, drilling crewmembers must remove PPE before leaving the CRZ. PPE must be removed in a step-wise fashion to prevent contamination of work clothing, as follows:

- Remove all contaminated soil from work boots and remove protective clothing for decontamination or disposal. If disposable PPE is required, it should be placed in an open top drum designated for that purpose. A lid should be placed on the drum after usage. All drummed material will be labeled identifying contents and the date filled.
- Remove and wash outer gloves and hard hat. Place disposable gloves in a collection bag.
- The use of respiratory protection is not anticipated. If a respirator must be used or otherwise removed from its containers, wash it down and take it with you as you exit the CRZ.
- Final daily decontamination will be reviewed by the SSL to ensure that no contaminated articles are left which may be accessible to the public. Therefore, all disposable PPE and other miscellaneous garbage will be stored in a drum with a secured lid.

After leaving the CRZ, and before eating, drinking, smoking, or using the restroom, all personnel must wash their hands, arms, face, and neck. In addition, personnel who have come in contact with heavily contaminated materials should take a full-body shower at the end of the workday if hand washing is not effective at removing dirt and grime. A full-body shower includes the use of a wash cloth to scrub the skin.

## **9.2 Waste Storage and Disposal**

Since all soil and water removed from its natural setting is considered potentially contaminated, these materials will be stored and disposed of according to the guidelines established in the Work Plan for the site. If no guidelines have been established in the work plan for storage and disposal of these investigative wastes, the procedures outlined in OBG Standard Practices Manual, Section 6, Health and Safety, Number 06-07.

Waste container contents and identification will be made in the field log for future reference. All containers will be distinctly labeled using a paint pen or marker.

# 10 EMERGENCY ACTION PLAN

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## 10.1 Medical Emergencies

In the event of a medical emergency, the following procedures should be used.

1. If serious injury or life-threatening condition exists, call 911. Clearly describe the location, injury, and conditions to the dispatcher. Designate a person to direct emergency responders to the injured person(s).
2. Call the project manager.
3. Implement steps to prevent the reoccurrence of the accident.

## 10.2 Chemical Emergencies

1. If serious injury or life-threatening condition exists, call 911. Clearly describe the location, injury, and conditions to the dispatcher.
2. Evacuate other on-site personnel to a safe place in an upwind direction until it is safe for work to resume.
3. Call the PM.
4. If necessary contact clean-up contractor.
5. If release requires contacting government agencies the PM makes the appropriate calls (PM also contacts Client).

## 10.3 General Emergencies

In the case of fire (other than a managed pre-approved fire, discussed in Section 8.2), flood, explosion, spills, severe weather, tank or pipe punctures, or other hazard, work shall be halted and if applicable, 911 called. All on-site personnel will immediately be evacuated to a safe place.

## 10.4 Accident Reports and Follow up

All accidents, including those that do not result in injury or illness, are to be reported verbally to the SSL or the PM immediately, with written documentation within 24 hours of their occurrence. Accidents and other health and safety incidents must be reported through the Ramboll Health & Safety Incident

Reporting system: <https://ramboll.ehsinsight.com/site#/home>. A copy of the online form is provided in Appendix B.

## **11 CONFINED SPACE ENTRY PROCEDURES**

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No confined spaces (or the need to enter a confined space) are anticipated at the site; however, should such an issue arise (or become anticipated at a particular site), it will be addressed in the site specific work plan.

## 12 SPILL CONTAINMENT PROGRAM

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No potential spill situations are anticipated on the site; however, if there is an accidental release of potentially hazardous materials or waste (e.g., spilled purge water or soil cuttings, ruptured hydraulic line), site personnel will:

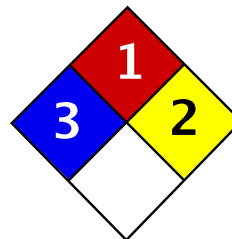
- Contact the PM and SSL
- Contain the spill, if it is possible and it can be done safely
- Initiate cleanup
- Contact a qualified spill response/cleanup contractor, as needed

# Appendix A

## Chemical Information / Safety Data Sheets

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- PAHs
- Metals
- Arsenic
- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Silver
- Zinc
- Lithium batteries
- Lead acid batteries
- Benzene
- Alconox
- Isobutylene
- Deep Woods Off



Health	3
Fire	1
Reactivity	2
Personal Protection	E

## Material Safety Data Sheet Arsenic MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Arsenic

**Catalog Codes:** SLA1006

**CAS#:** 7440-38-2

**RTECS:** CG0525000

**TSCA:** TSCA 8(b) inventory: Arsenic

**CI#:** Not applicable.

**Synonym:**

**Chemical Name:** Arsenic

**Chemical Formula:** As

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Arsenic	7440-38-2	100

**Toxicological Data on Ingredients:** Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH.

MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.

The substance is toxic to kidneys, lungs, the nervous system, mucous membranes.

Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures



**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact:** Not available.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:** Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:**

Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits highly toxic fumes.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not

present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, moisture.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 0.01 from ACGIH (TLV) [United States] [1995]  
Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Lustrous solid.)

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 74.92 g/mole

**Color:** Silvery.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** Not available.

**Melting Point:** Sublimation temperature: 615°C (1139°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 5.72 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water, hot water.

### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Reactive with oxidizing agents, acids, moisture.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

### Section 11: Toxicological Information

**Routes of Entry:** Inhalation. Ingestion.

**Toxicity to Animals:** Acute oral toxicity (LD50): 145 mg/kg [Mouse].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH.

Causes damage to the following organs: kidneys, lungs, the nervous system, mucous membranes.

**Other Toxic Effects on Humans:**

Very hazardous in case of ingestion, of inhalation.

Slightly hazardous in case of skin contact (irritant).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:** Not available.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are as toxic as the original product.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

### Section 14: Transport Information

**DOT Classification:** CLASS 6.1: Poisonous material.

**Identification:** : Arsenic UNNA: UN1558 PG: II

**Special Provisions for Transport:** Not available.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Arsenic

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Arsenic

Pennsylvania RTK: Arsenic

Massachusetts RTK: Arsenic

TSCA 8(b) inventory: Arsenic

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:**

**WHMIS (Canada):**

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).

CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R22- Harmful if swallowed.

R45- May cause cancer.

**HMIS (U.S.A.):**

**Health Hazard:** 3

**Fire Hazard:** 1

**Reactivity:** 2

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 3

**Flammability:** 1

**Reactivity:** 2

**Specific hazard:**

**Protective Equipment:**

Gloves.

Lab coat.

Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Safety glasses.

**Section 16: Other Information****References:**

-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.

-Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec.

-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec.

-SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.

-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.

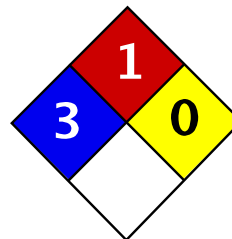
-Guide de la loi et du règlement sur le transport des marchandises dangereuses au Canada. Centre de conformité international Ltée. 1986.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 04:16 PM

**Last Updated:** 10/09/2005 04:16 PM

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Health	3
Fire	1
Reactivity	0
Personal Protection	E

## Material Safety Data Sheet Cadmium MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Cadmium

**Catalog Codes:** SLC3484, SLC5272, SLC2482

**CAS#:** 7440-43-9

**RTECS:** EU9800000

**TSCA:** TSCA 8(b) inventory: Cadmium

**CI#:** Not applicable.

**Synonym:**

**Chemical Name:** Cadmium

**Chemical Formula:** Cd

**Contact Information:**

**Sciencelab.com, Inc.**  
14025 Smith Rd.  
Houston, Texas 77396

US Sales: **1-800-901-7247**  
International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**  
1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Cadmium	7440-43-9	100

**Toxicological Data on Ingredients:** Cadmium: ORAL (LD50): Acute: 2330 mg/kg [Rat.]. 890 mg/kg [Mouse]. DUST (LC50): Acute: 50 ppm 4 hour(s) [Rat].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant). Severe over-exposure can result in death.

**Potential Chronic Health Effects:**

**CARCINOGENIC EFFECTS:** Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP.

**MUTAGENIC EFFECTS:** Not available.

**TERATOGENIC EFFECTS:** Not available.

**DEVELOPMENTAL TOXICITY:** Not available.

The substance is toxic to kidneys, lungs, liver.

Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

## Section 4: First Aid Measures

**Eye Contact:** No known effect on eye contact, rinse with water for a few minutes.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:** Not available.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

**Ingestion:**

Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** 570°C (1058°F)

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:**

Non-flammable in presence of open flames and sparks, of heat, of oxidizing materials, of reducing materials, of combustible materials, of moisture.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:**

Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits toxic fumes.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

**Storage:**

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 0.01 (ppm)

Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Lustrous solid.)

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 112.4 g/mole

**Color:** Silvery.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 765°C (1409°F)

**Melting Point:** 320.9°C (609.6°F)

**Critical Temperature:** Not available.



**Specific Gravity:** 8.64 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol.

### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Reactive with oxidizing agents.

**Corrosivity:** Not considered to be corrosive for metals and glass.

**Special Remarks on Reactivity:** Reacts violently with potassium.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

### Section 11: Toxicological Information

**Routes of Entry:** Inhalation. Ingestion.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.

Acute oral toxicity (LD50): 890 mg/kg [Mouse].

Acute toxicity of the dust (LC50): 229.9 mg/m³ 4 hour(s) [Rat].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP.

The substance is toxic to kidneys, lungs, liver.

**Other Toxic Effects on Humans:**

Hazardous in case of ingestion, of inhalation.

Slightly hazardous in case of skin contact (irritant, sensitizer).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** An allergen. 0047 Animal: embryotoxic, passes through the placental barrier.

**Special Remarks on other Toxic Effects on Humans:** May cause allergic reactions, exzema and/or dehydration of the skin.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are as toxic as the original product.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

## Section 14: Transport Information

**DOT Classification:**

**Identification:**

**Special Provisions for Transport:**

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute:

Cadmium

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Cadmium

Pennsylvania RTK: Cadmium

Massachusetts RTK: Cadmium

TSCA 8(b) inventory: Cadmium

SARA 313 toxic chemical notification and release reporting: Cadmium

CERCLA: Hazardous substances.: Cadmium

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:**

**WHMIS (Canada):**

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).

CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R26- Very toxic by inhalation.

R45- May cause cancer.

**HMIS (U.S.A.):**

**Health Hazard:** 3

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 3

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves.

Lab coat.

Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Safety glasses.

## Section 16: Other Information

### References:

- Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
- Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec.
- Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec.
- SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
- The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
- Guide de la loi et du règlement sur le transport des marchandises dangereuses au Canada. Centre de conformité international Ltée. 1986.

**Other Special Considerations:** Not available.

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# CHROMIUM

Also known as: Chrome, Chromate, Cr, Chrome III, Chrome VI, Hex Chrome, Tri Chrome  
Chemical reference number (CAS): 7440-47-3

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## WHAT IS CHROMIUM?

Chromium is an element existing in several different forms. Metallic chromium is mined for use in steel and other metal products. Many chromium-containing compounds are used for plating, manufacturing paints and dyes, tanning leather and preserving wood.

“Trivalent” chromium is naturally occurring and is essential for good health. The normal intake from eating foods that are high in natural chromium is 70-80 micrograms per day and is considered safe.

In the home or office the less-toxic forms of chromium are used to make flooring materials, video and audio recording tapes, stainless steel, chrome-plated items and copy machine toner.

“Hexavalent” chromium does not occur naturally, but is produced by certain industrial processes. It is the most toxic form of chromium, and is shown to cause lung cancer when workers are exposed to high air levels for long time periods.

## HOW ARE PEOPLE EXPOSED TO CHROMIUM?

**Breathing:** People can be exposed to chromium by breathing chromium dust or fumes. This is the route of exposure that is of greatest concern.

**Drinking/Eating:** Most human exposure to chromium occurs when people eat fresh vegetables, meats, fish, and poultry.

Drinking water is not normally a major source of exposure. Plants can absorb chromium and it can be passed to those who eat the plants.

**Touching:** Contact with contaminated soils can result in exposure to chromium. Exposure can be reduced by thorough washing of exposed skin and clothing to remove soil residues. Chromium can pass through the skin, but this is probably not a major route of exposure.

## DO STANDARDS EXIST FOR REGULATING CHROMIUM?

**Water:** The state and federal drinking water standards for the total amount of all forms of chromium found in drinking water are set at 100 parts per billion (ppb). We suggest you stop drinking water containing more than 100 ppb of chromium.

**Air:** No standards exist for the amount of chromium allowed in the air of homes. We use a formula to convert workplace limits to home limits. Based on the formula, we recommend levels of hexavalent chromium in air be no higher than 0.0002 milligrams per cubic meter of air (mg/m³). The lifetime cancer risk at this level is 1 in 8, or about 120,000 times higher than normal.

The Wisconsin Department of Natural Resources regulates the amount of chromium that can be released by industries.

## WILL EXPOSURE TO CHROMIUM RESULT IN HARMFUL HEALTH EFFECTS?

The following health effects may occur immediately or shortly after exposure to high levels of chromium:

- Irritation to mouth, throat, lungs, and nose following inhalation of hexavalent chromium particles
- Skin irritation and allergic reactions
- Digestive problems, kidney damage, and liver damage after eating food or drinking water contaminated with hexavalent chromium

The following health effects can occur after several years of exposure to chromium:

**Cancer:** Lung cancer can develop after exposure to hexavalent chromium vapors or fumes.

**Respiratory:** Lung irritation resulting in asthma can be caused by hexavalent chromium.

**Organ Systems :** Chromium exposure can cause liver and kidney damage.

**Immune System:** Animal studies show changes in immune system function.

**Reproductive Effects:** Animal studies show damage to developing fetuses and lowered sperm production in males.

In general, chemicals affect the same organ systems in all people who are exposed. However, the seriousness of the effects may vary from person to person. A person's reaction depends on several things, including individual health, heredity, previous exposure to chemicals including chromium and medicines, and personal habits such as smoking or drinking. It is also important to consider the length of exposure to the chemical; the amount of chemical exposure; and whether the chemical was inhaled, touched, or eaten.

## CAN A MEDICAL TEST DETERMINE EXPOSURE TO CHROMIUM?

When a person is regularly exposed to chromium, the chemical can be monitored by testing hair, urine, blood serum and red blood cells. Most of the chromium that enters the body is eliminated within 24 hours. Chromium does not build up in the body.

*Seek medical advice if you have any symptoms that you think may be related to chemical exposure.*

This fact sheet summarizes information about this chemical and is not a complete listing of all possible effects. It does not refer to occupational exposure or emergency situations.

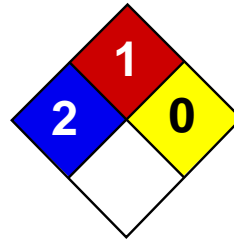
## FOR MORE INFORMATION

- Poison Control Center, 800-815-8855
- Your local public health agency
- Division of Public Health, BEH, 1 West Wilson Street, Rm. 150, Madison, WI 53701-2659, (608) 266-1120 or Internet: [www.dhfs.state.wi.us/eh/index.htm](http://www.dhfs.state.wi.us/eh/index.htm)



Prepared by the  
Wisconsin Department of Health and Family Services  
Division of Public Health, with funds from the  
Agency for Toxic Substances and Disease Registry,  
Public Health Service,  
U.S. Department of Health and Human Services.

(POH 4593 Revised 12/2000)



Health	2
Fire	1
Reactivity	0
Personal Protection	E

# Material Safety Data Sheet

## Copper MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Copper

**Catalog Codes:** SLC4939, SLC2152, SLC3943, SLC1150, SLC2941, SLC4729, SLC1936, SLC3727, SLC5515

**CAS#:** 7440-50-8

**RTECS:** GL5325000

**TSCA:** TSCA 8(b) inventory: Copper

**CI#:** Not available.

**Synonym:**

**Chemical Name:** Not available.

**Chemical Formula:** Cu

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**  
1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Copper	7440-50-8	100

**Toxicological Data on Ingredients:** Copper LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant).

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:** Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:** Not available.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:** Not available.

