STN Environmental

service disabled veteran owned small business

January 05, 2010

Mr. Ross Delrosario
Remedial Project Manager
Remedial Response Branch
U.S. Environmental Protection Agency
77 West Jackson Boulevard
Chicago, IL 60603

Subject: **Remedial Action Letter Report**
Moss American Superfund Site
Milwaukee, Milwaukee County, Wisconsin
Technical Direction Document No. S05-0806-001
START Contract No. EP-S5-06-03

Dear Mr. Delrosario:

The STN Environmental JV (STN) Superfund Technical Assessment and Response Team (START) has prepared this remedial action letter report in accordance with the requirements of U.S. Environmental Protection Agency (EPA) Technical Direction Document (TDD) No. S05-0806-002. The scope of this TDD included (1) preparing a health and safety plan; (2) conducting oversight of sediment remedial activities conducted from approximately 4,800 feet (ft) (Reach 4 and 5 Area of Interest) of the Little Menomonee River; (3) documenting on-site conditions; (6) conducting pre-excavation and post-excavation sediment elevation survey in Little Menomonee river work areas; and (7) preparing a remedial action letter report. Remedial activities were conducted by the Emergency and Rapid Response Services (ERRS) contractor, Los Alamos Technical Associates, Inc and Kemron (LATA-Kemron) based on a zone crossover contract from Region IV.

This remedial action letter report summarizes the site background; discusses the remedial action activities; and provides a summary of the remedial action. Appendix A of this letter report presents a photographic log of remedial action activities and Appendix B provides sediment survey maps. This document presents the Draft Final Design Report for excavating sediments.

SITE BACKGROUND

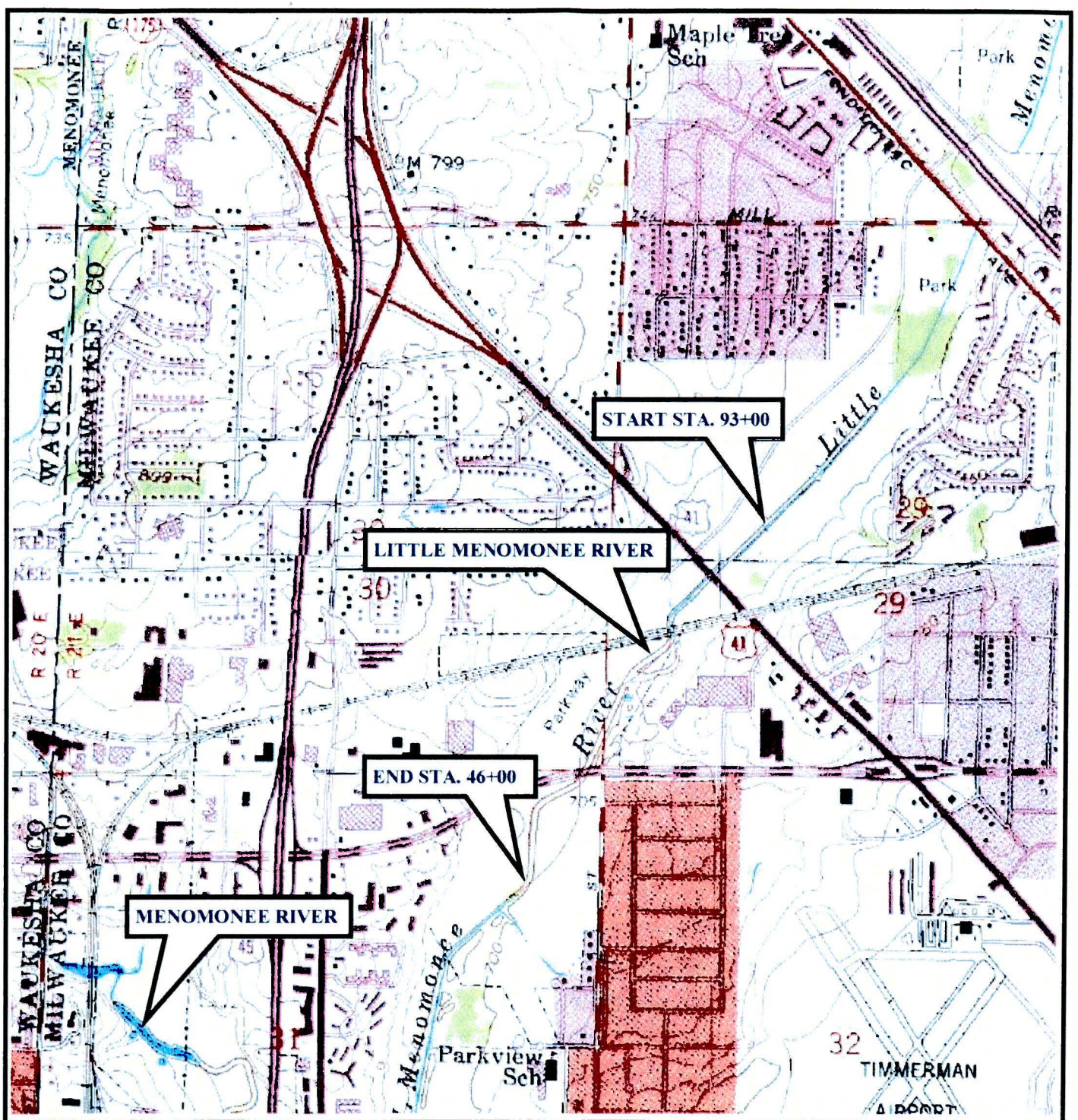
Site Location and Description

The Site is located in the northwestern section of the City of Milwaukee, County of Milwaukee, State of Wisconsin. The Site includes the former wood-treating facility (facility) and 5.87 miles of the Little Menomonee River (LMR) and associated floodplain downstream of the facility. The approximately 88-acre facility is located at 8716 Granville Road at the southeast comer of Brown Deer and Granville Roads intersection. Milwaukee County currently owns 65 acres of land on the eastern portion of the facility, and the Union Pacific Railroad owns the 23-acre parcel comprising the western portion of the facility. The LMR flows through the eastern portion of the facility and continues downstream through the Milwaukee County Parkway until its confluence with the Menomonee River south of the facility. The Site is located in a moderately populated suburban area of mixed light industrial, commercial, residential, and-recreational use. The Site Boundary Map of the Reach 4 and 5 Area of Interest is included as Figure 1. The boundary map is from a 1966 Topographic map of the Site.

Site creosote operations were conducted from approximately 1921 to 1976. Past site aerial photos show that land usage patterns have changed considerably with the passage of time. Photos from the 1930s to the 1950s show the creosote plant operating in a relatively sparsely populated setting, where several farms surrounded the manufacturing operation. From the 1960s on to the present, residential and commercial use of nearby property has increased considerably, and agricultural and farming operations have been completely phased out. Industrial parks and multi-lane highways also traverse the site setting. County owned land along the river corridor has featured installation of hiking and bicycle trails to enhance recreational opportunities. These features have had a direct bearing on site soil cleanup standards, and have focused sediment remediation on combining natural resource recovery with sediment cleanup goals.

Contamination History

In 1921, the T. J. Moss Tie Company established a wood preserving facility west of the Little Menomonee River. The plant preserved railroad ties, poles, and fence posts with creosote, a mixture of numerous chemical compounds, derived from coal tar. While No. 6 fuel oil was also used, no evidence of pentachlorophenol use was found at the Moss-American site. Creosote plant operations often contain storage facilities for creosote and fuels, a boiler for making steam, heating the creosote and applying the creosote to the wood, areas for unloading and storing incoming timbers, rail cars for transporting the



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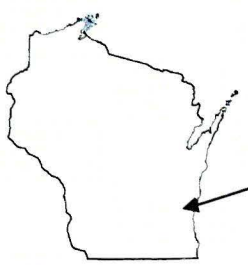


Figure 1
Site Location Map
Reach 4/5—Little Menomonee River

Moss American Removal Action Site
Milwaukee, Milwaukee County, WI
TDD No.:S05-0806-001

STN Environmental

creosote, and a drying area for subsequent storage. Potential for release of materials exists throughout the storage, application, and drying processes.