**Ingestion:**

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:** Not available.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

### Section 6: Accidental Release Measures

**Small Spill:**

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

### Section 7: Handling and Storage

**Precautions:**

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible.

**Storage:**

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

**Section 8: Exposure Controls/Personal Protection****Engineering Controls:**

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:**

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 1 (mg/m³) from ACGIH [1990] Consult local authorities for acceptable exposure limits.

**Section 9: Physical and Chemical Properties**

**Physical state and appearance:** Solid.

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 63.54 g/mole

**Color:** Not available.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 2595°C (4703°F)

**Melting Point:** 1083°C (1981.4°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 8.94 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water.

**Section 10: Stability and Reactivity Data**



**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:** The substance is toxic to lungs, mucous membranes.

**Other Toxic Effects on Humans:**

Very hazardous in case of ingestion. Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Human: passes through the placenta, excreted in maternal milk.

**Special Remarks on other Toxic Effects on Humans:** Not available.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are as toxic as the original product.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

## Section 14: Transport Information

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Marine Pollutant

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

Pennsylvania RTK: Copper Massachusetts RTK: Copper TSCA 8(b) inventory: Copper CERCLA: Hazardous substances.: Copper

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:**

**WHMIS (Canada):** CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):** R36- Irritating to eyes.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

**Section 16: Other Information**

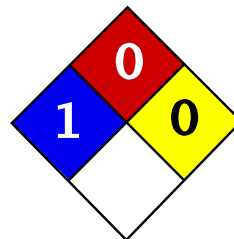
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 04:58 PM

**Last Updated:** 11/01/2010 12:00 PM

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Health	1
Fire	0
Reactivity	0
Personal Protection	E

## Material Safety Data Sheet Lead MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Lead

**Catalog Codes:** SLL1291, SLL1669, SLL1081, SLL1459, SLL1834

**CAS#:** 7439-92-1

**RTECS:** OF7525000

**TSCA:** TSCA 8(b) inventory: Lead

**CI#:** Not available.

**Synonym:** Lead Metal, granular; Lead Metal, foil; Lead Metal, sheet; Lead Metal, shot

**Chemical Name:** Lead

**Chemical Formula:** Pb

**Contact Information:**

**Sciencelab.com, Inc.**  
14025 Smith Rd.  
Houston, Texas 77396

US Sales: **1-800-901-7247**  
International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**  
1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Lead	7439-92-1	100

**Toxicological Data on Ingredients:** Lead LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

**Potential Acute Health Effects:** Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

**Potential Chronic Health Effects:**

Slightly hazardous in case of skin contact (permeator).

**CARCINOGENIC EFFECTS:** Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC.

**MUTAGENIC EFFECTS:** Not available.

**TERATOGENIC EFFECTS:** Not available.

**DEVELOPMENTAL TOXICITY:** Not available.

The substance may be toxic to blood, kidneys, central nervous system (CNS).

Repeated or prolonged exposure to the substance can produce target organs damage.

## Section 4: First Aid Measures

### Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact:** Not available.

### Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:** Not available.

### Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:** Non-flammable in presence of open flames and sparks, of shocks, of heat.

### Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

### Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** When heated to decomposition it emits highly toxic fumes of lead.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

### Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

### Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not

present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 0.05 (mg/m³) from ACGIH (TLV) [United States]

TWA: 0.05 (mg/m³) from OSHA (PEL) [United States]

TWA: 0.03 (mg/m³) from NIOSH [United States]

TWA: 0.05 (mg/m³) [Canada] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Metal solid.)

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 207.21 g/mole

**Color:** Bluish-white. Silvery. Gray

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 1740°C (3164°F)

**Melting Point:** 327.43°C (621.4°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 11.3 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials, excess heat

**Incompatibility with various substances:** Reactive with oxidizing agents.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Can react vigorously with oxidizing materials.

Incompatible with sodium carbide, chlorine trifluoride, trioxane + hydrogen peroxide, ammonium nitrate, sodium azide, disodium acetylide, sodium acetylide, hot concentrated nitric acid, hot concentrated hydrochloric acid, hot concentrated sulfuric acid, zirconium.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Inhalation. Ingestion.

**Toxicity to Animals:**

LD50: Not available.

LC50: Not available.

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC.

May cause damage to the following organs: blood, kidneys, central nervous system (CNS).

**Other Toxic Effects on Humans:** Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential:

Skin:

Lead metal granules or dust: May cause skin irritation by mechanical action.

Lead metal foil, shot or sheets: Not likely to cause skin irritation

Eyes:

Lead metal granules or dust: Can irritate eyes by mechanical action.

Lead metal foil, shot or sheets: No hazard. Will not cause eye irritation.

**Inhalation:**

In an industrial setting, exposure to lead mainly occurs from inhalation of dust or fumes.

Lead dust or fumes: Can irritate the upper respiratory tract (nose, throat) as well as the bronchi and lungs by mechanical action. Lead dust can be absorbed through the respiratory system. However, inhaled lead does not accumulate in the lungs. All of an inhaled dose is eventually absorbed or transferred to the gastrointestinal tract. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include metallic taste, chest pain, decreased physical fitness, fatigue, sleep disturbance, headache, irritability, reduces memory, mood and personality changes, aching bones and muscles, constipation, abdominal pains, decreasing appetite. Inhalation of large amounts may lead to ataxia, delirium, convulsions/seizures, coma, and death.

Lead metal foil, shot, or sheets: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count.

**Ingestion:**

Lead metal granules or dust: The symptoms of lead poisoning include abdominal pain or cramps (lead colic), spasms, nausea, vomiting, headache, muscle weakness, hallucinations, distorted perceptions, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness and other symptoms similar to that of inhalation. Acute poisoning may result in high lead levels in the blood and urine, shock, coma and death in extreme cases.

Lead metal foil, shot or sheets: Not an ingestion hazard for usual industrial handling.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

### Section 14: Transport Information

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead

California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead

California prop. 65: This product contains the following ingredients for which the State of California has found to

cause reproductive harm (male) which would require a warning under the statute: Lead  
California prop. 65 (no significant risk level): Lead: 0.0005 mg/day (value)  
California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Lead  
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead  
Connecticut hazardous material survey.: Lead  
Illinois toxic substances disclosure to employee act: Lead  
Illinois chemical safety act: Lead  
New York release reporting list: Lead  
Rhode Island RTK hazardous substances: Lead  
Pennsylvania RTK: Lead

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).  
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):** CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R20/22- Harmful by inhalation and if swallowed.  
R33- Danger of cumulative effects.  
R61- May cause harm to the unborn child.  
R62- Possible risk of impaired fertility.  
S36/37- Wear suitable protective clothing and gloves.  
S44- If you feel unwell, seek medical advice (show the label when possible).  
S53- Avoid exposure - obtain special instructions before use.

**HMIS (U.S.A.):**

**Health Hazard:** 1

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 1

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves.  
Lab coat.  
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.



Safety glasses.

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:21 PM

**Last Updated:** 10/10/2005 08:21 PM

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# MERCURY

MCR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Quicksilver	Liquid Silver Odorless
Sinks in water.	
Keep people away. AVOID CONTACT WITH LIQUID. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. LIQUID Effects of exposure may be delayed.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: Hg 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 2809 2.5 CAS Registry No.: 7439-97-6 2.6 NAERG Guide No.: 172 2.7 Standard Industrial Trade Classification: 52227
<b>3. HEALTH HAZARDS</b>	
3.1 <b>Personal Protective Equipment:</b> Avoid contact of liquid with skin. For vapor use chemical cartridge (Hopcalite) respirator.	
3.2 <b>Symptoms Following Exposure:</b> No immediate symptoms. As poisoning becomes established, slight muscular tremor, loss of appetite, nausea, and diarrhea are observed. Psychic, kidney, and cardiovascular disturbances may occur.	
3.3 <b>Treatment of Exposure:</b> Consult a doctor.	
3.4 <b>TLV-TWA:</b> 0.025 mg/m ³	
3.5 <b>TLV-STEL:</b> Not listed.	
3.6 <b>TLV-Ceiling:</b> Not listed.	
3.7 <b>Toxicity by Ingestion:</b> No immediate toxicity	
3.8 <b>Toxicity by Inhalation:</b> Currently not available.	
3.9 <b>Chronic Toxicity:</b> Development of mercury poisoning	
3.10 <b>Vapor (Gas) Irritant Characteristics:</b> None	
3.11 <b>Liquid or Solid Characteristics:</b> None	
3.12 <b>Odor Threshold:</b> Odorless	
3.13 <b>IDLH Value:</b> Not listed.	
3.14 <b>OSHA PEL-TWA:</b> Not listed.	
3.15 <b>OSHA PEL-STEL:</b> Not listed.	
3.16 <b>OSHA PEL-Ceiling:</b> 0.1 mg/m ³	
3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not flammable
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 0.5-1 ppm/48 hr/caragius ariarium/TL₅₀/fresh water  
0.29 ppm/48 hr/marine fish/TL₅₀/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** Mercury concentrates in liver and kidneys of ducks and geese to levels above FDA limit of 0.5 ppm. Muscle tissue usually well below the limit.
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** U155/D009
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 200.59
- 9.3 **Boiling Point at 1 atm:** 675°F = 357°C = 630°K
- 9.4 **Freezing Point:** -38.0°F = -38.9°C = 234.3°K
- 9.5 **Critical Temperature:** 2663.6°F = 1462°C = 1735.2°K
- 9.6 **Critical Pressure:** 23,300 psia = 1587 atm = 160.8 MN/m²
- 9.7 **Specific Gravity:** 13.55 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 470 dynes/cm = 0.470 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** 375 dynes/cm = 0.375 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 2.7 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

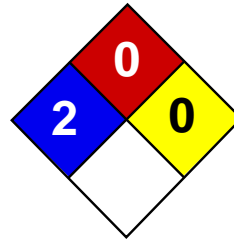
## NOTES

# MERCURY

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	851.399	35	0.033		N	0	1.827
5	851.000	40	0.033		O	5	1.801
10	850.500	45	0.033		T	10	1.777
15	850.099	50	0.033			15	1.754
20	849.699	55	0.033		P	20	1.731
25	849.199	60	0.033		E	25	1.709
30	848.799	65	0.033		R	30	1.688
35	848.399	70	0.033		T	35	1.668
40	847.899	75	0.033		I	40	1.648
45	847.500	80	0.033		N	45	1.629
50	847.099	85	0.033		E	50	1.610
55	846.599	90	0.033		N	55	1.592
60	846.199	95	0.033		T	60	1.575
65	845.799	100	0.033			65	1.558
70	845.299					70	1.541
75	844.899					75	1.525
80	844.500					80	1.510
85	844.000					85	1.495
90	843.599					90	1.480
95	843.199					95	1.466
100	842.699					100	1.452

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



Health	2
Fire	0
Reactivity	0
Personal Protection	E

# Material Safety Data Sheet

## Nickel metal MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Nickel metal

**Catalog Codes:** SLN2296, SLN1342, SLN1954

**CAS#:** 7440-02-0

**RTECS:** QR5950000

**TSCA:** TSCA 8(b) inventory: Nickel metal

**CI#:** Not applicable.

**Synonym:** Nickel Metal shot; Nickel metal foil.

**Chemical Name:** Nickel

**Chemical Formula:** Ni

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Nickel metal	7440-02-0	100

**Toxicological Data on Ingredients:** Nickel metal LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of ingestion.

**Potential Chronic Health Effects:**

Slightly hazardous in case of skin contact (sensitizer), of ingestion, of inhalation (lung sensitizer). **CARCINOGENIC EFFECTS:** Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. **MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance is toxic to skin. The substance may be toxic to kidneys, lungs, liver, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:** Not available.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:** Not available.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** Not applicable.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

**Special Remarks on Fire Hazards:** Material in powder form, capable of creating a dust explosion. This material is flammable in powder form only.

**Special Remarks on Explosion Hazards:**

Material in powder form, capable of creating a dust explosion. Mixtures containing Potassium Perchlorate with Nickel & Titanium powders & infusorial earth can explode. Adding 2 or 3 drops of approximately 90% peroxyformic acid to powdered nickel will result in explosion. Powdered nickel reacts explosively upon contact with fused ammonium nitrate at temperatures below 200 deg. C.

## Section 6: Accidental Release Measures

**Small Spill:**

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep locked up.. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Keep away from incompatibles such as oxidizing agents, combustible materials, metals, acids.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 1 (mg/m³) from ACGIH (TLV) [United States] Inhalation Respirable. TWA: 0.5 (mg/m³) [United Kingdom (UK)] TWA: 1 (mg/m³) from OSHA (PEL) [United States] Inhalation Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Metal solid. Lustrous solid.)

**Odor:** Odorless.

**Taste:** Not available.

**Molecular Weight:** 58.71 g/mole

**Color:** Silvery.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 2730°C (4946°F)

**Melting Point:** 1455°C (2651°F)

**Critical Temperature:** Not available.

**Specific Gravity:** Density: 8.908 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:**

Insoluble in cold water, hot water. Insoluble in Ammonia. Soluble in dilute Nitric Acid. Slightly soluble in Hydrochloric Acid, Sulfuric Acid.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials

**Incompatibility with various substances:** Reactive with oxidizing agents, combustible materials, metals, acids.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Incompatible with strong acids, selenium, sulfur, wood and other combustibles, nickel nitrate, aluminum, aluminum trichloride, ethylene, p-dioxan, hydrogen, methanol, non-metals, oxidants, sulfur compounds, aniline, hydrogen sulfide, flammable solvents, hydrazine, and metal powders (especially zinc, aluminum, and magnesium), ammonium nitrate, nitryl fluoride, bromine pentafluoride, potassium perchlorate + titanium powder + indusorial earth.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Inhalation. Ingestion.

**Toxicity to Animals:**

LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. Causes damage to the following organs: skin. May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

**Other Toxic Effects on Humans:**

Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of ingestion.

**Special Remarks on Toxicity to Animals:**

Lowest Published Lethal Dose/Conc: LDL [Rat] - Route: Oral; Dose: 5000 mg/kg LDL [Guinea Pig] - Route: Oral; Dose: 5000 mg/kg

**Special Remarks on Chronic Effects on Humans:** May cause cancer based on animal test data

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Nickel dust and fume can irritate skin. Eyes: Nickel dust and fume can irritate eyes. Inhalation: Inhalation of dust or fume may cause respiratory tract irritation with non-productive cough, hoarseness, sore throat, headache, vertigo, weakness, chest pain, followed by delayed effects, including tachypnea, dyspnea, and ARDS. Death due to ARDS has been reported following inhalation of high concentrations of respirable metallic nickel dust. Later effects may include pulmonary edema and fibrosis. Ingestion: Metallic nickel is generally considered not to be acutely toxic if ingested. Ingestion may cause nausea, vomiting, abdominal , and diarrhea. Nickel may damage the kidneys(proteinuria), and may affect liver function. It may also affect behavior (somnolence), and cardiovascular system (increased coronary artery resistance, decreased myocardial contractility, myocardial damage, regional or general arteriolar or venus dilation). Chronic Potential Health Effects: Skin: May cause skin allergy. Nickel and nickel compounds are among the most common sensitizers inducing allergic contact dermatitis. Inhalation: Chronic inhalation nickel dust or fume can cause chronic hypertrophic rhinitis, sinusitis, nasal polyps, perforation of the nasal septum, chronic pulmonary irritation, fibrosis, pulmonary edema, pulmonary eosinophilia, Pneumoconiosis, allergies (asthma-like allergy), and cancer of the nasal sinus cavities, lungs, and possibly other organs. Future exposures can cause asthma attacks with shortness of breath, wheezing, cough, and/or chest tightness. Chronic inhalation of nickel dust or fume may also affect the liver (impaired liver function tests), and blood (changes in red blood cell count). Ingestion: Prolonged or repeated ingestion of nickel can be a source chronic urticaria and other signs of allergy.