Kerr-McGee purchased the facility in 1963 and changed the facility's name to Moss-American. The name was changed again in 1974 to Kerr-McGee Chemical Corporation - Forest Products Division. In 1998, the name of this company changed to Kerr-McGee Chemical LLC (KMC).

From 1921 to 1971, the facility discharged wastes to settling ponds that ultimately discharged to the Little Menomonee River. These discharges ceased when the plant diverted its process water discharge to the Milwaukee sanitary sewerage system. Production at the facility ceased in 1976.

Under WDNR order, KMC cleaned out eight former settling ponds and dredged about 1,700 feet of river to remove creosote-contaminated soil and sediment. In the period from 1972 through 1973, three different dredging efforts were conducted in the Little Menomonee River within the first mile downstream of the facility. In 1974, Moss-American became part of the Kerr-McGee Chemical Corporation - Forest Products Division. In 1998, Kerr-McGee Chemical Corporation became - Kerr-McGee Chemical, LLC. In 2005, Kerr-McGee Chemical, LLC, became Tronox, LLC.

Initial Response

In 1983, the facility was proposed for inclusion on the National Priorities List (NPL) pursuant to Section 105 of CERCLA. In 1985, U.S. EPA initiated a negotiation period with potentially responsible parties (PRPs) associated with the site to determine if they would conduct the Remedial Investigation/Feasibility Study (RI/FS). When those discussions did not result in a settlement, U.S. EPA conducted the RI/FS.

RI findings indicated that for site soils most of the contamination was associated with former creosote processing areas such as application areas, near former settling ponds, and in the vicinity of treated wood storage areas, where some drippage of applied substances can occur. Polycyclic Aromatic Hydrocarbon (PAH) contamination ranged as high as 32,000 mg/kg in soils. Benzene - toluene - ethyl benzene - xylene compounds (sometimes denoted as "BTEX" substances), also were detected in soils, at levels ranging from 0.02 mg/kg to 17 mg/kg. Most soil contamination occurred within the upper 10 feet of soil.

The RI revealed indications of free product liquids associated with site groundwater. Contaminants, consisting chiefly of PAHs and BTEX compounds, occurred principally in shallow monitoring wells. Little or no groundwater contamination was detected deeper than 20 feet below ground surface. The main

plume of groundwater contamination appeared to occur in the central portion of the former processing area, in a band approximately 600 feet across. Shallow groundwater at the site was believed to be discharging into the Little Menomonee River.

Sediment samples from the Little Menomonee River were collected and analyzed at intervals running from a point near Brown Deer Road to the confluence of the Little Menomonee River with the Menomonee River, located some 5.5 to 6 miles downstream from the former creosote processing facility. While there was considerable variation in sample results, at least 12 sediment samples exceeded 100 mg/kg or greater of carcinogenic PAH (CPAH) compounds. Background levels of CPAH substances were initially put at 18 mg/kg; but this value was refined in a subsequent study to 15 mg/kg. The cleanup value was derived by considering site CPAH background, the likelihood that CPAH sediment content may be affected by other emission factors as the stream flows through an urbanized area, and the relationship of sediment cleanup goals with the stream's floodplain.

Basis for Taking Action

In considering risks that may be posed to human health and the environment, a baseline risk assessment was conducted as part of the RI effort for the Moss-American site. Major site contaminants fall into such chemical groups as PAHs and BTEX compounds. PAHs are a primary component of creosote blends, and in terms of health effects have been associated with lung, stomach, and skin cancers. PAH compound structure is in varying complexity of connected hexagonally shaped rings. Carcinogenicity has been associated with some of the more complex 4 and 5 ring PAH compounds; benzo[a]pyrene is one such example. As for the BTEX compounds, benzene has been associated with occurrences of leukemia, while toluene and xylenes appear to cause depression of the human central nervous system.

In considering the types of personnel who might be exposed to site soils, and the levels of site contaminants within such soils, the RI risk assessment calculated a risk of five times the 10^{-4} value considered to be an acceptable upper limit for casual site users. Potential users with more frequent instances of exposure would have faced higher risks.

In considering exposure to site sediments, the RI risk assessment noted that risk varied somewhat in each of the stream "segments" moving downstream from the former creosote processing area. Sediment exposure risks to humans tended to be higher in segments 1, 2, and 3 - on the order of 10^{-4} excess carcinogenic risk due to CPAH exposure. In river segments 4 and 5, the excess carcinogenic risk dropped

to 5 and 3 times 10^{-5}, respectively. Based on human exposure alone, exposure to CPAHs via sediment presented excess risk at the upper (10^{-4}) acceptable range of the risk range (10^{-6} to 10^{-4}) sought by U.S. EPA for remedial sites. However, when coupled with perceived risk to aquatic habitat, sediments were also viewed as an environmental medium that presented an unacceptably high risk pathway. While not viewed as an "applicable or relevant and appropriate requirement", or ARAR, at the time of risk assessment compilation, literature cited by WDNR indicated that a level of 3 mg/kg of CPAHs in sediment might constitute a "to be considered" value of what would constitute acceptable long-term aquatic habitat protection.

Through negotiations between Tronox and U.S. EPA, an agreement on areas and depth of sediment removal was achieved based on the results of several rounds of sediment sampling and statistical analysis of sediment data. In 2008, a final round of sediment samples were collected and analyzed for CPAHs in Reach 4 and 5 Areas of Interest as part of the work plan. CPAH action level of 15 mg/kg was used and a remedial design was proposed in the work plan by Tronox. The extensive sediment and statistical analysis sampling program conducted in 2008 eliminated the need for confirmation sampling during sediment removal.

REMEDIAL ACTION ACTIVITIES

The FS was completed in May 1990. Pursuant to Section 117 of CERCLA, U.S. EPA published a notice of completion of the FS and released to the public a proposed plan for remedial action. After evaluation of public comment, U.S. EPA selected a remedy for the site documented in the Record of Decision (ROD) signed on September 27, 1990. The remedy addressed contaminated site soils, Little Menomonee River sediments, and site groundwater. Remedy components included:

- Particularly highly contaminated site soils were to be excavated, and to undergo treatment in a bioslurry vessel.
- Successfully treated soils and lower contaminated soils could then be disposed of under an appropriate cover, and the areas re vegetated.
- Sediments were to be addressed by creating a new channel in the vicinity of the LMR, removing the most highly contaminated sediments from the existing channel, diverting flow into the new channel, and filling the dewatered existing channel with soils from new channel excavation.
- Contaminated site groundwater was to undergo collection and treatment, presumably using some manner of biological treatment system.

The 1990 ROD envisioned soils treatment using bioslurry technology. Pilot testing done by KMC/Weston indicated reasonably good soils treatment of the lighter 2-3 linked hexagonal ring sized fractions of the PAH contaminants in soil using bioslurry technology, but a decided dropoff in treatment efficiency for the 4-6 ring PAH compounds. Since the leading site soil contaminants of concern were the heavier PAH compounds with carcinogenic properties, after consulting the literature and RODs for other creosote sites, U.S. EPA in 1998 developed a ROD amendment which authorized a soils technology change to thermal desorption.

Little Menomonee River cleanup activities had been conducted in phases. The River was divided into five segments, increasing from the former T.J. Moss Tie Company facility. Some portions of the remediated River was not rerouted into a new channel in order to achieve site cleanup goals. Areas of the River underneath bridges, near some roads, near railroad bridges, and near valuable wetland habitat in segments 1 through 3 and areas of the river in segments 4 and 5 were not rerouted. In those areas, River remediation was limited to dredging and off-site disposal of contaminated sediments that exceeded the site cleanup level.

REMEDIAL ACTION IN REACH 1, 2 and 3

Ground water Treatment

One of the remedy components at the Moss-American site, the groundwater funnel and gate treatment system, involves long-term operation of a groundwater collection/treatment system, with a goal of restoration of ground water to MCLs, and another goal of prevention of movement of contaminated groundwater into nearby surface water.