Chronic ingestion of Nickel may also affect respiration and cause pneumoconiosis or fibrosis. Note: In the general population, sensitization occurs from exposure to nickel-containing coins, jewelry, watches,

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are as toxic as the original product.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Nickel metal California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Nickel metal Connecticut hazardous material survey.: Nickel metal Illinois toxic substances disclosure to employee act: Nickel metal Illinois chemical safety act: Nickel metal New York release reporting list: Nickel metal Rhode Island RTK hazardous substances: Nickel metal Pennsylvania RTK: Nickel metal Michigan critical material: Nickel metal Massachusetts RTK: Nickel metal Massachusetts spill list: Nickel metal New Jersey: Nickel metal New Jersey spill list: Nickel metal Louisiana spill reporting: Nickel metal California Director's List of Hazardous Substances: Nickel metal TSCA 8(b) inventory: Nickel metal

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):** CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R40- Possible risks of irreversible effects. R43- May cause sensitization by skin contact. S22- Do not breathe dust. S36- Wear suitable protective clothing.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 0



**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:42 PM

**Last Updated:** 11/01/2010 12:00 PM

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## POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

Also known as: Polynuclear Aromatic Hydrocarbons, PNA, Polyaromatic Hydrocarbons

Examples: Benzo(a)pyrene, Benzanthracene, Benzo(b)fluoranthene, Fluoranthene, Naphthalene

### WHAT ARE PAHs?

PAHs are a group of approximately 10,000 compounds, a few of which are listed above. Most PAHs in the environment are from incomplete burning of carbon-containing materials like oil, wood, garbage or coal. Many useful products such as mothballs, blacktop, and creosote wood preservatives contain PAHs. They are also found at low concentrations in some special-purpose skin creams and anti-dandruff shampoos that contain coal tars.

Automobile exhaust, industrial emissions and smoke from burning wood, charcoal and tobacco contain high levels of PAHs. In general, more PAHs form when materials burn at low temperatures, such as in wood fires or cigarettes. High-temperature furnaces produce fewer PAHs.

Fires can form fine PAH particles. They bind to ash particles and can move long distances through the air. Some PAHs can dissolve in water. PAHs can enter groundwater from ash, tar, or creosote that is improperly disposed in landfills.

### HOW ARE PEOPLE EXPOSED TO PAHs?

**Breathing:** Most people are exposed to PAHs when they breathe smoke, auto emissions or industrial exhausts. Most exhausts contain many different PAH compounds. People with the highest exposures are smokers, people who live or work with smokers, roofers, road builders and people who live near major highways or industrial sources.

**Drinking/Eating:** Charcoal-broiled foods, especially meats, are a source of some PAH exposure. Shellfish living in contaminated water may be another major source of exposure. PAHs may be in groundwater near disposal sites where construction wastes or ash are buried; people may be exposed by drinking this water. Vegetables do not take up significant amounts of PAHs that are in soil.

**Touching:** PAH can be absorbed through skin. Exposure can come from handling contaminated soil or bathing in contaminated water. Low levels of these chemicals may be absorbed when a person uses medicated skin cream or shampoo containing PAHs.

### DO STANDARDS EXIST FOR REGULATING PAHs?

**Water:** Wisconsin has established drinking water standards for five PAHs: Anthracene - 3,000 parts per billion (ppb), Benzo(a)pyrene - 0.2 ppb, Benzo(b)fluoranthene - 0.2 ppb, Fluoranthene - 400 ppb and Fluorene - 400 ppb. We suggest you stop drinking water containing more than these amounts. If other PAHs are found in your drinking water, contact your local public health agency for advice.

**Air:** No standards exist for the amount of PAHs allowed in the air of homes. We use a formula to convert workplace limits to suggested home limits. Based on the formula, we recommend levels of PAHs in air be no higher than 0.004 parts per million (ppm).

The Wisconsin Department of Natural Resources regulates the amount of several PAHs that can be released by industries.

## WILL EXPOSURE TO PAHs RESULT IN HARMFUL HEALTH EFFECTS?

The effects of breathing high concentrations of PAHs have not been studied. However, PAHs may be attached to dust or ash causing lung irritation. Skin contact with PAHs may cause redness, blistering, and peeling.

The following health effects can occur after several years of exposure to PAHs:

**Cancer:** Benzo(a)pyrene, a common PAH, is shown to cause lung and skin cancer in laboratory animals. Other PAHs are not known to have this effect. Extracts of various types of smoke containing PAHs caused lung tumors in laboratory animals. Cigarette smoke will cause lung cancer.

**Reproductive Effects:** Reproductive problems and problems in unborn babies' development have occurred in laboratory animals that were exposed to benzo(a)pyrene. Other PAHs have not been studied enough to determine whether they cause reproductive problems.

**Organ Systems:** A person's lungs, liver, skin, and kidneys can be damaged by exposure.

In general, chemicals affect the same organ systems in all people who are exposed. However, the seriousness of the effects may vary from person to person.

A person's reaction depends on several things, including individual health, heredity, previous exposure to chemicals including medicines, and personal habits such as smoking or drinking.

It's also important to consider the length of exposure to the chemical; the amount of chemical exposure; and whether the chemical was inhaled, touched, or eaten.

## CAN A MEDICAL TEST DETERMINE EXPOSURE TO PAHs?

Many PAHs can be detected in blood or urine soon after exposure. Tests for these compounds are not routine and can only be performed using special equipment not usually found in doctor's offices. People who think they may have been exposed to PAHs for a long time should contact their physician. Blood tests of liver and kidney function are available. People exposed to PAHs in air may want to ask their doctor to consider having lung function tests done.

*Seek medical advice if you have any symptoms that you think may be related to chemical exposure.*

This fact sheet summarizes information about this chemical and is not a complete listing of all possible effects. It does not refer to work exposure or emergency situations.

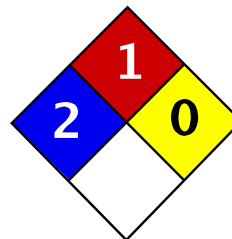
## FOR MORE INFORMATION

- Poison Control Center, 800-815-8855
- Your local public health agency
- Division of Public Health, BEH, 1 West Wilson Street, Rm. 150, Madison, WI 53701-2659, (608) 266-1120 or Internet: [www.dhfs.state.wi.us/eh/index.htm](http://www.dhfs.state.wi.us/eh/index.htm)



Prepared by the  
Wisconsin Department of Health and Family Services  
Division of Public Health, with funds from the  
Agency for Toxic Substances and Disease Registry,  
Public Health Service,  
U.S. Department of Health and Human Services.

(POH 4606 Revised 12/2000)



Health	2
Fire	1
Reactivity	0
Personal Protection	J

## Material Safety Data Sheet Silver MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Silver

**Catalog Codes:** SLS4222, SLS2005, SLS3427, SLS1210, SLS2632, SLS4054, SLS1837

**CAS#:** 7440-22-4

**RTECS:** VW3500000

**TSCA:** TSCA 8(b) inventory: Silver

**CI#:** Not applicable.

**Synonym:**

**Chemical Formula:** Ag

**Contact Information:**

**Sciencelab.com, Inc.**  
14025 Smith Rd.  
Houston, Texas 77396

US Sales: **1-800-901-7247**  
International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**  
1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Silver	7440-22-4	100

**Toxicological Data on Ingredients:** Silver: ORAL (LD50): Acute: 100 mg/kg [Mouse].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of eye contact (irritant), of ingestion, of inhalation. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available.

MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.

Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

### Section 4: First Aid Measures

**Eye Contact:** Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

**Skin Contact:** No known effect on skin contact, rinse with water for a few minutes.

**Serious Skin Contact:** Not available.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:** Not available.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

### Section 6: Accidental Release Measures

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

### Section 7: Handling and Storage

**Precautions:**

Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not

breathe dust. Avoid contact with eyes In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label.

**Storage:**

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Splash goggles. Lab coat.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 0.01 (mg/m³) from OSHA (PEL)

TWA: 0.01 (mg/m³) from OSHA NIOSH

Australia: TWA: 0.1 (mg/m³) Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Solid metallic powder. Metal solid.)

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 107.87 g/mole

**Color:** Not available.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 2212°C (4013.6°F)

**Melting Point:** 961°C (1761.8°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 10.4 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Is not dispersed in cold water, hot water.

**Solubility:** Insoluble in cold water, hot water.

### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

### Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:** Acute oral toxicity (LD50): 100 mg/kg [Mouse].

**Chronic Effects on Humans:** Not available.

**Other Toxic Effects on Humans:** Very hazardous in case of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:** Not available.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are as toxic as the original product.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

## Section 14: Transport Information

**DOT Classification:**

**Identification:**

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

### Federal and State Regulations:

Rhode Island RTK hazardous substances: Silver

Pennsylvania RTK: Silver

Minnesota: Silver

Massachusetts RTK: Silver

New Jersey: Silver

TSCA 8(b) inventory: Silver

TSCA 8(a) PAIR: Silver

TSCA 8(d) H and S data reporting: Silver

SARA 313 toxic chemical notification and release reporting: Silver: 1%

CERCLA: Hazardous substances.: Silver: 1000 lbs. (453.6 kg)

### Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

### Other Classifications:

#### WHMIS (Canada):

CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).

CLASS D-2B: Material causing other toxic effects (TOXIC).

**DSCL (EEC):** R41- Risk of serious damage to eyes.

#### HMIS (U.S.A.):

**Health Hazard:** 2

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** j

#### National Fire Protection Association (U.S.A.):

**Health:** 2

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

#### Protective Equipment:

Not applicable.

Lab coat.

Wear appropriate respirator when ventilation is inadequate.

Splash goggles.



## Section 16: Other Information

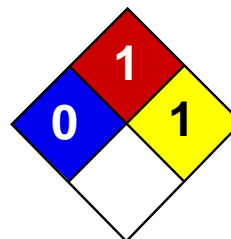
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:26 PM

**Last Updated:** 10/10/2005 08:26 PM

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Health	1
Fire	1
Reactivity	1
Personal Protection	E

# Material Safety Data Sheet

## Zinc Metal MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Zinc Metal

**Catalog Codes:** SLZ1054, SLZ1159, SLZ1267, SLZ1099, SLZ1204

**CAS#:** 7440-66-6

**RTECS:** ZG8600000

**TSCA:** TSCA 8(b) inventory: Zinc Metal

**CI#:** Not applicable.

**Synonym:** Zinc Metal Sheets; Zinc Metal Shot; Zinc Metal Strips

**Chemical Name:** Zinc Metal

**Chemical Formula:** Zn

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Zinc Metal	7440-66-6	100

**Toxicological Data on Ingredients:** Zinc Metal LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

**Potential Acute Health Effects:** Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact:** Not available.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:** Not available.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 480°C (896°F)

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:**

Slightly flammable to flammable in presence of open flames and sparks, of heat, of oxidizing materials, of acids, of alkalis, of moisture. Non-flammable in presence of shocks.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

**Special Remarks on Fire Hazards:**

Zinc + NaOH causes ignition. Oxidation of zinc by potassium proceeds with incandescence. Residues from zinc dust /acetic acid reduction operations may ignite after long delay if discarded into waste bins with paper. Incandescent reaction when Zinc and Arsenic or Tellurium, or Selenium are combined. When hydrazine mononitrate is heated in contact with zinc, a flaming decomposition occurs at temperatures a little above its melting point. Contact with acids and alkali hydroxides (sodium hydroxide, potassium hydroxide, calcium hydroxide, etc.) results in evolution of hydrogen with sufficient heat of reaction to ignite the hydrogen gas. Zinc foil ignites if traces of moisture are present. It is water reactive and produces flammable gases on contact with water. It may ignite on contact with water or moist air.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:**

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

**Large Spill:**

Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

## Section 7: Handling and Storage

### Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, alkalis, moisture.

### Storage:

Keep container tightly closed. Keep container in a cool, well-ventilated area. Keep from any possible contact with water. Do not allow water to get into container because of violent reaction.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:** Not available.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Lustrous solid. Metal solid.)

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 65.39 g/mole

**Color:** Bluish-grey

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 907°C (1664.6°F)

**Melting Point:** 419°C (786.2°F)

**Critical Temperature:** Not available.

**Specific Gravity:** Not available.

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Excess heat, incompatible materials, moisture

**Incompatibility with various substances:**

Reactive with oxidizing agents, acids, alkalis. Slightly reactive to reactive with moisture. The product may react violently with water to emit flammable but non toxic gases.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Incompatible with acids, halogenated hydrocarbons,  $\text{NH}_4\text{NO}_3$ , barium oxide,  $\text{Ba}(\text{NO}_3)_2$ , Cadmium,  $\text{CS}_2$ , chlorates,  $\text{Cl}_2$ ,  $\text{CrO}_3$ ,  $\text{F}_2$ , Hydroxylamine,  $\text{Pb}(\text{N}_3)_2$ ,  $\text{MnCl}_2$ ,  $\text{HNO}_3$ , performic acid,  $\text{KClO}_3$ ,  $\text{KNO}_3$ ,  $\text{N}_2\text{O}_2$ , Selenium,  $\text{NaClO}_3$ ,  $\text{Na}_2\text{O}_2$ , Sulfur, Te, water,  $(\text{NH}_4)_2\text{S}$ ,  $\text{As}_2\text{O}_3$ ,  $\text{CS}_2$ ,  $\text{CaCl}_2$ , chlorinated rubber, catalytic metals, halocarbons, o-nitroanisole, nitrobenzene, nonmetals, oxidants, paint primer base, pentacarbonoyliron, transition metal halides, seleninyl bromide,  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$ ,  $(\text{Mg} + \text{Ba}(\text{NO}_3)_2 + \text{BaO}_2)$ , (ethyl acetoacetate +tribromoneopentyl alcohol. Contact with Alkali Hydroxides(Sodium Hydroxide, Potassium Hydroxide, Calcium Hydroxide, etc) results in evolution of hydrogen. Ammonium nitrate + zinc + water causes a violent reaction with evolution of steam and zinc oxide. May react with water.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Inhalation. Ingestion.

**Toxicity to Animals:**

LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:** Not available.

**Other Toxic Effects on Humans:** Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: May cause skin irritation. Dermal exposure to zinc may produce leg pains, fatigue, anorexia and weight loss. Eyes: May cause eye irritation. Ingestion: May be harmful if swallowed. May cause digestive tract irritation with tightness in throat, nausea, vomiting, diarrhea, loss of appetite, malaise, abdominal pain. fever, and chills. May affect behavior/central nervous system and autonomic nervous system with ataxia, lethargy, staggering gait, mild derrangement in cerebellar function, lightheadness, dizziness, irritability, muscular stiffness, and pain. May also affect blood. Inhalation: Inhalation of zinc dust or fumes may cause respiratory tract and mucous membrane irritation with cough and chest pain. It can also cause "metal fume fever", a flu-like condition characterized appearance of chills, headached fever, maliase, fatigue, sweating, extreme thirst, aches in the legs and chest, and difficulty in breathing. A sweet taste may also be be present in metal fume fever, as well as a dry throat, aches, nausea, and vomiting, and pale grey cyanosis. The toxicological properties of this substance have not been fully investisgated.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** Not available.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

### Section 14: Transport Information

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

New York release reporting list: Zinc Metal Rhode Island RTK hazardous substances: Zinc Metal Pennsylvania RTK: Zinc Metal Florida: Zinc Metal Michigan critical material: Zinc Metal Massachusetts RTK: Zinc Metal New Jersey: Zinc Metal California Director's List of Hazardous Substances: Zinc Metal TSCA 8(b) inventory: Zinc Metal TSCA 12(b) one time export: Zinc Metal SARA 313 toxic chemical notification and release reporting: Zinc Metal CERCLA: Hazardous substances.: Zinc Metal: 1000 lbs. (453.6 kg)

**Other Regulations:** EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):** Not Available

**DSCL (EEC):**

R15- Contact with water liberates extremely flammable gases. R17- Spontaneously flammable in air. S7/8- Keep container tightly closed and dry.