Field construction of ground water treatment system began in November 1999. KMC completed most of the construction phase in April 2000. However, the construction completion was delayed due to wet site conditions. U.S. EPA, in consultation with WDNR, sent KMC recommendations and suggestions on field techniques that could be employed to overcome this problem. KMC resumed construction in late May 2000. They completed injection/monitoring well installation first. Piping runs were then completed. By July 26, 2000, all regrading had been completed. Final inspection of the electrical connections was made by the City of Milwaukee, and all needed decontamination measures associated with groundwater system construction had occurred. Work was conducted to develop dosage rates of nutrients/air needed for optimal performance.

According to the 5-year review completed in 2005, very good contaminant removal efficiency was occurring at the more upgradient treatment gates within the groundwater funnel and gate treatment system. Naphthalene concentrations dropped from around 4000 µg/l to 40-80 µg/l to 8-10 µg/l as groundwater flows from the upgradient side of the gate, into the gate treatment zone itself, and past gates one and two. However, little beneficial treatment was occurring at the two more downgradient pairs of treatment gates. Both U.S. EPA and WDNR had notified KMC and it's consultant Weston of this observation. KMC's consultant undertook the placement of about 10 additional piezometer wells in the vicinity of the various treatment gates to get a better idea of flow conditions. These wells indicated that groundwater flow is nearly stagnant at the downgradient pairs of treatment gates. The groundwater monitoring well network indicated that there is a pocket of contamination downgradient of the first pair of treatment gates (which are providing good treatment efficiency), and upgradient of the pairs of treatment gates where flow conditions are nearly stagnant.

Soils Treatment

Low Temperature Thermal desorption (LTTD) work was conducted from April 2001 to February 2002 as a soil treatment remedy. During the course of LTTD work, lime was mixed in with soils to undergo thermal treatment for one of two main reasons: it helped absorb excess water in the soil, and it aided in trying to minimize/neutralize any generation of sulfur oxide compounds for some site soils where sulfur content of the soils was higher. With the exception of one delivery, when pelletized lime was unavailable, site operators used pelletized lime to help reduce dust generation when mixing lime and soils. The purpose of thermal desorption was to heat the contaminants above the boiling points of so that they were driven off the soil particles. The contaminants driven off the soils were in gaseous form, and required a flare to bum them off so as to avoid release into the atmosphere. The flare was to operate at a reduction efficiency of 99.99%. After component assembly and initial runs, one of the minor contaminants associated with site soils, benzene, initially proved difficult in attaining treatment goals. Some experimentation was needed on both sampling and LTTD treatment run conditions on getting optimal temperatures and unit residence time so as to get best treatment. This optimizing took place largely in June 2001. During the course of operations, the plant was inspected twice by air contaminant control personnel representing both the Milwaukee Health Department and the WDNR. Improvements suggested by these entities and U.S. EPA were incorporated, including gathering more air data from the site perimeter, and lightly wetting down piles of treated soils temporarily staged pending analytical results.

Once successfully treated, soils were at first returned to their place of excavation. However, the volume of the treated - and now uncompacted soil – exceeded original volume. Hence, other treated soils were at first stockpiled. Some of these were later graded in place. Other treated soils were used in old channel fill work. KMC and its consultant took further soil samples from excavated areas, and found quite often that additional soils required further excavation and treatment. A total of 137,000 tons of contaminated soils were treated using LTTD.

Sediment Excavation and Disposal

Primary activity during October and November 2002 was the excavation and creation of a new stream channel for Segment 1, in a routing near the existing stream but going through soil essentially free of the PAH-creosote related hazardous substances that contaminated the previously existing stream channel. In December 2002 and January 2003, the existing channel was dewatered section by section. Before soils excavated in creating the new channel were used as fill material in the old channel, sediments were examined for signs of most severe contamination. Such severe contamination was evidenced by "free-product" creosote, or "visible contamination". Sediments possessing these characteristics were then excavated, and placed on a bermed concrete storage pad. About 10,000 cubic yards of such "visibly contaminated" sediments, believed to be the most obvious sources that could attempt to migrate into the new channel if not picked up and isolated, were removed. The new channel has slightly greater sinuosity than the former channel. Since reroute into a new channel is not feasible near road or railroad bridges, about the last hundred yards of the stream north of Bradley Road was not rerouted. Instead, since both a railroad and road bridge are in close proximity, the last 100 yards was dredged so as to maintain the existing stream channel, and achieve a sediment cleanup goal of no more than 15 ppm total PAH in stream sediments in this 100 yard stream stretch.

Sediment remediation work involving Segments 2 and 3 was performed in two phases. Phase 1 work was performed from March 1, 2004 to July 16, 2004. Phase 1 work primarily involved preparation and construction of new channel areas. Other associated supplemental activities included installation of erosion control and snake barriers, clearing and grubbing for haul roads, transporting and disposing of previously stockpiled sediment materials from the Moss-American site to the Peoria Disposal facility in Peoria, Illinois, excavation of new channel, placement of woody debris, performing site maintenance to repair damage caused by high water/excessive rain, dewatering newly constructed channel, and stabilizing new channel lengths. After new channel construction needed for Segments 2 and 3 was largely completed, there was a lull in heavy-construction tasks as new channel stabilization steps proceeded.

During this time, in August 2004 KMC consultants performed surveys in Segments 2 and 3 to more clearly update and delineate where zones of "visibly contaminated" sediments were in "old" channel zones where dewatering and fill-in were necessary. Phase 2 activities then began on September 13, 2004, and continued in Segments 2 and 3 until December 30, 2004.

As Segment 2 and 3 remediation work proceeded, about 9,000 feet of new channel length was created. Some 8,060 feet of previous river channel was eventually filled in. Some 2,515 feet of river channel underwent dredging instead of rerouting to meet sediment cleanup objectives. Compared to Segment 1 work, the volume of more highly contaminated sediments from Segments 2 and 3 requiring excavation and removal before old channel zones could be filled in seemed to drop. For Segment 1, over 16,000 cubic yards of sediments required excavation and haul away. For Segments 2 and 3, the combined figure was approximately 8,563 cubic yards of more highly contaminated sediments requiring excavation and removal.

REMEDIAL ACTION IN REACH 4 and 5

Originally, Tronox was scheduled to begin the remedial action outlined in the work plan in April 2009. However, earlier in 2009 Tronox declared bankruptcy, and shortly before the scheduled start of field activities announced that the removal action would be postponed indefinitely due to a lack of funding.

Subsequently the U.S. EPA chose to complete the remedial action in Reaches 4 and 5 as a Superfund-lead project. The remedial action was conducted from August to December 2009 following the work plan. The LMR channel was cleaned of sediments at specified locations and specified depths per the agreed-upon statistical analysis. Sediment excavation of the LMR channel was conducted within a stretch of the LMR extending from north of US-41 (Appleton Avenue) at Station 93+00 southward to south of Silver Spring Drive at Station 45+00. Sediment removal from the LMR channel will reduce the negative effects previously posed by the contaminated sediments to human health, the environment, and adjacent infrastructure.

Remedial action activities at the site included mobilization of OSC, START and ERRS personnel and equipment; clearing and constructing access roads and support areas; procuring transportation and disposal of the excavated material; excavating the contaminated sediment; conducting surveying of pre- and post-removal sediment elevations to confirm removal of sediments to the planned limits; and restoration of the access roads, support areas, and disturbed areas on the river banks.

Prior to arrival at the site, START prepared a health and safety plan and a map for hospital route from the site. On July 31, 2009, EPA RPM Ross Del Rosario, EPA OSC Craig Thomas, Tom Wentland of Wisconsin DNR, Kevin Haley of Milwaukee County Park System, ERRS Response Manager Kevin Shaver and START Naren Babu conducted a site walkthrough to identify site access issues and discuss the general set-up of the site for the remedial action.

On August 03, 2008, ERRS, OSC, RPM and START mobilized to the site. ERRS mobilization included field personnel and equipments and supplies. Field personnel included a response manager, equipment operators, field technicians and a field cost analyst. Equipment and supplies included but were not limited to, excavators, wood chipper, frac tanks, front end loaders, vacuum trucks, dozer, dump trucks, pumps, hoses, inflatable dams, gravel, rock, imported fill soil, and saw dust . Equipment operators, crew members and equipment and supplies were mobilized and demobilized as required by the site operations and approved by U.S. EPA.