**HMIS (U.S.A.):**

**Health Hazard:** 1

**Fire Hazard:** 1

**Reactivity:** 1

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 0

**Flammability:** 1

**Reactivity:** 1

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

### Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 12:18 AM

**Last Updated:** 11/01/2010 12:00 PM

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.*

# Appendix B

## Accident / Injury or Near Miss Report Form

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### Incident Reporting

- Contact WorkCare ASAP, and then Jeff Parsons within 24 hours
- Reporting is done online  
Use EHS Insights to submit an incident report: <https://ramboll.ehsinsight.com/site#/home>

Jeff Parsons, Health & Safety  
Jeffrey.Parsons@Ramboll.com  
315-956-6070 | c 315-391-0638





## Incident Event

---

### Consequences

---

Consequences

### Event Details

Business Entity

Market

Client Name

Project Number

Location of Incident

Incident Date

Incident Time

Reported Date

Reported Time

Incident Summary

Incident Description

### Event Severity

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Initial Potential Severity

Work Stopped

### Attachments

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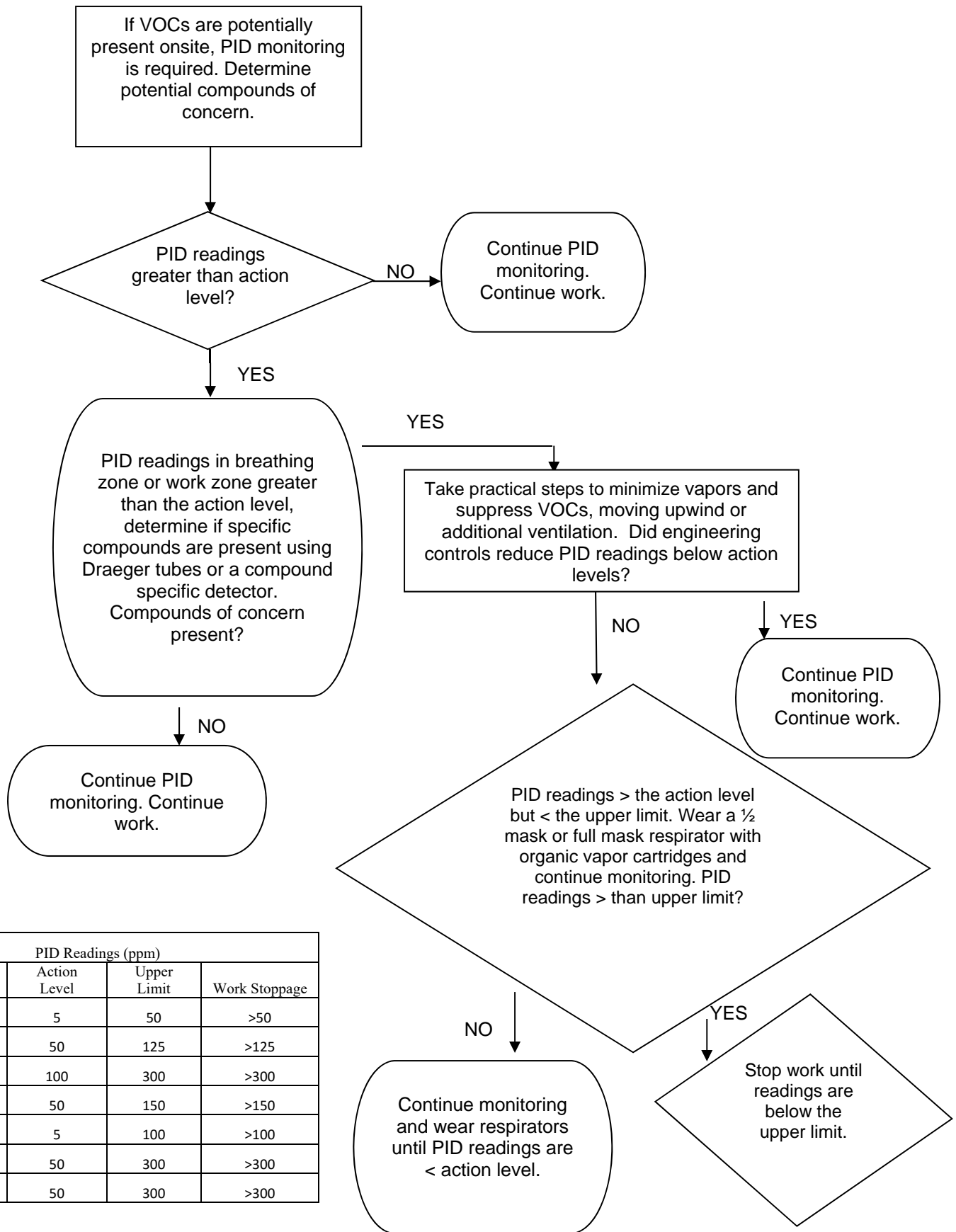
Attachments

Powered by EHS Insight

Appendix C  
Respirator Use Flow Chart

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# Air Monitoring and Respirator Use Flowchart



Compound	PID Readings (ppm)		
	Action Level	Upper Limit	Work Stoppage
benzene	5	50	>50
ethylbenzene	50	125	>125
toluene	100	300	>300
xylenes	50	150	>150
naphthalene	5	100	>100
tetrachloroethene	50	300	>300
trichloroethene	50	300	>300

Appendix D  
Activity Hazard Analysis

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# ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)  
(Use highest code)

M
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Date Prepared: August 10, 2020

Project Location: Burnham Canal Superfund Alternative Site – Miller Compressing

Prepared by: Ernie Miyashita

Job: Sediment and Surface Water Sampling

Reviewed by: Todd Lewis

### RISK ASSESSMENT CODE MATRIX

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
S e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

JOB STEPS	HAZARDS	ACTONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
<ol style="list-style-type: none"> <li>1. Determine location of underground utilities</li> <li>2. Collect sediment samples with a push core, piston core, ponar sampler</li> <li>3. Collect surface water</li> </ol>	<ul style="list-style-type: none"> <li>-Shock, explosion or damage to underground utilities</li> <li>-Noise</li> <li>-Caught-by</li> <li>-Struck-by</li> <li>-Vibration</li> <li>-Contact with contaminants</li> <li>-Fall overboard</li> <li>-Cut by</li> <li>-Slip, trip and falls</li> </ul>	<ul style="list-style-type: none"> <li>-Contact site personnel and utility clearinghouse for utility locations</li> <li>-Call private utility clearance</li> <li>-Wear appropriate PPE (hard hat, safety glasses, hearing protection, safety boots, Tyvek suit, gloves, PFD, face mask/shield)</li> <li>- All personnel shall wear a USCG-approved PFD at all times while working within 6 ft of water.</li> <li>- PFDs will be properly worn, snug, and fully zippered/buttoned/clipped.</li> <li>- No one shall work alone when working in, over, or near water. At least two (2) personnel shall be present at all times working under a "buddy system."</li> <li>-Daily Health and Safety Tailgate Meetings to go over activities and associated hazards.</li> <li>-Keep boat deck clear of tools and cables, to the extent practicable</li> <li>-Inspect equipment, cables, latches, hooks, safety line, sampling devices, and connections prior to use</li> <li>-Communicate intended actions with others in the vicinity</li> </ul>	M
<ol style="list-style-type: none"> <li>4. Process sediment cores and surface water</li> </ol>	<ul style="list-style-type: none"> <li>-Noise</li> <li>-Caught-by</li> <li>-Struck-by</li> <li>-Contact with contaminants</li> <li>-Cut by</li> </ul>	<ul style="list-style-type: none"> <li>-Wear appropriate PPE</li> <li>- Daily Health and Safety Tailgate Meetings to go over activities and associated hazards</li> <li>-Inspect tools and power source prior to use</li> <li>-Use two hands to hold saws and other power tools</li> </ul>	L
EQUIPMENT	TRAINING	INSPECTION	

# ACTIVITY HAZARDS ANALYSIS

General work	<ol style="list-style-type: none"> <li>1. All site personnel will read and comply with project specific HASP.</li> <li>2. All environmental monitoring personnel will have 40-hour OSHA training and a current 8-hour refresher course.</li> <li>3. All site personnel will receive site specific training and know evacuation procedures and hospital route.</li> <li>4. At least two individuals on-site will have current CPR, first aid, and blood-borne pathogen training.</li> <li>5. Instruct personnel of proper use of fire extinguishers.</li> </ol>	<ul style="list-style-type: none"> <li>- Inspect all PFD and PPE prior to use. Replace worn or defective equipment</li> <li>- Inspect first aid kit, eye wash, and fire extinguisher for contents and functionality</li> </ul>
Boat	Boater Safety Course In-house training	See boat operation AHA
Push core, piston core or ponar, peristaltic pump	In-house training	Threads are not cross-threaded or stripped
Hand tools (drill, sawsall, sockets, router)	Personnel will be trained on the proper use of hand/power and sampling tools	- Inspect all hand/power and sampling tools prior to use; repair or replace as necessary.

Approval Authority: Steve Wiskes

## **APPENDIX D**

### **CONSTRUCTION SCHEDULE AND SEQUENCE OF OPERATIONS**





## Appendix D Project Schedule Burnham Canal Remediation

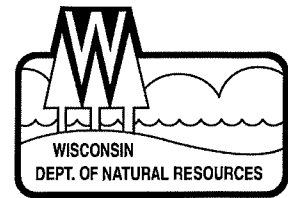
ID	Task Name	Duration	Start	Finish	Qtr 4, 2019			Qtr 1, 2020			Qtr 2, 2020			Qtr 3, 2020			Qtr 4, 2020			Qtr 1, 2021			Qtr 2, 2021			Qtr 3, 2021			Qtr 4, 2021		
					Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
48	Floating platform sediment dredging 2nd pass (if required)	5 days	Mon 11/9/20	Fri 11/13/20																										Floating platform sediment dredging 2nd pass (if required) ■	
49	Post dredge Sampling	3 days	Mon 11/16/20	Wed 11/18/20																										Post dredge Sampling ■	
50	Upland excavation	5 days	Mon 11/16/20	Fri 11/20/20																										Upland excavation ■	
51	Dredging equipment decontamination	2 days	Mon 11/23/20	Tue 11/24/20																										Dredging equipment decontamination ■	
52	Upland backfill & armor	5 days	Wed 11/25/20	Tue 12/1/20																										Upland backfill & armor ■	
53	Offsite sediment disposal	60 days	Mon 1/25/21	Fri 4/16/21																										Offsite sediment disposal ■	
54	Channel excavation (Sta 2+00 to 4+50)	5 days	Mon 11/23/20	Fri 11/27/20																										Channel excavation (Sta 2+00 to 4+50) ■	
55	Stabilize dredge area (Sta 1+50 to 2+00)	2 days	Mon 11/30/20	Tue 12/1/20																										Stabilize dredge area (Sta 1+50 to 2+00) ■	
56	Channel stabilization (Sta 2+00 to 4+50 full width)	5 days	Wed 12/2/20	Tue 12/8/20																										Channel stabilization (Sta 2+00 to 4+50 full width) ■	
57	Cap dredge area & channel (Sta 1+50 to 4+50)	3 days	Wed 12/9/20	Fri 12/11/20																										Cap dredge area & channel (Sta 1+50 to 4+50) ■	
58	Dredge area betterment & armor (Sta 1+50 to 2+00)	3 days	Mon 12/14/20	Wed 12/16/20																										Dredge area betterment & armor (Sta 1+50 to 2+00) ■	
59	Cap full width (Sta. 2+00 to 4+50)	5 days	Thu 12/17/20	Wed 12/23/20																										Cap full width (Sta. 2+00 to 4+50) ■	
60	Channel filter fabric (Sta. 2+00 to 4+50 channel width only)	4 days	Thu 12/24/20	Tue 12/29/20																										Channel filter fabric (Sta. 2+00 to 4+50 channel width only) ■	
61	Channel backfill / armor	8 days	Wed 12/30/20	Fri 1/8/21																										Channel backfill / armor ■	
62	<b>Winter Break</b>	45 days	Mon 1/11/21	Fri 3/12/21																										Winter Break ■	
63	<b>Stabilization</b>	164 days	Mon 3/15/21	Thu 10/28/21																										Stabilization ■	
64	Stabilization test section	1 day	Mon 3/15/21	Mon 3/15/21																										Stabilization test section ■	
65	Stabilization Layer 1 - East end	10 days	Tue 3/16/21	Mon 3/29/21																										Stabilization Layer 1 - East end ■	
66	Stabilization Layer 2	7 days	Tue 3/30/21	Wed 4/7/21																										Stabilization Layer 2 ■	
67	Stabilization Layer Consolidation	1 day	Thu 4/8/21	Thu 4/8/21																										Stabilization Layer Consolidation ■	
68	Stabilization Layer 3 (as needed)	7 days	Fri 4/9/21	Mon 4/19/21																										Stabilization Layer 3 (as needed) ■	
69	Stabilization Layer 4 (as needed)	7 days	Tue 4/20/21	Wed 4/28/21																										Stabilization Layer 4 (as needed) ■	
70	Stabilization surface survey	1 day	Thu 4/29/21	Thu 4/29/21																										Stabilization surface survey ■	
71	<b>Cap Installation</b>	30 days	Fri 4/30/21	Thu 6/10/21																										Cap Installation ■	
72	Cap Layer 1	5 days	Fri 4/30/21	Thu 5/6/21																										Cap Layer 1 ■	
73	Cap Layer 2	5 days	Fri 5/7/21	Thu 5/13/21																										Cap Layer 2 ■	
74	Cap Layer 3 (as needed)	10 days	Fri 5/14/21	Thu 5/27/21																										Cap Layer 3 (as needed) ■	
75	Cap baseline sampling	10 days	Fri 5/28/21	Thu 6/10/21																										Cap baseline sampling ■	
76	Cap surface survey	1 day	Fri 5/28/21	Fri 5/28/21																										Cap surface survey ■	
77	<b>Betterment Tasks</b>	45 days	Mon 5/31/21	Fri 7/30/21																										Betterment Tasks ■	
78	Betterment placement	36 days	Mon 5/31/21	Mon 7/19/21																										Betterment placement ■	
79	Install armor stone	4 days	Tue 7/20/21	Fri 7/23/21																										Install armor stone ■	
80	Cut Sheet pile at top of betterment	5 days	Mon 7/26/21	Fri 7/30/21																										Cut Sheet pile at top of betterment ■	
81	Site restoration / demobilization	10 days	Mon 8/2/21	Fri 8/13/21																										Site restoration / demobilization ■	
82	Construction Completion	1 day	Mon 8/16/21	Mon 8/16/21																										Construction Completion ◆ 8/16/21	
83	Construction surveys & Final Documentation	45 days	Mon 5/31/21	Fri 7/30/21																										Construction surveys & Final Documentation ■	
84	Construction Completion Report Submittal	1 day	Wed 10/27/21	Wed 10/27/21																										Construction Completion Report Submittal ◆ 10/27/21	
85	Begin 36 Month Warranty Period	1 day	Thu 10/28/21	Thu 10/28/21																										Begin 36 Month Warranty Period ◆ 10/28/21	
86	<b>Reporting &amp; Meeting</b>	212 days	Mon 11/2/20	Tue 8/24/21																										Submit Photos of completed site to DNR ■	
87	Submit Photos of completed site to DNR	1 day	Tue 8/24/21	Tue 8/24/21																										Submit Photos of completed site to DNR ■	
88	Notify Fisheries of field work start	1 day	Mon 11/2/20	Mon 11/2/20																										Notify Fisheries of field work start ■	
89	Submit start notification to Waterway Division	1 day	Mon 12/7/20	Mon 12/7/20																										Submit start notification to Waterway Division ■	
90	Post Project Permits	1 day	Mon 12/14/20	Mon 12/14/20																										Post Project Permits ■	
91	City of MKE notice for floodplain compliance	1 day	Mon 12/14/20	Mon 12/14/20																										City of MKE notice for floodplain compliance ■	

Project: Burnham RA Construction  
Date: Fri 8/28/20

Task ■ Split ..... Milestone ◆ Summary ■ Project Summary ▬ Progress ▬ critical path ■

**APPENDIX E**

**AUGUST 31, 2018 LETTER - NR718 LOW-LEVEL HAZARD  
EXEMPTION REQUEST**



August 31, 2018

Mr. Jon Spigel  
Miller Compressing Company  
1640 West Bruce Street  
Milwaukee, WI 53204

Subject: Approval to Manage Contaminated Material under Wis. Admin. Code § NR 718.15  
Miller Compressing (Burnham Canal) (ALT SF), 1640 West Bruce Street, Milwaukee, WI  
DNR BRRTS Activity #: 02-41-552940, 15-41-581667;  
FID #: 241213720

Dear Mr. Spigel:

On June 26, 2018, Mark Walter of O'Brien & Gere Engineers, Inc. (OBG) submitted a completed 'Recommended Format for Exemption Request' on your behalf requesting to manage 1,400 cubic yards of contaminated material on the same site from which it will be excavated in accordance with Wis. Admin. Code § NR 718.15. The Department of Natural Resources (DNR) received all applicable technical assistance and database fees for providing review and response, in accordance with Wis. Admin. Code § NR 749.04(1).