The Work Plan divided the stretch of Reach 4/5 undergoing sediment removal into 20 work areas. These Work Areas were grouped into three access areas based on accessibility: the Appleton Avenue access area (the northernmost work area to the CSX railroad bridge), the Silver Spring Drive access area (the CSX railroad bridge to Silver Spring Drive), and the 107th Street access area (Silver Spring Drive to southernmost work area). START surveyors marked the boundaries and depths of the sediments to be removed from each work areas with color-coded stakes prior to the start of the excavation activities using a portable Trimble GPS-unit and reference points established along the river by PRPs. The color-coded stakes used to differentiate the sediment removal area indicated the target removal depths. An orange flagged wooden stake was used for 6-inch excavations. Blue and green flagged wooden stakes were used for 15-inch and 24-inch excavations, respectively. START surveyors set up random points inside the excavation work areas and determined the pre-excavation sediment elevation using a portable GPS unit. START used this pre-excavation sediment elevation and compared with post-excavation sediment elevation to estimate the depth of sediment removed.

Sediment excavation in each access area was initiated at the most upstream point of contamination in that access area and continued down river to the end of that access area. Inflatable dams (Photo #6) or earthern dams were installed upstream and downstream of multiple work areas. Inflatable dams were used during most of the sediment removal activities because of the ease and speed in installing and removing them. River flow was maintained by diverting river water from the upstream dam to the downstream dam using by-pass lines/hoses. River water trapped between the dams was pumped into a frac tank for temporary

storage, treated, and discharged back to the LMR channel outside the dewatered area. Once the channel between the dams was dewatered, excavation activities commenced. The water accumulated due to runoff, groundwater seepage, and leakage around the dams was also pumped into a frac tank for temporary storage and treatment prior to discharge outside the dewatered area. Water stored in the frac tanks was treated using fabric filters, a sand filter, and/or an activated carbon filtration system. Contaminated sediments were excavated with a backhoe excavator from the work areas (Photo #7), loaded onto the trucks (Photo #8), and transported to a sediment dewatering pad (Photo #9). Even though the work areas were dewatered as much as possible, the removed sediment still contained some water. To keep this water from leaking from the sediments during transportation, the excavated sediments were mixed with wood chips or saw dust during excavation and at the sediment dewatering pad (Photo #10) before loading them onto the 20-cubic yard trucks to landfill. Dry sediment was shipped to Waste Management's Orchard Ridge Landfill located in Menomonee Falls, WI.

Silver Spring Access Area

Site set-up activities were conducted from August 18, 2009 until August 29, 2009 in the Silver Spring Access area. A job site trailer and support area was set up on a pre-existing paved area off of Silver Spring Road near the intersection of Silver Spring Drive and Silver Spring Road. A sediment dewatering pad was constructed near the trailer area along Silver Spring Drive with gravel, geofabric and clean soil. An orange snow fence was installed along the Silver Spring Drive from around the site trailer area to the Little Menomonee River to discourage unauthorized access into the work areas. Silt fence was installed inside the orange snow fence (Photo #1) to keep the work area free from a local threatened and endangered species: the Butler Garter Snake. Trees and brush were cleared for an access road to support heavy vehicle access in and out of the work areas (Photo #2). Branches and logs were turned into wood chips using wood chippers (Photo #3). The woods chips were stored at the site and later mixed with excavated sediments to absorb free water in the sediments. After clearing the trees, the ground surface was graded; Geofabric material was placed on the ground surface; and then gravel was placed on top of the Geofabric material to construct the access roads. A silt barrier was installed along the access road from the trailer area up to the river to prevent gravel or silt run-off to the wetland areas. The access road was constructed from the trailer area at the Silver Spring Road to the LMR and then northwards to the CSX rail road. The access road was constructed on the west side of the Little Menomonee River between the river and wetland areas. Culverts and drainage points were constructed across the access road for placement of the water by-pass lines and to allow storm water to drain from the wetland areas to the river

without hindering the heavy vehicle traffic along the access road. ERRS constructed two gravel pads adjacent to the access road to stage the frac tanks and water filtration systems (Photo #4 and Photo #5).

Sediment excavation activities at Silver Spring access area began on August 31, 2009 and were completed on October 9, 2009. Excavation started from Work Area #5 and continued through work area #13. Excavation was conducted with a backhoe excavator in work areas #5 through #12. In these work areas the backhoe excavator was used to remove the sediments and transfer them to 5-cubic yard, tracked haul trucks, which then transported them to the dewatering pad. At work area #13 underneath the Silver Spring Drive bridge, the backhoe excavator was not used because of low clearance between the bottom of the bridge and the sediment surface. Sediment removal in this work area was completed using a combination of vacuum extraction using a Vacuum truck (Photo #11) and removal with mini-excavators. The vacuum extraction operation involved manual excavation of contaminated sediments with shovels and removal of the loose sediments through hoses attached to a negative pressure vacuum truck. Once the vacuum truck was filled with sediment, the vacuum truck dumped the wet sediment at the sediment dewatering pad for drying with wood chips and saw dust. Due to the slower than expected pace of the vacuum extraction operation, mini-excavators were brought in and used to move some of the sediments from beneath the bridge to an area outside the bridge where a larger back hoe excavator transferred the sediment and loaded on to the 5-cubic yard haul trucks for transport to the dewatering pad. All work areas were excavated to the planned depths in the Work Plan prepared by Tronox. If the confirmation sediment survey conducted by START did not verify that the sediments in part of a work area had been excavated to the planned depth, that part was re-excavated and resurveyed to confirm the target depth had been achieved. Figures B-3 through B-5 in Appendix B show the sediment survey points and actual excavated depths for work areas #5 through #13. Table 1 shows the actual depth of excavation and actual sediment volume removed for all work areas.

107th Street Access Area

U.S. EPA obtained access approval from the City of Milwaukee across the City sidewalk and right-of-way and established an access point-of-entry for site vehicles from North 107th Street to the 107th Street access area. Site set-up activities in 107th Street access area were conducted from August 03, 2009 until September 09, 2009. A snow fence was installed along the 107th Street to discourage unauthorized access into the work area. A silt fence was installed inside the orange snow fence to try to keep the work area free of the endangered Butler Garter Snake. A sediment dewatering pad and staging pad for frac tanks storage was constructed at the 107th Street access area (Photo #9 and Photo #10) with gravel, geofabric

and clean soil. Trees and brush were cleared for an access road to allow heavy vehicle travel to and along the river from Silver Spring Drive bridge to the southern (most downstream) end of this remedial action. Cut branches and logs were turned into wood chips. After clearing the trees and brush along the river, the ground surface was graded but no gravel layer was constructed. Culverts and drainage points were constructed across the access road to allow surface drainage across the road to the river. A hydrophobic adsorbent boom and a silt curtain were installed across the river downstream of the southernmost work area. The boom was installed to minimize the possible migration of floating petroleum product released into the water during site remedial activities. The silt curtain was installed to help prevent siltation of the down river channel.

Excavation activities at 107th Street access area began on September 10, 2009 and were completed on September 23, 2009. Excavation started from Work Area #14 at Silver Spring access area and continued to work area #20. Excavation was conducted with a backhoe excavator in all work areas at 107th Street access area. Excavated sediments were transported to the sediment dewatering pad; mixed with wood chips and saw dust; and stockpiled temporarily prior to shipping the dried sediments to the landfill. All the work areas were excavated up to a depth indicated in the work plan. A confirmation survey was conducted by START to verify that the sediments had been excavated up to the planned depths (Photo #12). Figures B-5 through B-6 in Appendix B show the sediment survey points and actual excavated depths for work areas #13 through #20. Table 1 shows the actual depth of excavation and actual sediment volume removed for all work areas.