Contaminated sediment within the western portion of the Burnham Canal is being addressed through limited dredging and offsite disposal of sediment and the installation of a cap over remaining contamination. In order to complete the remediation and to maintain storm water flow through the canal a channel must be formed at the base of the canal east of the West End Dredge Area. To form the channel, 1400 cubic yards of sediment will be excavated and replaced to an adjacent portion of the canal. Polycyclic aromatic hydrocarbon (PAH) and metal contamination was identified in samples collected from sediments within the canal. The approved cover will be installed over both the excavation and reuse areas within the canal.

**Wis. Admin. Code § NR 718.15 Exemption**

This letter grants an exemption from the solid waste requirements in Wis. Stats. § 289 and Wis. Admin. Code §§ NR 500 to NR 538 for the proposed material management activities. Approval of the exemption is based on the following:

- 1) Managing contaminated waste material in areas of the site identified on Figure A1, Sample Locations (1/14/16) included with the completed 'Recommended Format for Exemption Request' will meet the locational criteria listed under Wis. Admin. Code § NR 718.12(1)(c), with the exception of the following:
  - Within a floodplain
  - Within 3 feet of the high groundwater level
  - At a depth greater than the depth of the original excavation from which the contaminated soil was removed

**Grant of exemption to s. NR 718.12(1)(c)1, 5, and 6**

In consideration that sediment is being excavated from within a canal and will be replaced in an adjacent portion of the canal under similar conditions (with the exception of that the reuse area is located downslope from the excavation area), and the material will pose no greater risk to human health or the

environment after it is replaced within the canal, the DNR grants an exemption to the location criteria of Wis. Admin. Code § 718.12(1)(c)1, 5, and 6 will allow placement of contaminated waste material within the floodplain, below the waterline, and at a greater depth from which it was excavated.

- 2) Soil samples have been collected for analysis of contaminants previously detected or expected to be present at this site including PAHs and metals from areas most likely to contain residual contamination. Based on an estimated volume of 1,400 cubic yards of material, and a sampling frequency of 1 sample per 160 cubic yards, the sampling protocol described in Wis. Admin. Code § NR 718.12(1)(e) has been met.
- 3) A complete soil management plan, as defined by Wis. Admin. Code §§ NR 718.12(2)(b) and (c), has been provided to the DNR.
- 4) The proposed management of contaminated material at the Miller Compressing (Burnham Canal) (ALT SF) is expected to meet the criteria of Wis. Admin. Code §§ NR 726.13(1)(b)1 to 5.
- 5) Per Wis. Admin. Code § NR 718.12(2), the DNR was provided with at least 7 days' notice prior to commencing to proposed material management.
- 6) You have acknowledged that the continuing obligations described below will be required as a condition of managing the contaminated material on your property as proposed.

#### Continuing Obligations

The current property owner of the Miller Compressing (Burnham Canal) (ALT SF), and any subsequent property owners, must comply with the following continuing obligations, established under Wis. Admin. Code § NR 718.12(2)(d) at this site, to ensure that conditions will remain protective. DNR staff will conduct periodic prearranged inspections to ensure that the conditions included in this letter and the "Institutional Control Implementation Plan" are met. If these requirements are not followed, the DNR may take enforcement action under Wis. Stat. § 292.11 to ensure compliance with the specified requirements, limitations or other conditions related to the property.

Documents submitted to the DNR to request the Wis. Admin. Code § 718.15 exemption meet the requirements of Wis. Admin. Code § NR 718.12(2)(e) and are available in Portable Document Format (PDF) on the Bureau for Remediation and Redevelopment Tracking System (BRRTS on the Web) at <http://dnr.wi.gov/topic/Brownfields/wrrd.html>. Additionally, this site will be identified on the Remediation and Redevelopment Sites Map (RRSM), available at <http://dnr.wi.gov/topic/Brownfields/wrrd.html, as having continuing obligations>. All site information is on file at the Regional DNR office located at 2300 N. Dr. Martin Luther King, Jr. Drive, Milwaukee, WI 53212-3128.

The DNR fact sheet "Continuing Obligations for Environmental Protection," RR-819, helps to explain a property owner's responsibility for continuing obligations on their property. The fact sheet may be obtained at <http://dnr.wi.gov/files/PDF/pubs/rr/RR819.pdf>.

Please send written notifications in accordance with the following requirements to:

Department of Natural Resources  
Attn: Remediation and Redevelopment Program Environmental Program Associate  
2300 N. Dr. Martin Luther King, Jr. Drive  
Milwaukee, WI 53212-3128

Site Specific Condition - Residual Sediment Contamination:

If contaminated sediment that was managed as proposed in the completed 'Recommended Format for Exemption Request' is excavated in the future, the property owner at the time of excavation will be responsible for the following:

- determine if contamination is present,
- determine whether the material would be considered solid or hazardous waste,
- ensure that any storage, treatment or disposal is in compliance with applicable statutes and rules.

Excavated material may be managed in accordance with Wis. Admin. Code § NR 718, with DNR approval obtained at that time. In addition, all current and future property owners and occupants of the property need to be aware that excavation of the contaminated soil may pose a hazard and special precautions may need to be taken to prevent a health threat to humans. If material managed under this exemption included solid waste other than soil, a historic fill exemption may be required to be obtained from the DNR prior to excavating the waste or constructing any structure over the materials.

The location(s) where contaminated soil is proposed to be managed at the Miller Compressing (Burnham Canal) (ALT SF) site is depicted on the attached Figure A1, Sample Locations (1/14/2016).

DNR approval prior to well construction or reconstruction is required *where contaminated sediment has been managed*, in accordance with Wis. Admin. Code § NR 812.09(4)(w). This requirement applies to private drinking water wells and high capacity wells. To obtain approval, complete and submit Form 3300-254 to the DNR Drinking and Groundwater program's regional water supply specialist. This form can be obtained at <http://dnr.wi.gov/topic/wells/documents/3300254.pdf>.

Maintenance of a cover:

A cover of approximately five feet of aggregate fill overlying a one-foot gravel remedial subaqueous cap is proposed to be installed and maintained over contaminated solid waste that will be managed at the Miller Compressing (Burnham Canal) (ALT SF) site as proposed in the completed 'Recommended Format for Exemption Request'. Once constructed, inspections of the cover will be required, and submittal of inspection reports may also be required. If the cover is approved for industrial land use the DNR is required to be notified before changing to a non-industrial use, to determine if the cover will be protective for that use. Institutional Controls will be implemented to ensure that the sand cover remains in place and is not disturbed. The Institutional Control Implementation and Assurance Plan (ICIAP) must be updated as part of the remedial design for the Site which will describe the inspection and maintenance activities that will apply to the proposed barrier. The attached Figure A1, Sample Locations (1/14/2016), shows where contaminated material is proposed to be managed and covered. An updated ICIAP must be provided to the DNR once the barrier has been constructed if changes were made to address actual site conditions.

Certain activities will be prohibited in areas of this site where maintenance of a cover or barrier is intended to prevent contact with any remaining contamination. When a barrier is required, the DNR must be notified before making a change, in order to determine if further action is needed to maintain the protectiveness of the remedy employed. The following activities are prohibited on any portion of the property where the cover is required, unless prior written approval has been obtained from the DNR:

- removal of the existing barrier or cover;
- replacement with another barrier or cover;
- excavating or grading of the land surface;
- filling on covered or paved areas;

- plowing for agricultural cultivation;
- construction or placement of a building or other structure;
- changing the use or occupancy of the property to a non-industrial exposure setting.

### **Other Information**

- 1) Any hazardous substance discharge discovered during material management activities must be reported to the DNR following the requirements of Wis. Admin. Code § NR 706.
- 2) Material management activities exempted by this letter are scheduled to be completed within one year. Notify the DNR if this schedule will change.
- 3) Unless otherwise directed by the DNR, documentation of material management activities shall be provided within 60 days of the completion of this project. The documentation must describe how the activities complied with the approved management plan and must also comply with the requirements of Wis. Admin. Code § NR 724.15(3). Documentation must include:
  - a. A cover letter that contains the information required by Wis. Admin. Code § NR 724.05(2)(e)1.
  - b. Owner contact and property location information for the Miller Compressing (Burnham Canal) (ALT SF) site.
  - c. Maps, drawings, and cross sections that depict how contaminated material was managed.
  - d. A synopsis of the work conducted and an explanation as to how it complied with the material management plan and the conditions in this exemption approval.
  - e. A description of any changes made to the planned management activity and an explanation as to why they were necessary for the project.
  - f. Any field observations or results of monitoring conducted during the management activity.
  - g. A description of how new site conditions are protective of human health, safety, welfare and the environment at the Miller Compressing (Burnham Canal) (ALT SF) site.
  - h. A revised cover maintenance plan, if needed.

The DNR will request that incomplete documentation be amended as allowed by Wis. Admin. Code § NR 724.07(2).

- 4) This exemption is granted under Wis. Admin. Code § NR 718.15 and applies only to the specific activities described within the submitted 'Recommended Format for Exemption Request'. Any contaminated material that is excavated or otherwise disturbed at the Miller Compressing (Burnham Canal) (ALT SF) site, not covered under this or another exemption, must be managed in compliance with the requirements of Wis. Admin. Code §§ NR 500 through NR 538, the solid waste rules administered by the DNR's Waste and Materials Management Program. The management of contaminated material on a property that does not comply with these rules may be considered a hazardous substance discharge and would be required to be addressed following the process outlined in Wis. Admin. Code §§ NR 700 to NR 750.
- 5) Miller Compressing Company is responsible for obtaining any local, federal, or other applicable state permits to carry out the project.

All remediation sites are included in DNR's Bureau of Remediation and Redevelopment Tracking System (BRRTS) database. All documents and project milestones related to the cleanup of each of the involved sites are listed in the database entry identified by BRRTS activity #(s) 02-41-552940. Actions relating only to the management of contaminated material are tracked in the BRRTS system under activity # 15-41-552940.

Miller Compressing (Burnham Canal) (ALT SF)  
1640 West Bruce Street, Milwaukee, WI  
WDNR BRRTS #: 02-41-552940, 15-41-581667  
FID #: 241213720

Page 5

We appreciate your efforts to protect the environment at this site. If you have any questions regarding this approval decision, please contact me by calling (608) 266-0941, or by email at [paul.grittner@wisconsin.gov](mailto:paul.grittner@wisconsin.gov). Other questions regarding this site can be directed to the DNR project manager Margaret Brunette at (414) 263-8557, or [margaret.brunette@wisconsin.gov](mailto:margaret.brunette@wisconsin.gov).

Sincerely,



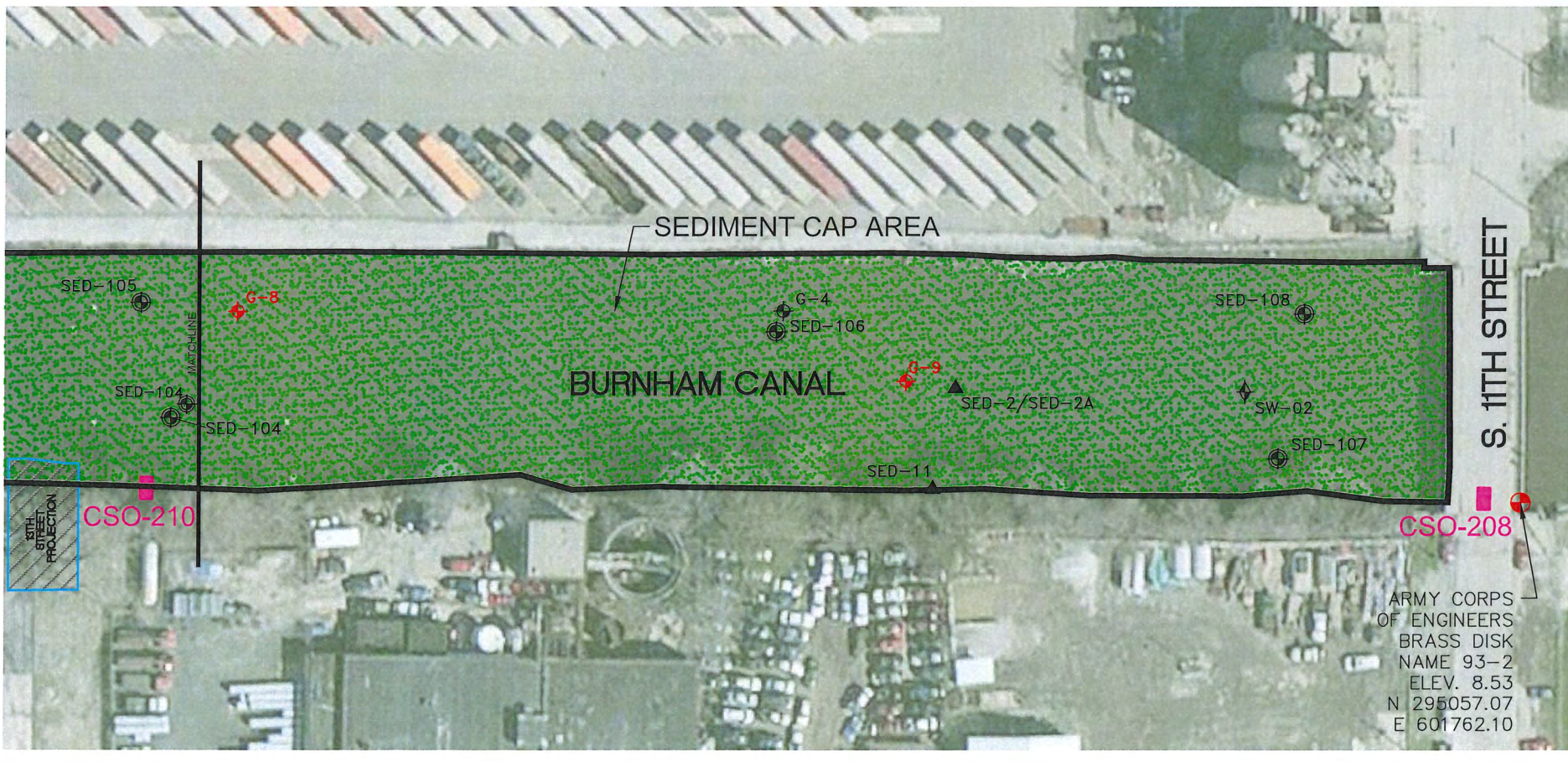
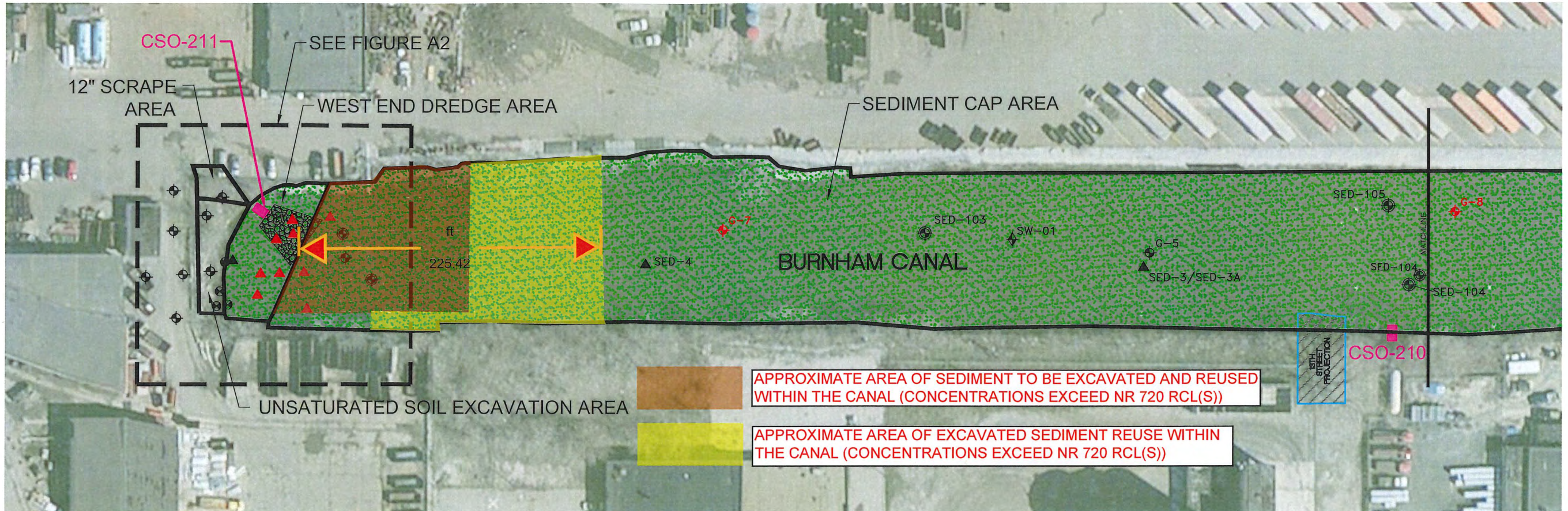
Paul Grittner  
Contaminated Material Management Specialist  
Remediation & Redevelopment Program

Attachments:

- Figure A1, Sample Locations, Natural Resource Technology

cc: Mark Walter, O'Brien & Gere Engineers, Inc., 234 W. Florida Street, Fifth Floor, Milwaukee, WI 53204 (electronic)  
Leah Evison – EPA Region V (electronic)

Jan 14, 2016 6:30pm PLOTTED BY: dduida SAVED BY: dduida  
 Y: Mapping\Projects\2117\CAD\3-1 Final Design Report\Appendix A Figa\Figure A1_Sample Locations.dwg Layout  
 IMAGES: Y: Mapping\Projects\2117\CAD\3-1 Final Design Report\Appendix A Figa\Figure A1_Sample Locations.dwg  
 REFERENCES:



	COMBINED SEWER OUTFALL		SED-102	SEDIMENT SAMPLE LOCATION (2007)
	APPROXIMATE LOCATION OF 9TH AND 13TH STREET IF EXTENDED TO CANAL		G-6	GEOTECHNICAL SAMPLE LOCATION (2007)
	REMEDIATION AREAS		G-7	PRE-DESIGN GEOTECHNICAL SAMPLE LOCATION (11/2011)
	SEDIMENT CAP		SED-126	PRE-DESIGN SEDIMENT SAMPLE LOCATION (11/2011)
	RIPRAP		HA-4	HAND AUGER LOCATION (12/2007)
	SOIL BORING LOCATION (7/2009)		SED-T/SED-5A	SEDIMENT SAMPLE LOCATION, APPROX. (2006)
	SURFACE WATER SAMPLE LOCATION (12/2007)			

SOURCE NOTE:  
 THE DIGITAL DRAWING IMAGE WAS  
 CREATED FROM BING MAPS FOR  
 ARCGIS DESKTOP. (c) 2010  
 MICROSOFT CORPORATION AND ITS  
 DATA SUPPLIERS.  
 COORDINATES BASED ON  
 MILWAUKEE COUNTY COORDINATE  
 REFERENCE SYSTEM NAD 83(97).

ARMY CORPS  
 OF ENGINEERS  
 BRASS DISK  
 NAME 93-2  
 ELEV. 8.53  
 N 295057.07  
 E 601762.10

SCALE IN FEET  
 0 40 80

DRAWN BY:	DMD	DATE:	01/14/16
CHECKED BY:	RJB	DATE:	01/14/16
APPROVED BY:	RJB	DATE:	01/14/16
DRAWING NO.:		REFERENCE:	

**SAMPLE LOCATIONS**  
 BURNHAM CANAL SUPERFUND ALTERNATIVE SITE  
 FINAL DESIGN  
 MILLER COMPRESSING COMPANY  
 MILWAUKEE, WISCONSIN

NATURAL  
 RESOURCE  
 TECHNOLOGY

PROJECT NO.  
 2117/7.0

FIGURE NO.  
 A1



## Mark D Walter

---

**From:** Grittner, Paul V - DNR <Paul.Grittner@wisconsin.gov>  
**Sent:** Tuesday, July 21, 2020 8:19 AM  
**To:** Mark D Walter  
**Cc:** Brunette, Margaret M - DNR; Dietrich, Christopher A - DNR  
**Subject:** RE: Sediment management at Burnham Canal - 02-41-552940

Mark,

Thank you for updating the DNR on your schedule for completing this work; we have no comments regarding the proposed change. Please continue to update us if the schedule changes again.

**We are committed to service excellence.**

Visit our survey at <http://dnr.wi.gov/customersurvey> to evaluate how I did.

**Paul Grittner**

Phone: (262) 574-2166 (for voicemail)

Temporary Cell: (262) 354-5726

[paul.grittner@wisconsin.gov](mailto:paul.grittner@wisconsin.gov)

---

**From:** Mark D Walter <Mark.Walter@ramboll.com>  
**Sent:** Friday, July 17, 2020 5:47 PM  
**To:** Grittner, Paul V - DNR <Paul.Grittner@wisconsin.gov>  
**Subject:** RE: Sediment management at Burnham Canal - 02-41-552940

Hi Paul,

Any update on this?

Thanks!

Mark

**Mark Walter, PE**  
Senior Engineer

D 414-837-3563

M 608-220-2480

[mark.walter@ramboll.com](mailto:mark.walter@ramboll.com)

---

**From:** Mark D Walter  
**Sent:** Wednesday, July 8, 2020 4:04 PM  
**To:** Grittner, Paul V - DNR <[Paul.Grittner@wisconsin.gov](mailto:Paul.Grittner@wisconsin.gov)>  
**Cc:** Brunette, Margaret M - DNR <[Margaret.Brunette@wisconsin.gov](mailto:Margaret.Brunette@wisconsin.gov)>; Dietrich, Christopher A - DNR <[christopher.dietrich@wisconsin.gov](mailto:christopher.dietrich@wisconsin.gov)>  
**Subject:** RE: Sediment management at Burnham Canal - 02-41-552940

Hi Paul,

The attached August 31, 2018 Approval to Manage Contaminated Material under Wis. Admin. Code NR 718.15 states (see [Other Information 2](#)) on page 4) that, "material management activities exempted by this letter are scheduled to be completed within one year. Notify the DNR if this schedule will change."

This email serves as notification that the schedule has changed. Construction is now scheduled to begin in September 2020, at the earliest, and the sediment management activities described in the attached letter are planned to occur later in 2020 or in 2021. Please let me know if any additional information is required to conduct the work described in the letter or if you have any comments or questions.

Thanks,

Mark

**Mark Walter, PE**  
Senior Engineer

D 414-837-3563  
M 608-220-2480  
[mark.walter@ramboll.com](mailto:mark.walter@ramboll.com)

---

**From:** Grittner, Paul V - DNR <[Paul.Grittner@wisconsin.gov](mailto:Paul.Grittner@wisconsin.gov)>  
**Sent:** Friday, August 31, 2018 3:57 PM  
**To:** Mark Walter <[Mark.Walter@obg.com](mailto:Mark.Walter@obg.com)>  
**Cc:** Brunette, Margaret M - DNR <[Margaret.Brunette@wisconsin.gov](mailto:Margaret.Brunette@wisconsin.gov)>  
**Subject:** Sediment management at Burnham Canal - 02-41-552940

Mr. Mark Walter  
O'Brien & Gere Engineers, Inc.  
234 W. Florida Street, Fifth Floor  
Milwaukee, WI 53204

Subject: Approval to Manage Contaminated Material under Wis. Admin. Code § NR 718.15  
Miller Compressing (Burnham Canal) (ALT SF), 1640 West Bruce Street, Milwaukee, WI  
DNR BRRTS Activity #s: 02-41-552940, 15-41-581667;  
FID #: 241213720

Dear Mr. Walter:

Attached find the approval to manage contaminated material under an exemption through Wis. Admin. Code § NR 718.15 at the site identified above. A hardcopy of this letter will be sent to Jon Spigel and the Miller Compressing Company. Please contact me at the number or email below if you have any questions regarding this letter.

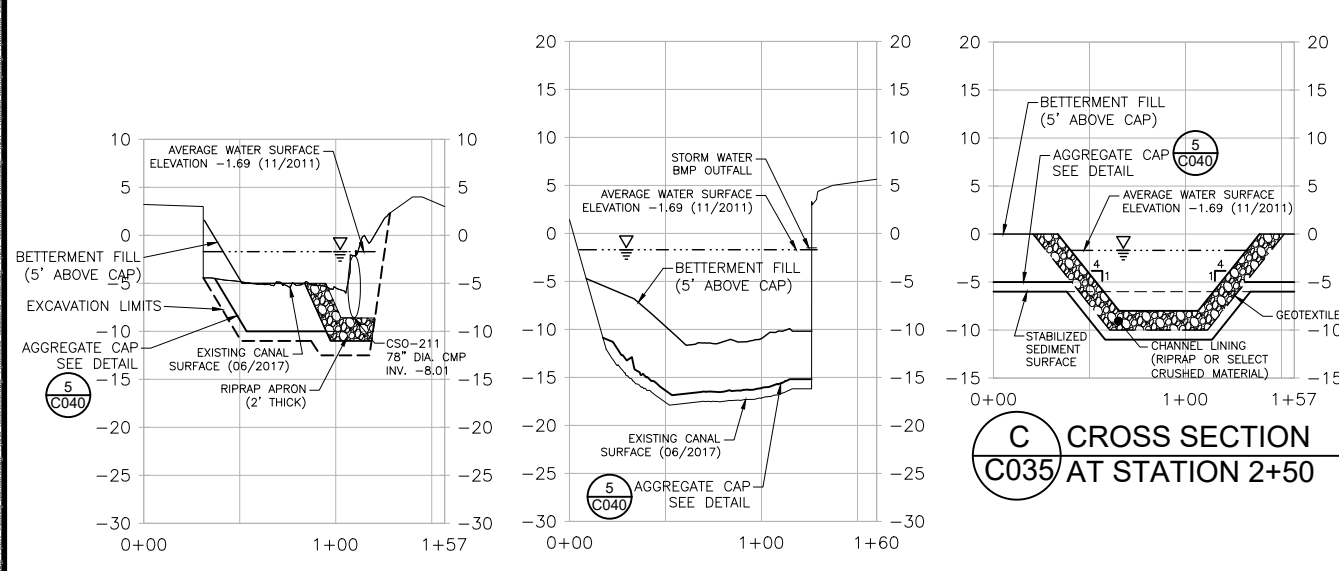
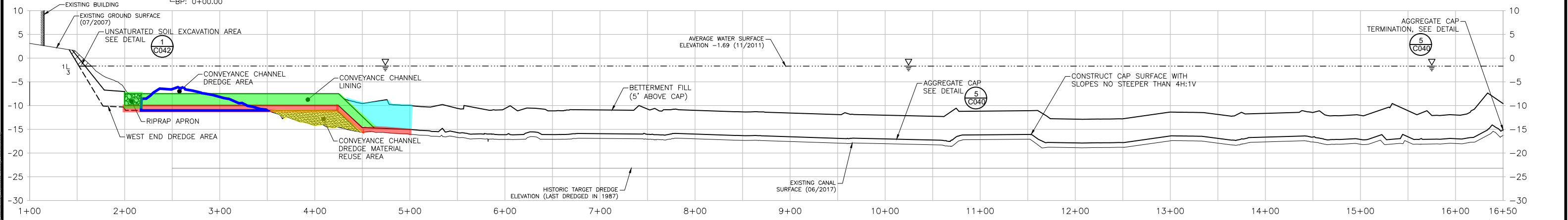
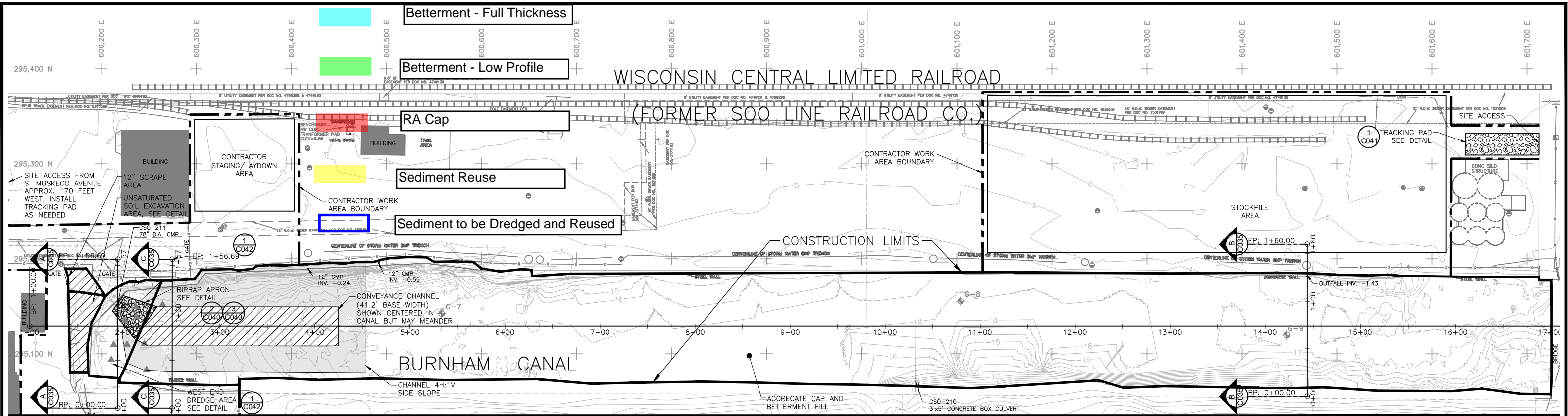
**We are committed to service excellence.**

Visit our survey at <http://dnr.wi.gov/customersurvey> to evaluate how I did.