Appleton Avenue Access Area

Trees and brush were cleared to create an access road for heavy vehicles into and out of the work areas from Little Menomonee Parkway. Branches and logs were turned into wood chips. After clearing the trees and brush, the ground surface was graded; Geofabric material was placed on the ground surface; and then gravel was placed on top of the Geofabric material to construct the access roads. A silt barrier was installed along the access road from the Little Menomonee Parkway up to the river at work area #2[1] to minimize gravel or silt run-off to the storm water drainage ditch. The access road was constructed from the Little Menomonee Parkway to the LMR and along the river for approximately 300 feet down river towards work area #3. The access road was constructed on the west side of the Little Menomonee River between the river and wetland areas. A culvert was constructed across the access road from the ditch to

[1] Note: the work areas in the Appleton Avenue access area were numbered out of sequence in the Work Plan. Work area #2 is the northernmost or first work area. It is followed by work areas 3, 1, and 4.

the river to allow storm water to drain across the access road to the river without hindering the heavy vehicle traffic along the access road. At the Appleton Avenue bridge (work area #1) heavy vehicle access ramps were constructed on both sides of the Appleton Avenue bridge from Appleton Avenue to the river with clean soil, geofabric and gravel. An elevated river bank was leveled at work area #4 and an access road was built from the bike trail to the work area with clean soil, geofabric and gravel.

Excavation activities at the Appleton Avenue access area began on October 13, 2009 and were completed on November 19, 2009. Excavation started from Work Area #2 and continued until work area #4. Excavation was conducted using vacuum removal in work areas #2 and #3. At work area #1 underneath the Appleton Avenue Bridge, a regular backhoe excavator was not used due to the low clearance between the bottom of the bridge and the sediment surface. Sediment removal was conducted using a combination of vacuum removal and mini-excavators as was done at work area #13. Excavation was conducted with a backhoe excavator in work area #4. The sediments removed from the Appleton Avenue access area were transported to the sediment dewatering pad at the Silver Spring Access area for drying with wood chips and saw dust prior to transport to the landfill.

In addition to the use of inflatable dams, earthern dams were used in the Appleton Avenue access area towards the end of the project after most of the inflatable dams became inoperable due to wear and tear caused by frequent site use. All the work areas were excavated down to or beyond the depth planned in the work plan. A confirmation sediment survey was conducted by START to verify that the sediments were excavated up to the planned depths. Figures B-1 and B-2 in Appendix B show the sediment survey points and actual excavated depths for work areas #1 through #4. Table 1 shows the actual depth of excavation and actual sediment volume removed for all work areas.

Sediment contaminated with free-product creosote was found south of the Appleton Avenue Bridge out of the boundaries of work area #1. This odorous, dark sediment (Photo #13) was not identified during previous investigations conducted by the PRP, Tronox. These stained sediments were excavated up to 4 feet depths until a layer of natural clay or odorless sediment was exposed. U.S. EPA conducted removal of these contaminated sediments from the channel between work area #1 and work area #4. This additional sediment removal resulted in a significant increase in actual sediment volume removed in work areas #1 and #4 compared to the original estimated volume proposed in the work plan by the PRP.

Rainfall events in August and late September and October delayed work activities on more than one occasion. These delays usually required interruptions in excavating activities for several days at a time

due to the time required to allow river flow to return to a manageable volume and to reinstall the dams and dewater the work areas. Collectively these delays amounted to about 3 to 4 weeks of lost time, and became particularly frequent in October.

TABLE 1
SEDIMENT SURVEY RESULTS
MOSS AMERICAN SUPERFUND SITE,
107th STREET ACCESS AREA
REACH 4/5 –LITTLE MENOMONEE RIVER
MILWAUKEE, MILWAUKEE COUNTY, WISCONSIN

Work Area #	Estimated Volume to be removed as per Work Plan (in Cubic Yards)				Average Depth of excavation (in feet)			Actual Sediment Volume* that was removed by U.S EPA (in Cubic Yards)
	0-6"	6-15"	15-24"	Work Area Total	0-6"	6-15"	15-24"	
1	122.7	170.7	110.2	403.6	0.73	1.01	0.93	1286.7
2	15.6	6.9	-	22.5	0.83	1.40		39.8
3	11.3	16.9	-	28.2	0.50	0.91		32.7
4	36.6	20.9	-	57.5	1.40	0.84		610.8
5	31.8	-	-	31.8	0.86	-		56.0
6	5.8	-	-	5.8	0.75	-		9.0
7	41.3	55.4	2.4	99.1	0.72	1.03	0.75	142.3
8	85.0	-	-	85.0	1.15			202.1
9	124.7	94.4	-	219.1	0.88	1.40		407.6
10	87.2	24.6	-	111.8	1.20	1.12		253.8
11	98.5	4.3	-	102.8	1.25	1.24		260.2
12	65.0	31.5	-	96.5	0.89	1.01		163.3
13	298.0	156.3	-	454.3	0.80	1.04		715.5
14	65.7	13.8	-	79.5	0.77	0.72		117.7
15	39.2	25.4	-	64.6	0.62	1.32		96.3
16	77.8	25.0	-	102.8	0.76	1.20		162.6
17	105.5	42.1	-	147.6	0.87	1.01		247.7
18	120.4	75.3	-	195.7	0.83	0.82		289.6
19	99.8	-	-	99.8	1.25			258.0
20	79.2	-	-	79.2	1.01			164.7
TOTAL	1611.1	763.5	112.6	**2487.2**	0.90	1.07	0.84	**5516.6**

Sediment survey was conducted by OTIE, START contractor for Region 5 U.S. EPA.

Restoration Activities

Following excavation in the channel, the equipment used for excavation, hauling, and bypass pumping was moved out of the work areas and then restoration was initiated. The disturbed areas of the river banks were graded and sloped back to the original conditions. A coconut fiber, or "coir," mat was used in areas between the bottom of the channel and the top of the restored bank where the water was in contact with the soil (Photo #16). The coir mat is a woven blanket of coconut fibers that is completely biodegradable and 100% natural. The woven structure eliminates wildlife entrapment and allows planting directly into the soil through the blanket without cutting it. Gravel, geofabric and soil were removed from the access roads (Photo #15) and shipped off for recycling to Orchard Ridge Landfill. After the access roads were completely removed, the areas along the river were graded, tilled and seeded with native seed mix and covered with coir or hay over the seeds for erosion control. All disturbed upland areas away from the river were graded, tilled and then covered with hay . Rip-rap (#4 rock) was placed around the footings of bridges on Silver Spring Drive and Appleton Avenue to minimize erosion around the footings (Photo #17). Rip-rap was also placed in the areas were culverts and drainage points were constructed during this remedial action for erosion control and bank stabilization and left in place following restoration. Soil, gravel and geofabric from the sediment dewatering pads were mixed with contaminated soil and shipped off to the landfill as non-hazardous special waste. Silt fence and orange fences were removed and shipped off to a landfill on a roll-off box. All restoration activities were completed on December 5, 2009. Kemron, START and all equipment and other materials were demobilized from the site during the week of December 6th, 2009.

Summary

Contaminated sediments were excavated from previously delineated areas in an approximately 4,800 feet stretch of Little Menomonee River in the Reach 4 and 5 segments of the project. Excavated sediments were mixed with wood chips and saw dust and the dried sediment was transported to and disposed of at the Waste Management Orchard Ridge Landfill in Menomonee Falls, WI, a nearby Subtitle D landfill. A total of 7,723 tons (approximately 5,516 cubic yards) of non-hazardous sediment was shipped from Moss American Site during this remedial action as non-hazardous special waste to the Orchard Ridge Landfill. The remedial action began on July 31, 2009 with a site walkthrough. The field activities were completed on December 5, 2009. ERRS , START, and equipment demobilization was completed during the week of December 06, 2009.

If you have any questions or comments regarding this letter report or require any additional information, please call me at (312) 220-7000 or send an e-mail to nbabu@otie.com.

Sincerely,

Naren Babu
Project Manager, STN Environmental JV

Appendix A Photographic Log

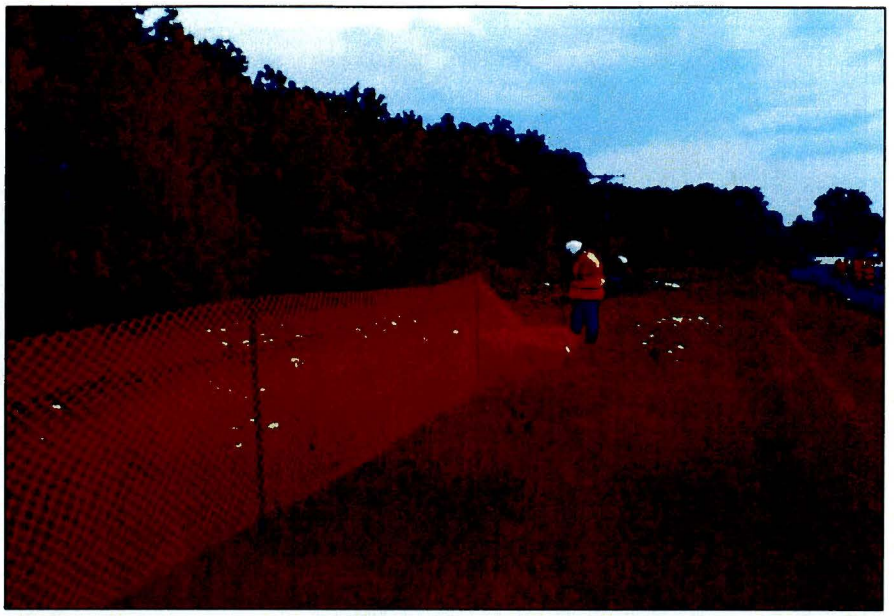
cc: Gail Stanuch, EPA START Project Officer
Raghu Nagam, STN START Program Manager

APPENDIX B

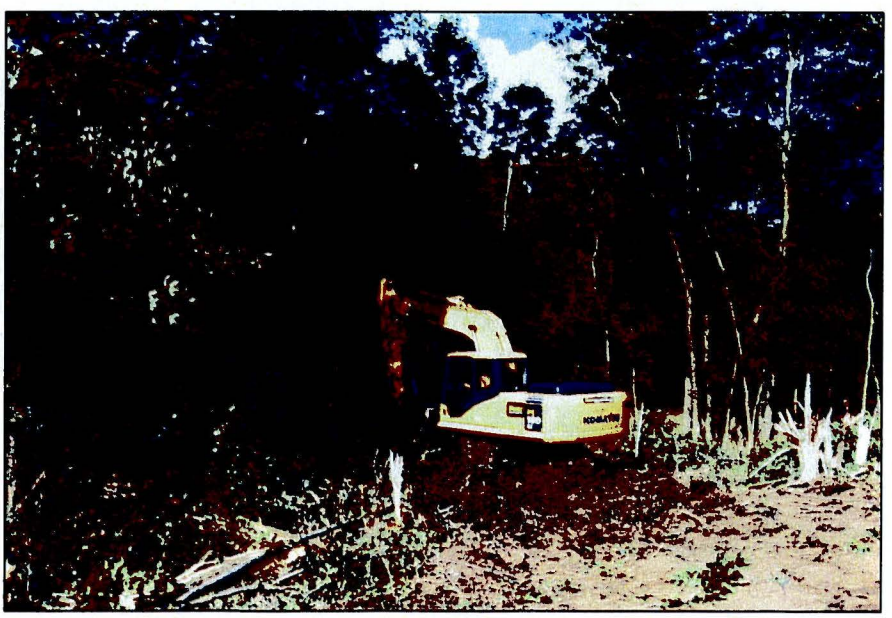
SEDIMENT SURVEY MAPS

(6 Pages)

Moss American Site
Milwaukee, Wisconsin
Removal Action Letter Report



Photograph No.: 1 **Photographer:** Naren Babu **Date:** 8/03/2009
Subject: General view of Snow fence along Silver Spring drive. Silt fence for endangered snake protection can bee seen inside the snow fence.

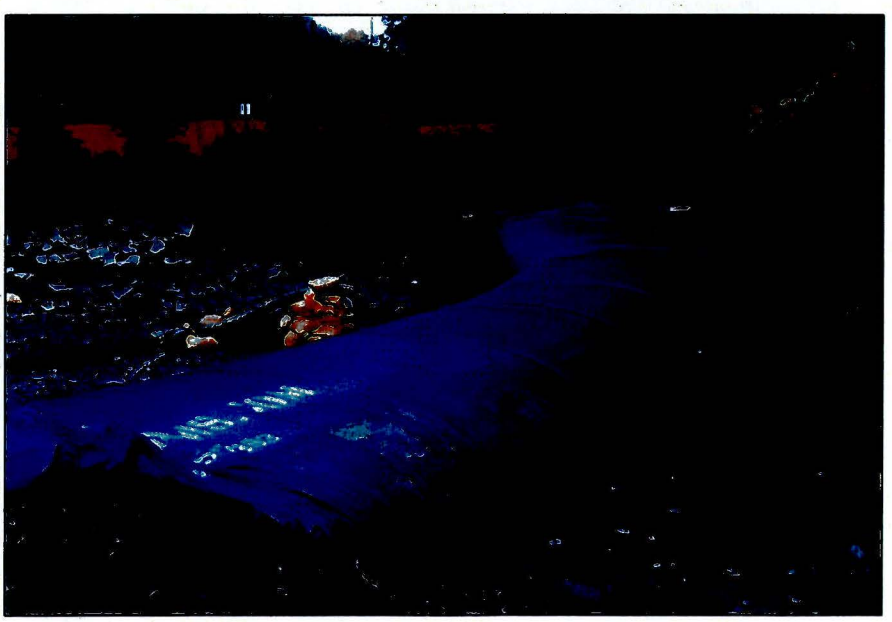


Photograph No.: 2 **Photographer:** Troy Thompson **Date:** 8/10/2009
Subject: ERRS clearing the trees with a back hoe for access roads.

Photograph No.: 3 **Photographer:** Troy Thompson **Date:** 8/13/2009
Subject: General view of the Wood Chipper and Wood chips.

Photograph No.: 4 **Photographer:** Troy Thompson **Date:** 8/15/2009
Subject: for pumps was constructed with soil, gravel and geofabric along the Little
ɜ river at Silver Spring Access area.

Photograph No.: 5 **Photographer:** Troy Thompson **Date:** 8/24/2009
Subject: General view of Frac tank and water treatment equipment on the staging pad.



Photograph No.: 6 **Photographer:** Troy Thompson **Date:** 08/25/2009
Subject: View of the water inflatable dam installed in the Little Menomonee River.

Photograph No.: 7 **Photographer:** Naren Babu **Date:** 09/11/2009
Subject: Excavator removing contaminated sediments from the river at the southern segment of Reach 4/5.

Photograph No.: 8 **Photographer:** Naren Babu **Date:** 9/10/2009
Subject: Back Hoe loading 5cubic yard truck with sediments from Work Area #8.

Photograph No.: 9 **Photographer:** Naren Babu **Date:** 9/11/2009
Subject: 5 cubic yard truck unloading sediments at the sediment dewatering pad on 107th Street access area.

Photograph No.: 10 **Photographer:** Naren Babu **Date:** 9/11/2009
Subject: Back Hoe mixing the sediments with saw dust at the sediment dewatering pad on 107th Street access area.

Photograph No.: 11 **Photographer:** Troy Thompson **Date:** 9/17/2009
Subject: ERRS removing sediments with Vacuum hoses at Work Area #13 under Silver Spring Drive Bridge.

Photograph No.: 12 **Photographer:** Sheila Sullivan **Date:** 9/22/2009
Subject: START conducting confirmation sediment survey at Work Area #17 in 107th Street access area.

Photograph No.: 13 **Photographer:** Naren Babu **Date:** 11/13/2009
Subject: View of the dark sediments with oily Sheen and odor found south of the Appleton Avenue Bridge.