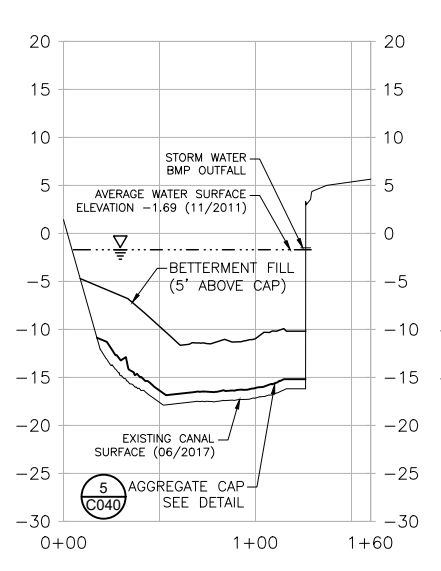
**Paul Grittner**

Contaminated Material Management Specialist - Remediation and Redevelopment Program  
Wisconsin Department of Natural Resources  
Phone: (608) 266-0941  
[paul.grittner@wisconsin.gov](mailto:paul.grittner@wisconsin.gov)

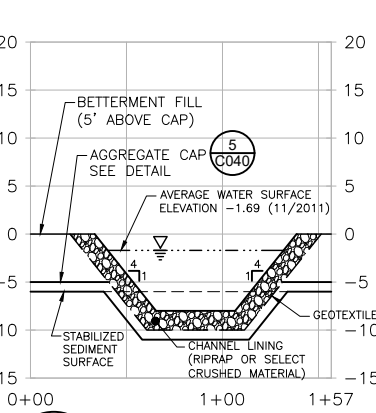




**A CROSS SECTION C035 AT STATION 1+93**



**B CROSS SECTION C035 AT STATION 14+44**



**C CROSS SECTION C035 AT STATION 2+50**

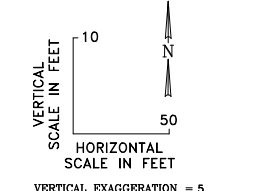
— 10 —	PRECONSTRUCTION CONTOUR	● SED-102	SEDIMENT SAMPLE LOCATION (2007)
- - -	RIGHT-OF-WAY (R.O.W.)/ PARCEL LINE	◆ G-6	GEOTECHNICAL SAMPLE LOCATION (2007)
- - -	SECTION LINE	◆ G-7	PRE-DESIGN GEOTECHNICAL SAMPLE LOCATION (11/2011)
— — —	CONTRACTOR WORK AREA	▲	PRE-DESIGN SEDIMENT SAMPLE LOCATION (11/2011)
— — —	TREES & BRUSH	— x —	FENCE
◆	SOIL BORING LOCATION (7/2009)	— B —	BUILDING
◆ SW-01	SURFACE WATER SAMPLE LOCATION (12/2007)	— OHW —	OVERHEAD WIRE
◆ HA-4	HAND AUGER LOCATION (12/2007)	— TEL —	TELEPHONE
◆ SED-T/SED-SA	SEDIMENT SAMPLE LOCATION, APPROX. (2006)	— ELC —	ELECTRIC
		— W —	WATER MAIN
		— G —	GAS
		— SAN —	SANITARY SEWER
		— STH —	STORM SEWER
		○	MANHOLE
		●	CATCH BASIN
		— — —	RAILROAD TRACKS

**CONSTRUCTION NOTES:**

1. THE INFORMATION SHOWN ON THIS DRAWING CONCERNING TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATIONS AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO.
2. LIMITS OF WEST END UNSATURATED SOIL AND DREDGE AREA DEPENDENT ON WATER ELEVATION, TO BE VERIFIED PRIOR TO WORK.

**SOURCE NOTES:**

1. EXISTING CONDITIONS NORTH AND WEST OF THE BURNHAM CANAL APPROXIMATE EDGE OF WATER CREATED FROM DIGITAL BASE FILE TM601D50.DWG/TM601D50RED, SURVEYED BY NATIONAL SURVEY & ENGINEERING ON 07/18/2007.
2. EXISTING CONTOURS WITHIN THE BURNHAM CANAL BASED ON BATHYMETRY SURVEY COMPLETED BY THE U.S. ARMY CORPS OF ENGINEERS ON 06/27/2017.
3. COORDINATE SYSTEM IS BASED ON NAD 83 HARN WISCONSIN COUNTY FEET. THE VERTICAL DATUM IS EQUAL TO THE NGVD 1929 ELEVATION MINUS 580.603.
4. CONTOURS SOUTH OF THE CANAL FROM MCAMLIUS (MILWAUKEE COUNTY AUTOMATED MAPPING AND LAND INFORMATION SYSTEM) DATA TYPE: ARCGIS MAP SERVICE, SERVER: HTTP://MAPS.MILWAUKEECOUNTY.ORG/ARCGIS/SERVICES.

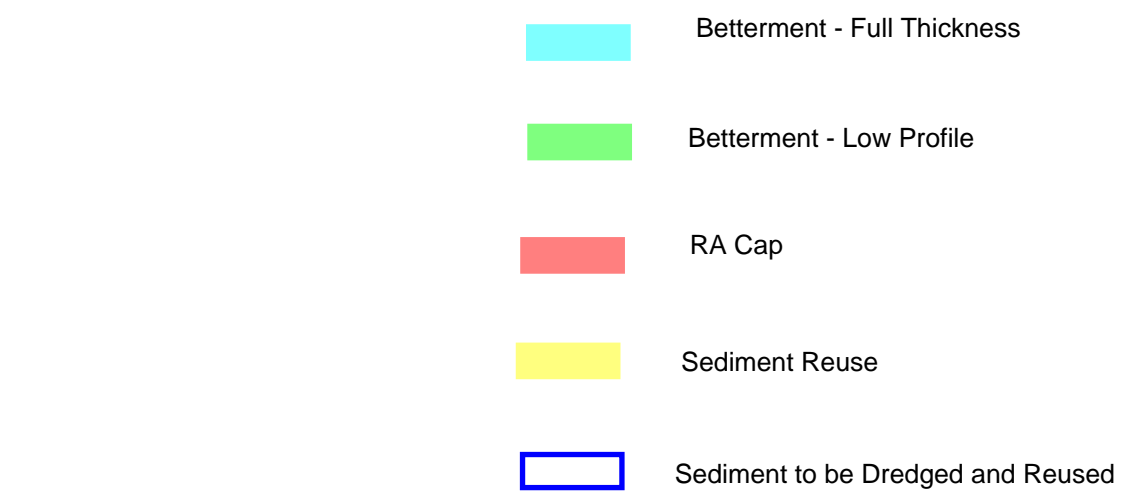
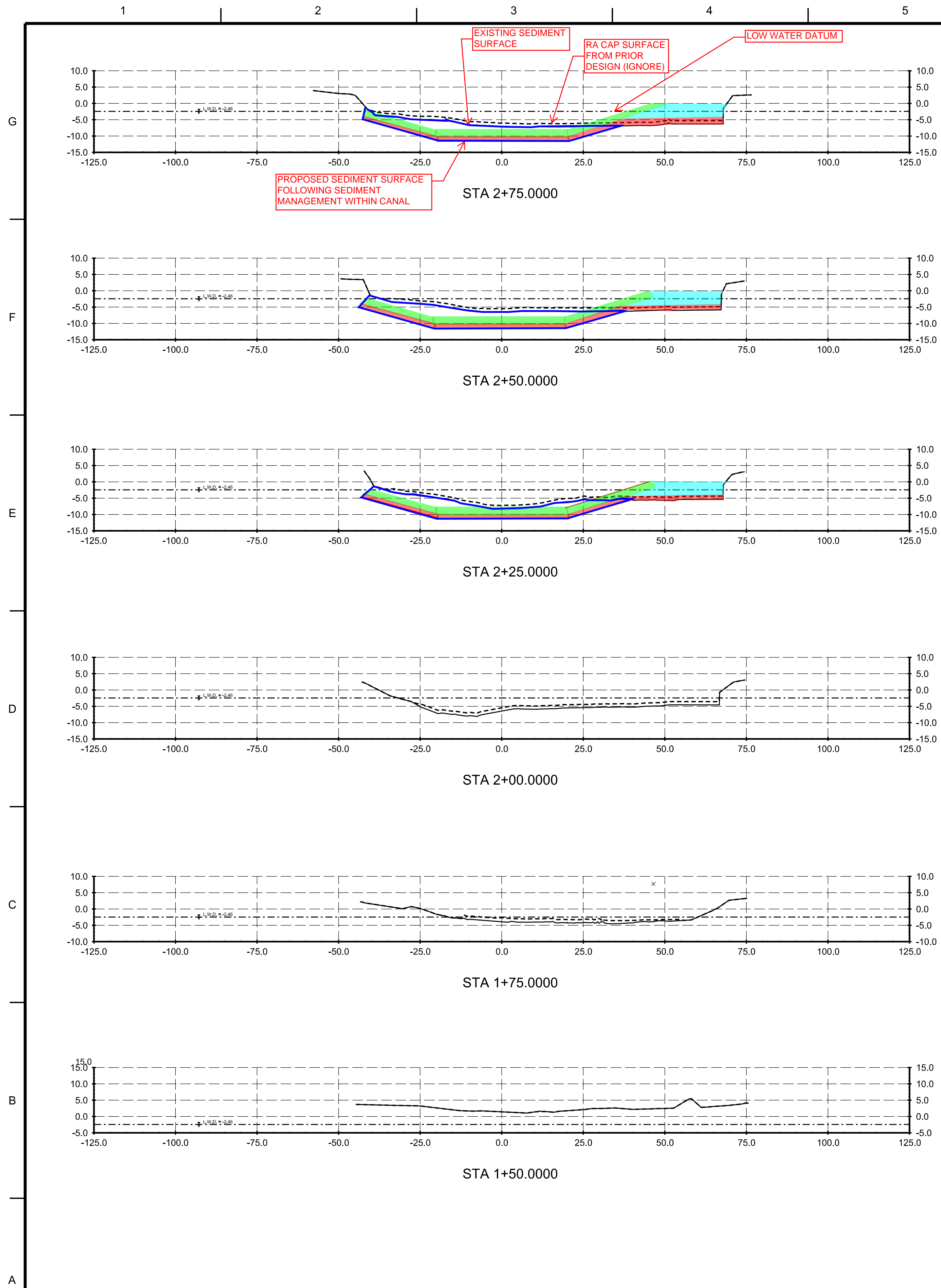


CONTACT DIGGERS' HOTLINE PRIOR TO ANY UNDERGROUND WORK ON-SITE  
CALL 811 OR (800) 242-8511  
(262) 432-7910  
(877) 500-9592 (EMERGENCY ONLY)

6.			
5.	VOL. BETTERMENT MOD. ISSUED FOR AGENCY REVIEW	<b>DRAFT</b>	
4.	ISSUED FOR AGENCY REVIEW	07/29/16	RJB
3.	ISSUED FOR AGENCY REVIEW	02/02/16	RJB
2.	ESD MODIFICATIONS ISSUED FOR AGENCY REVIEW	01/15/15	RJB
1.	ISSUED TO ADDRESS AGENCY COMMENTS	07/19/13	RJB
0.	ISSUED FOR AGENCY REVIEW	03/29/13	RJB
REVISION:		DATE:	APP'D BY:

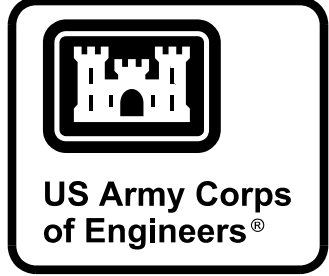
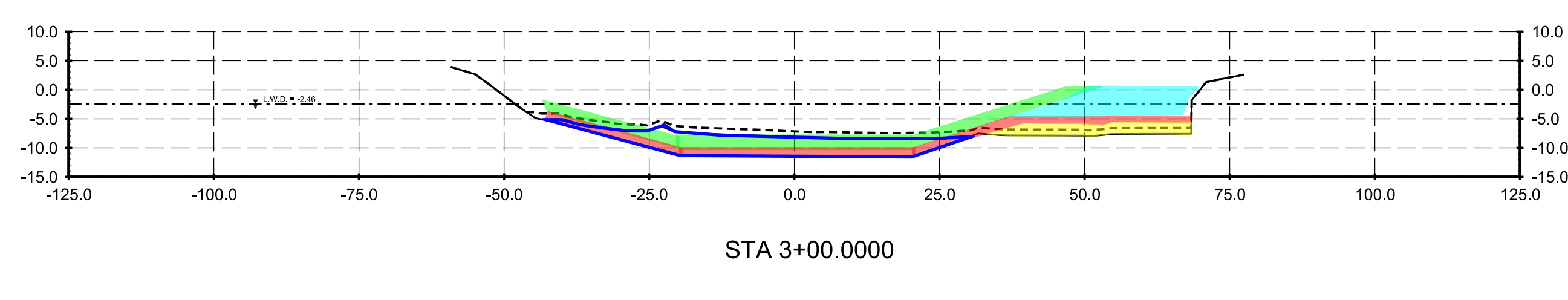
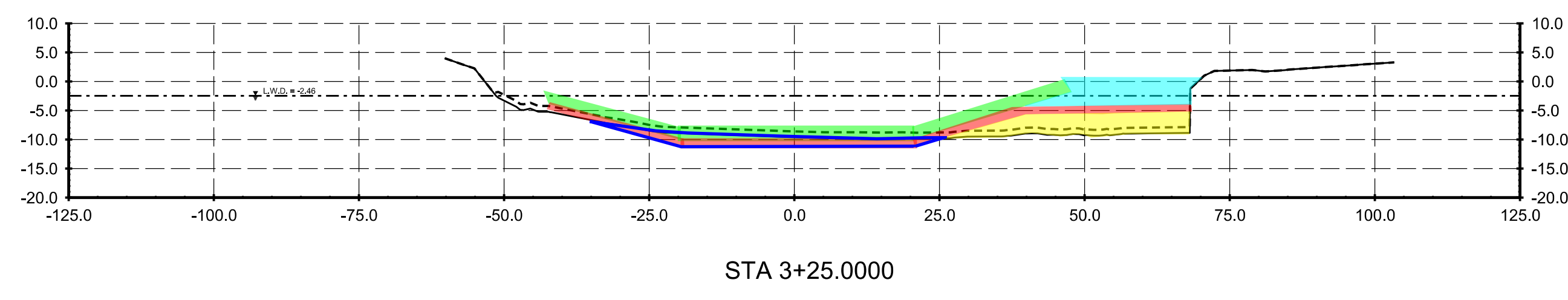
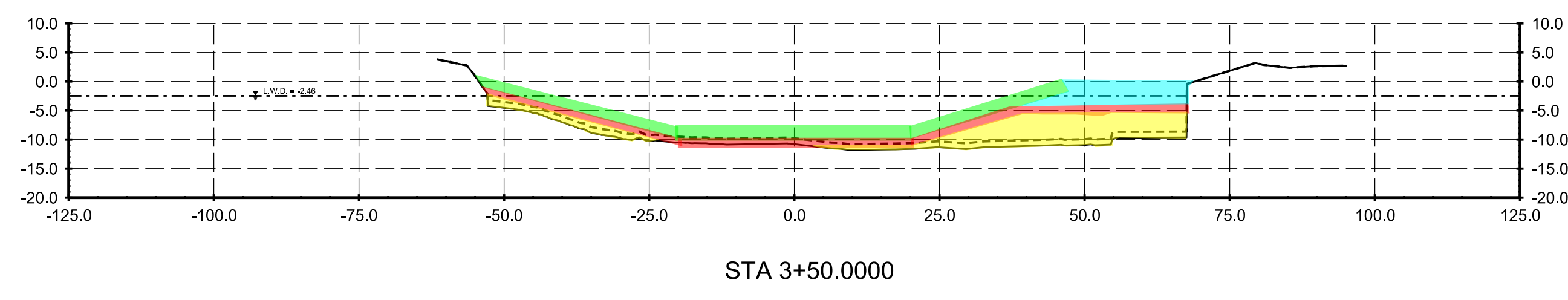
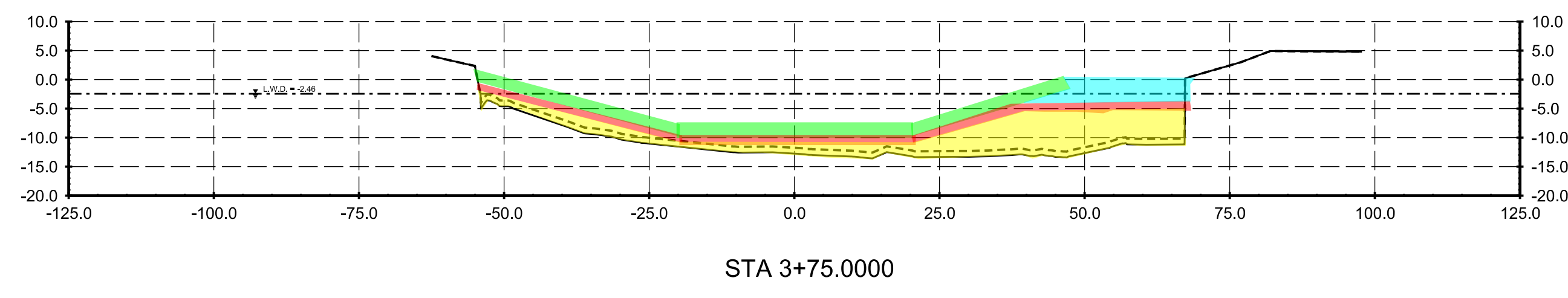
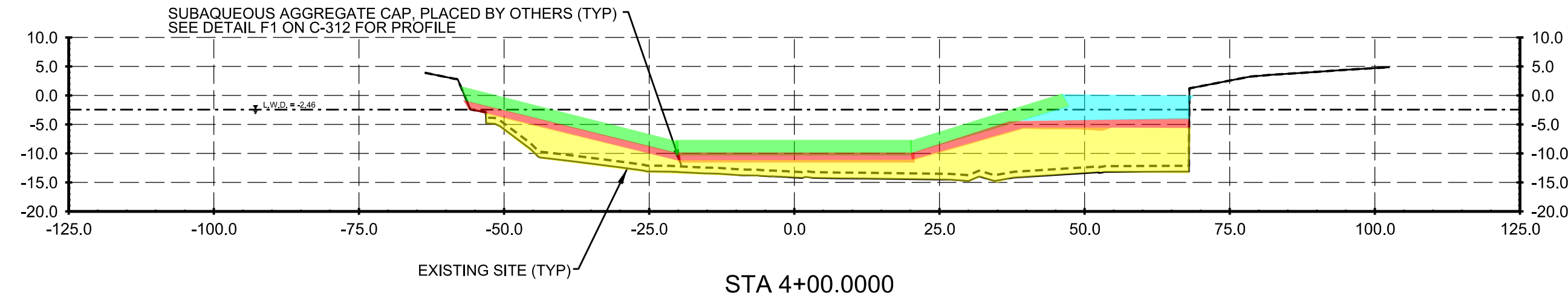