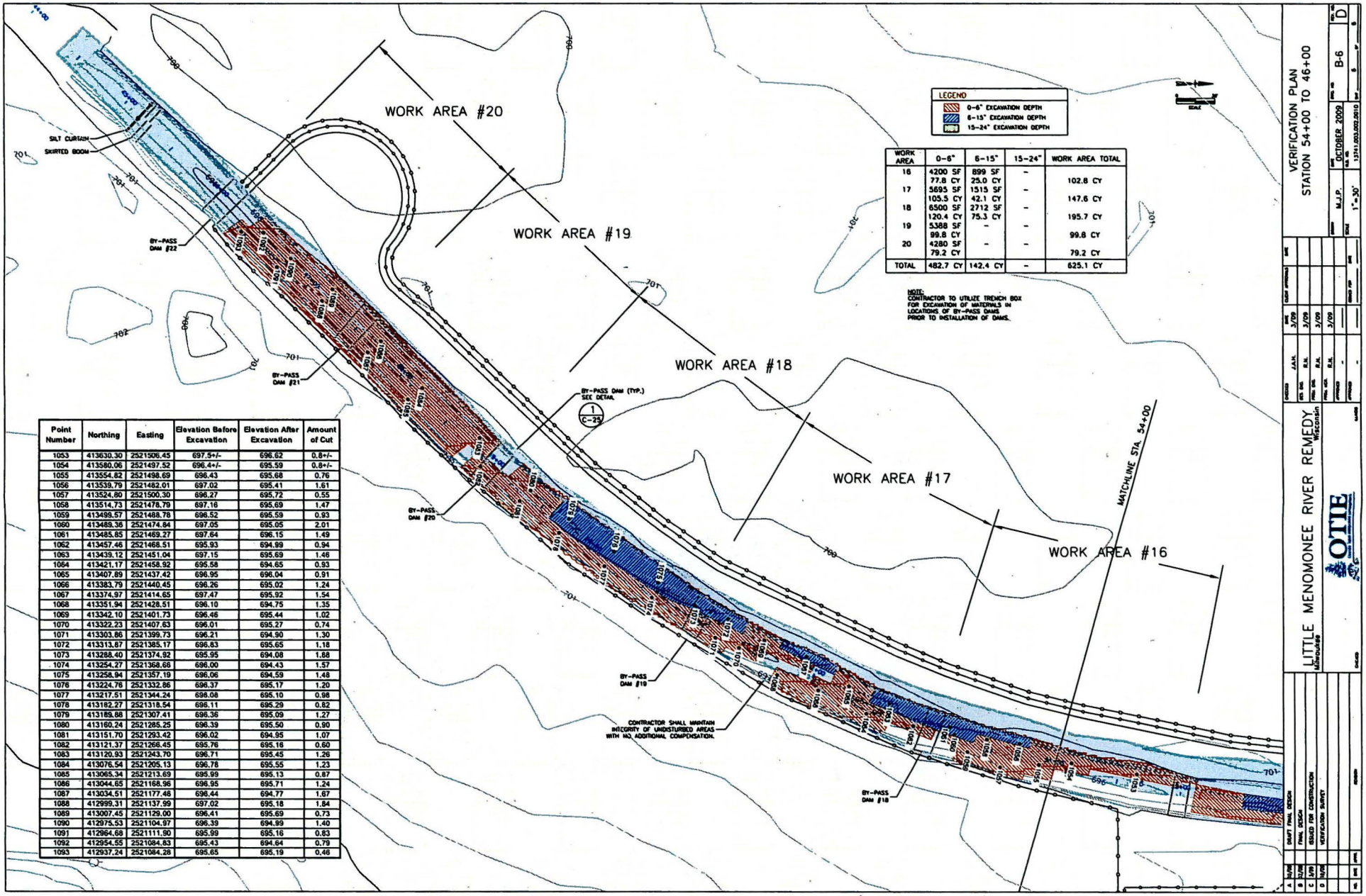
Photograph No.: 14 **Photographer:** Naren Babu **Date:** 11/10/2009
Subject: Excavator removing contaminated sediments underneath Appleton Avenue bridge.

Photograph No.: 15 **Photographer:** Naren Babu **Date:** 9/29/2009
Subject: Back Hoe removing gravel and geofabric liner from access roads.

Photograph No.: 16 **Photographer:** Troy Thompson **Date:** 10/28/2009
Subject: Disturbed areas along the river banks were seeded and erosion control mats were placed along the banks. Hay mulch was placed on the upland areas.

Photograph No.: 17 **Photographer:** Naren Babu **Date:** 11/17/2009
Subject: Rip raps were placed around the footings of the bridges for stabilization and erosion control.

Photograph No.: 18 **Photographer:** Troy Thompson **Date:** 11/20/2009
Subject: View of grass coming up from seeded areas along the river in 107th Street Access area.



WORK AREA	0-6"	6-15"	15-24"	WORK AREA TOTAL
16	4200 SF	899 SF	-	
	77.8 CY	25.0 CY	-	102.8 CY
17	5695 SF	1515 SF	-	
	105.5 CY	42.1 CY	-	147.6 CY
18	6500 SF	2712 SF	-	
	120.4 CY	75.3 CY	-	195.7 CY
19	5388 SF	-	-	
	99.8 CY	-	-	99.8 CY
20	4280 SF	-	-	
	79.2 CY	-	-	79.2 CY
TOTAL	482.7 CY	142.4 CY	-	625.1 CY

NOTE:
CONTRACTOR TO UTILIZE TRENCH BOX FOR EXCAVATION OF MATERIALS IN LOCATIONS OF BY-PASS DAMS PRIOR TO INSTALLATION OF DAMS.

Point Number	Northing	Easting	Elevation Before Excavation	Elevation After Excavation	Amount of Cut
1053	413630.30	2521506.45	697.5+/-	696.62	0.8+/-
1054	413580.06	2521497.52	696.4+/-	695.59	0.8+/-
1055	413554.82	2521498.69	696.43	695.68	0.76
1056	413539.79	2521482.01	697.02	695.41	1.61
1057	413524.80	2521500.30	696.27	695.72	0.55
1058	413514.73	2521478.79	697.16	695.69	1.47
1059	413499.57	2521488.78	696.52	695.59	0.93
1060	413489.36	2521474.84	697.05	695.05	2.01
1061	413485.85	2521469.27	697.64	696.15	1.49
1062	413457.46	2521468.51	695.93	694.99	0.94
1063	413439.12	2521451.04	697.15	695.69	1.46
1064	413421.17	2521458.92	695.58	694.65	0.93
1065	413407.89	2521437.42	696.95	696.04	0.91
1066	413383.79	2521440.45	696.26	695.02	1.24
1067	413374.97	2521414.65	697.47	695.92	1.54
1068	413351.94	2521428.51	696.10	694.75	1.35
1069	413342.10	2521401.73	696.46	695.44	1.02
1070	413322.23	2521407.63	696.01	695.27	0.74
1071	413303.86	2521399.73	696.21	694.90	1.30
1072	413313.87	2521385.17	696.83	695.65	1.18
1073	413288.40	2521374.92	695.95	694.08	1.88
1074	413254.27	2521368.66	696.00	694.43	1.57
1075	413258.94	2521357.19	696.06	694.59	1.48
1076	413224.76	2521332.86	696.37	695.17	1.20
1077	413217.51	2521344.24	696.08	695.10	0.98
1078	413182.27	2521318.54	696.11	695.29	0.82
1079	413189.88	2521307.41	696.36	695.09	1.27
1080	413160.24	2521285.25	696.39	695.50	0.90
1081	413151.70	2521293.42	696.02	694.95	1.07
1082	413121.37	2521266.45	695.76	695.16	0.60
1083	413120.93	2521243.70	696.71	695.45	1.26
1084	413076.54	2521205.13	696.78	695.55	1.23
1085	413065.34	2521213.69	695.99	695.13	0.87
1086	413044.65	2521168.96	696.95	695.71	1.24
1087	413034.51	2521177.46	696.44	694.77	1.67
1088	412999.31	2521137.99	697.02	695.18	1.84
1089	413007.45	2521129.00	696.41	695.69	0.73
1090	412975.53	2521104.97	696.39	694.99	1.40
1091	412964.68	2521111.90	695.99	695.16	0.83
1092	412954.55	2521084.83	695.43	694.64	0.79
1093	412937.24	2521084.28	695.65	695.19	0.46