PROJECT NO. 67830/910	<b>PROFILE AND CROSS SECTIONS</b>	BURNHAM CANAL REMEDIATION VOLUNTARY BETTERMENT AGGREGATE FILL MATERIAL PLACEMENT REVISION MILLER COMPRESSING COMPANY CITY OF MILWAUKEE, WISCONSIN	SHEET NO. C035
DRAWN BY: DMD 05/04/15			
CHECKED BY: Y_Z 02/02/16			
APPROVED BY: RJB 02/02/16	DRAWING NO: D2117C035-04.DWG		REFERENCE: SEE INFO BLOCK



**GENERAL NOTES:**

- ALL ELEVATIONS ARE SHOWN IN THE CITY OF MILWAUKEE DATUM (CMD), TO CONVERT TO LWD, ADD 2.46'
- SUBAQUEOUS CAP TO BE PLACED BY OTHERS BETWEEN THE WESTERN EXTENT OF THE PROJECT, STA 1+75 AND THE 11TH STREET BRIDGE STA 16+50.
- SECTIONS CUT LOOKING EASTERLY TOWARD MILWAUKEE CHANNEL.

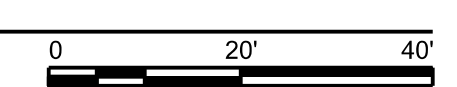


DATE	DESCRIPTION	MARK

ISSUE DATE: 05 OCT 2017  
 PROJECT NO: 1011XK-XX-XXXX  
 CONTRACT NO: W911XK-XX-XXXX  
 %ALLOCATION: %UOPX1%  
 %UOPX1%  
 DESIGNED BY: B. MELBY, B. KORZETZ  
 CHECKED BY: N. ZAGER  
 SUBMITTED BY: PHILLIP ROSS  
 SIZE: 1/4" x 3/4" (ANSI)  
 U.S. ARMY CORPS OF ENGINEERS  
 DETROIT DISTRICT  
 STREET ADDRESS  
 CITY, STATE ZIP

MILWAUKEE COUNTY  
 MILWAUKEE CITY, BURHAM CANAL  
 ESTUARY AREA OF CONCERN  
 ECOSYSTEM RESTORATION  
 EXISTING SITE  
 CROSS SECTION

A1  
 C-100  
**A1**  
 EXISTING SITE CROSS SECTIONS  
 SCALE: 1"=20'

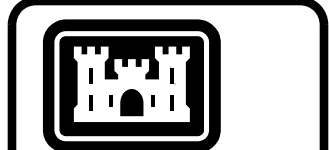


SHEET ID  
**C-300**

CERTIFIED FINAL

**GENERAL NOTES:**

1. ALL ELEVATIONS ARE SHOWN IN THE CITY OF MILWAUKEE DATUM (CMD), TO CONVERT TO LWD, ADD 2.46'
2. SUBAQUEOUS CAP TO BE PLACED BY OTHERS BETWEEN THE WESTERN EXTENT OF THE PROJECT, STA 1+75 AND THE 11TH STREET BRIDGE STA 16+50.
3. SECTIONS CUT LOOKING EASTERLY TOWARD MILWAUKEE CHANNEL.



**US Army Corps  
of Engineers**

DATE	DESCRIPTION	MARK

**DESIGNED BY:** R. MELBY, B. KORZETZ  
**CHECKED BY:** N. ZAGER  
**ISSUE DATE:** 05-OCT-2017  
**PROJECT NO.:** W91XK-XX-XXX  
**CONTRACT NO.:** W91XK-XX-XXX  
**SUBMITTED BY:** PHILLIP ROSS  
**SIZE:** MVBCFY7C-301.dgn

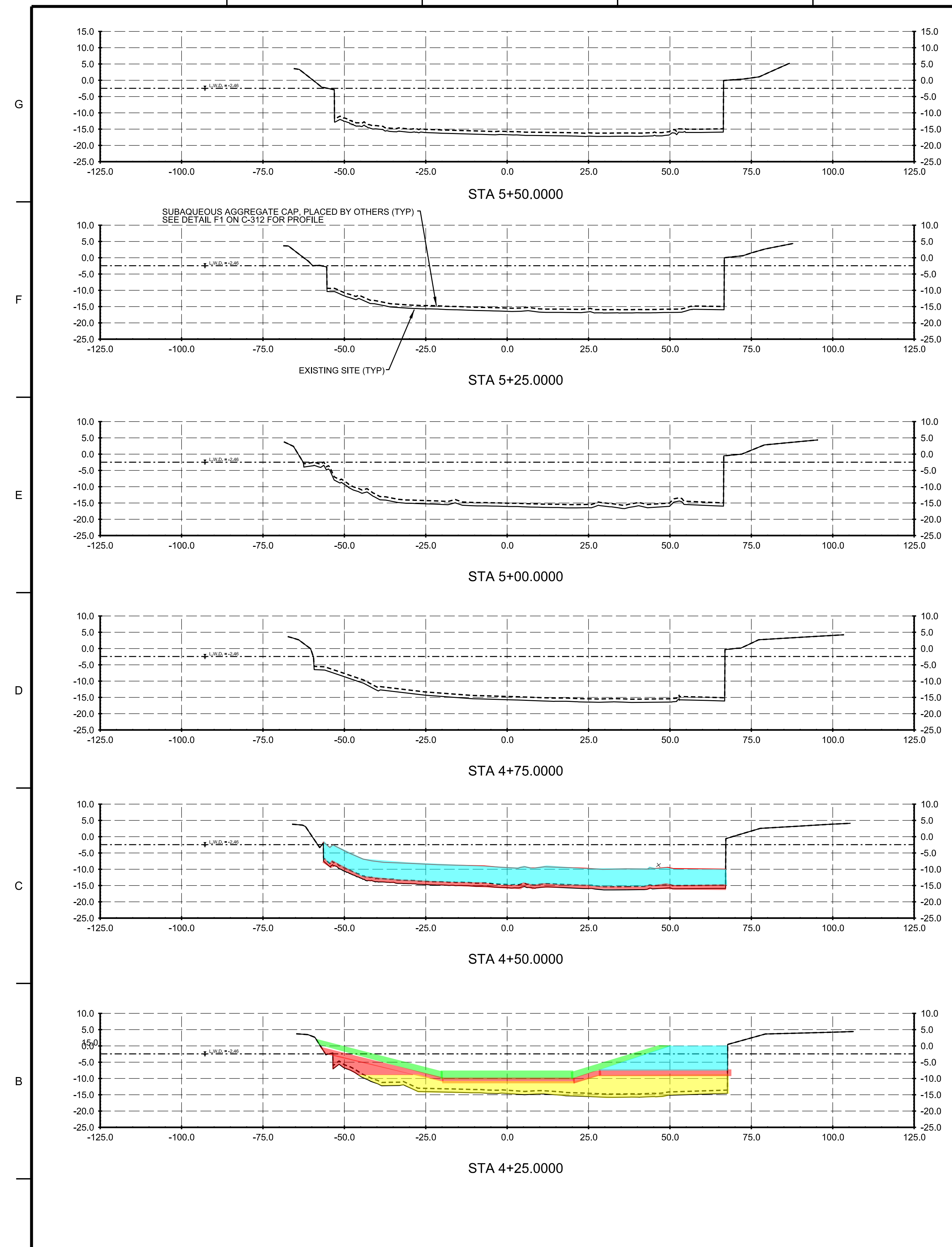
U.S. ARMY CORPS OF ENGINEERS  
 DETROIT DISTRICT  
 STREET ADDRESS  
 CITY, STATE, ZIP

MILWAUKEE COUNTY  
 MILWAUKEE CITY, BURHAM CANAL  
 ESTUARY AREA OF CONCERN  
 ECOSYSTEM RESTORATION

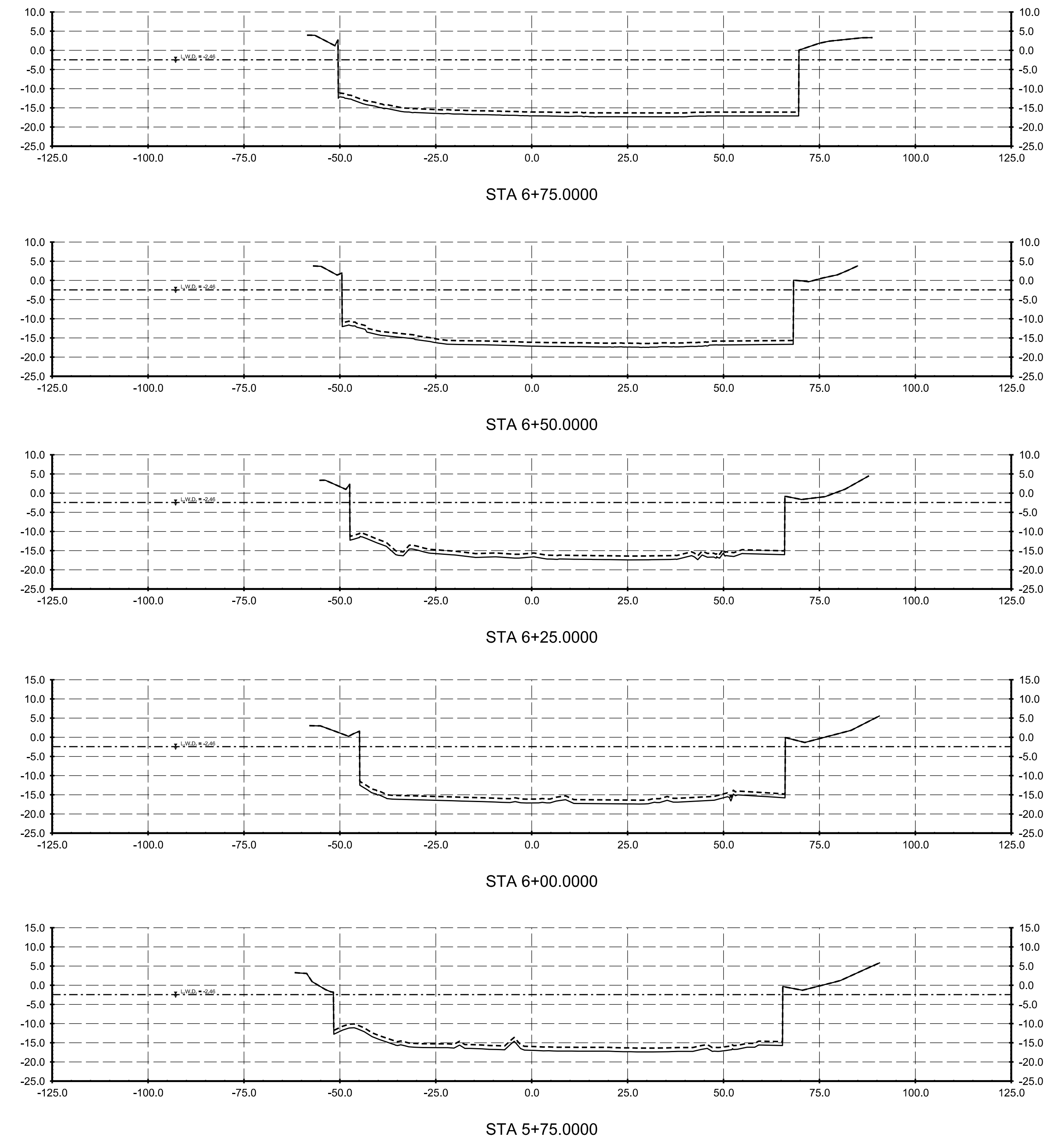
**EXISTING SITE  
CROSS SECTION**

SHEET ID  
**C-301**

CERTIFIED FINAL



- █ Betterment - Full Thickness
- █ Betterment - Low Profile
- █ RA Cap
- █ Sediment Reuse

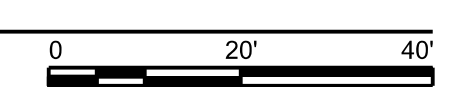


**EXISTING SITE CROSS SECTIONS**

NOTE:  
1. TITLE SPECIFIC NOTES

A1  
C-100  
C-101

SCALE: 1"=20'



## **APPENDIX F**

### **SUBAQUEOUS AGGREGATE CAP THICKNESS SAMPLING FORM**

# Subaqueous Aggregate Cap Thickness Sampling Form

Form # _____

**General Information**

Project Name/Site : Burnham Canal Superfund Alternative Site  
 Project # : 1950075954  
 Task # : _____  
 Date : _____  
 Samplers : _____

Sampling Equipment: _____  
 Coordinate System: _____  
 Datum: _____  
 Weather: _____

Sample Location (ID)	Time (military)	Sample Type	Water Elevation ⁽¹⁾	Water Depth (ft)	Stabilization Layer Thickness (in)	Aggregate Thickness (in)	Sample Location (Northing) ⁽²⁾ Field Reading/Post Processed Reading	Sample Location (Easting) ⁽²⁾ Field Reading/Post Processed Reading	Sample Notes

**Additional Comments:** _____  
 _____  
 _____

**Staff Gauge Readings:**                      **Time:** _____                      **Readings:** _____ **ft**                      **GPS File Name:** _____

Notes: (1) Water Elevation = Staff Gauge Elevation - Staff Gauge Reading, Calculated at end of day, based on a minimum of 2 staff gauge readings or direct reading by RTK equipment.  
 (2) Sample coordinates will be recorded after being post processed, when applicable.

n/a : Not Applicable  
 COC: Chain of Custody

**Sampling/Processing Personnel Signature:** _____