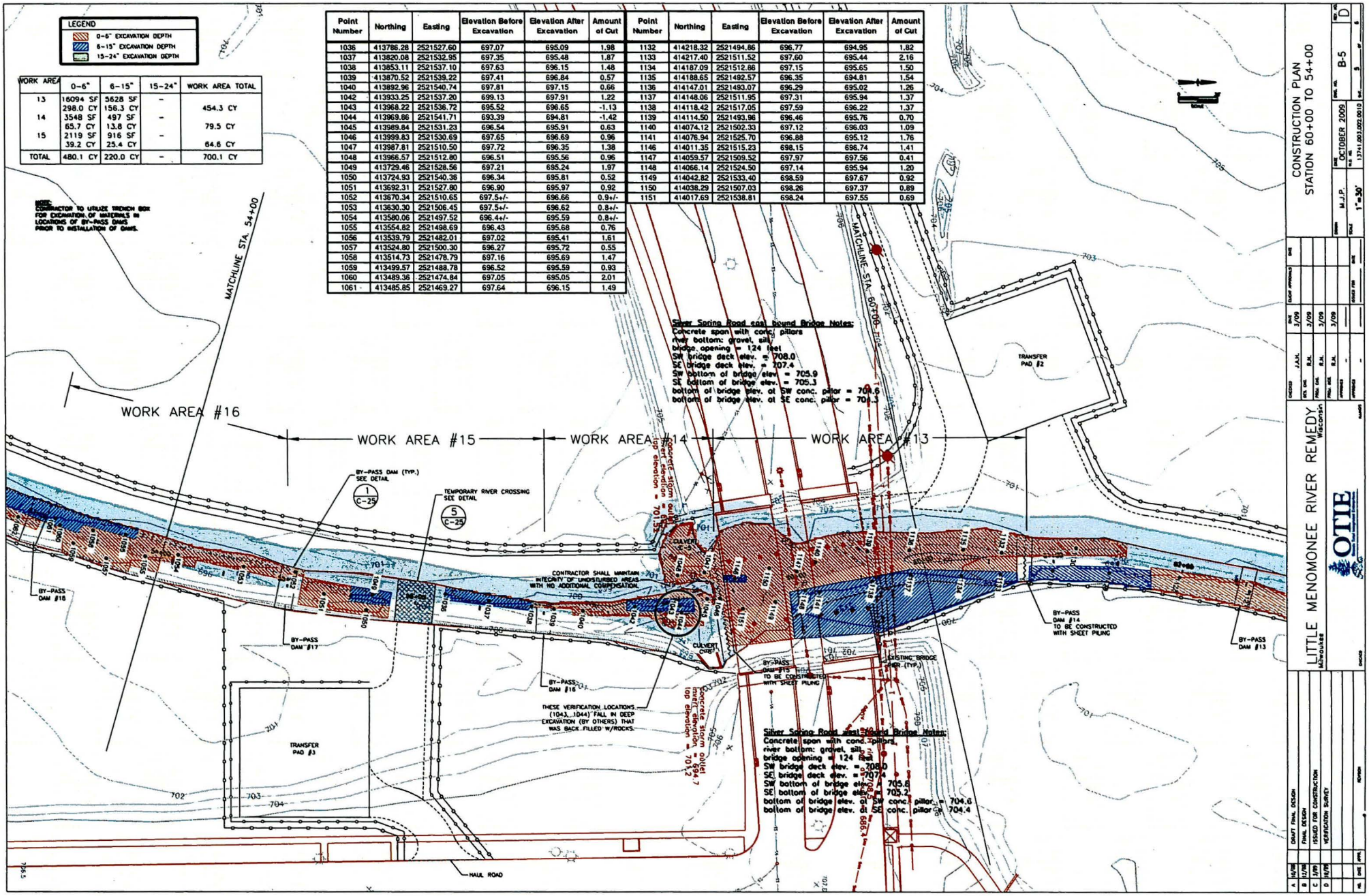
VERIFICATION PLAN
STATION 54+00 TO 46+00

LITTLE MENOMONEE RIVER REMEDY
Milwaukee Wisconsin

OTIE

M.J.P. | OCTOBER 2009 | B-6 | D
SCALE 1"=30'

A NONE DRAFT FINAL DESIGN
B NONE FINAL DESIGN
C NONE ISSUED FOR CONSTRUCTION
D NONE VERIFICATION SURVEY



WORK AREA	0-6"	6-15"	15-24"	WORK AREA TOTAL
13	16094 SF	5628 SF	-	454.3 CY
	298.0 CY	156.3 CY		
14	3548 SF	497 SF	-	79.5 CY
	65.7 CY	13.8 CY		
15	2119 SF	916 SF	-	84.6 CY
	39.2 CY	25.4 CY		
TOTAL	480.1 CY	220.0 CY	-	700.1 CY

Point Number	Northing	Easting	Elevation Before Excavation	Elevation After Excavation	Amount of Cut
1036	413786.28	2521527.60	697.07	695.09	1.98
1037	413820.08	2521532.95	697.35	695.48	1.87
1038	413853.11	2521537.10	697.63	696.15	1.48
1039	413870.52	2521539.22	697.41	696.84	0.57
1040	413892.96	2521540.74	697.81	697.15	0.66
1042	413933.25	2521537.20	699.13	697.91	1.22
1043	413968.22	2521536.72	695.52	696.65	-1.13
1044	413969.86	2521541.71	693.39	694.81	-1.42
1045	413989.84	2521531.23	696.54	695.91	0.63
1046	413999.83	2521530.69	697.65	696.69	0.96
1047	413987.81	2521510.50	697.72	696.35	1.38
1048	413966.57	2521512.80	696.51	695.56	0.96
1049	413729.46	2521528.56	697.21	695.24	1.97
1050	413724.93	2521540.36	696.34	695.81	0.52
1051	413698.29	2521527.80	696.90	695.97	0.92
1052	413670.34	2521510.65	697.5+/-	696.66	0.9+/-
1053	413630.30	2521506.45	697.5+/-	696.62	0.8+/-
1054	413580.06	2521497.52	696.4+/-	695.59	0.8+/-
1055	413554.82	2521498.69	696.43	695.68	0.76
1056	413539.79	2521482.01	697.02	695.41	1.61
1057	413524.80	2521500.30	696.27	695.72	0.55
1058	413514.73	2521478.79	697.16	695.69	1.47
1059	413499.57	2521488.78	696.52	695.59	0.93
1060	413489.36	2521474.84	697.05	695.05	2.01
1061	413485.85	2521469.27	697.64	696.15	1.49

Point Number	Northing	Easting	Elevation Before Excavation	Elevation After Excavation	Amount of Cut
1132	414218.32	2521494.86	696.77	694.95	1.82
1133	414217.40	2521511.52	697.60	695.44	2.16
1134	414187.09	2521512.86	697.15	695.65	1.50
1135	414188.65	2521492.57	696.35	694.81	1.54
1136	414147.01	2521493.07	696.29	695.02	1.26
1137	414148.06	2521511.95	697.31	695.94	1.37
1138	414118.42	2521517.05	697.59	696.22	1.37
1139	414114.50	2521493.96	696.46	695.76	0.70
1140	414074.12	2521502.33	697.12	696.03	1.09
1141	414076.94	2521525.70	696.88	695.12	1.76
1146	414011.35	2521515.23	698.15	696.74	1.41
1147	414059.57	2521509.52	697.97	697.56	0.41
1148	414066.14	2521524.50	697.14	695.94	1.20
1149	414042.82	2521533.40	698.59	697.67	0.92
1150	414038.29	2521507.03	698.26	697.37	0.89
1151	414017.69	2521538.81	698.24	697.55	0.69

NOTE: CONTRACTOR TO UTILIZE TRENCH BOX FOR EXCAVATION OF MATERIALS IN LOCATIONS OF BY-PASS DAMS PRIOR TO INSTALLATION OF DAMS.

CONSTRUCTION PLAN
STATION 60+00 TO 54+00

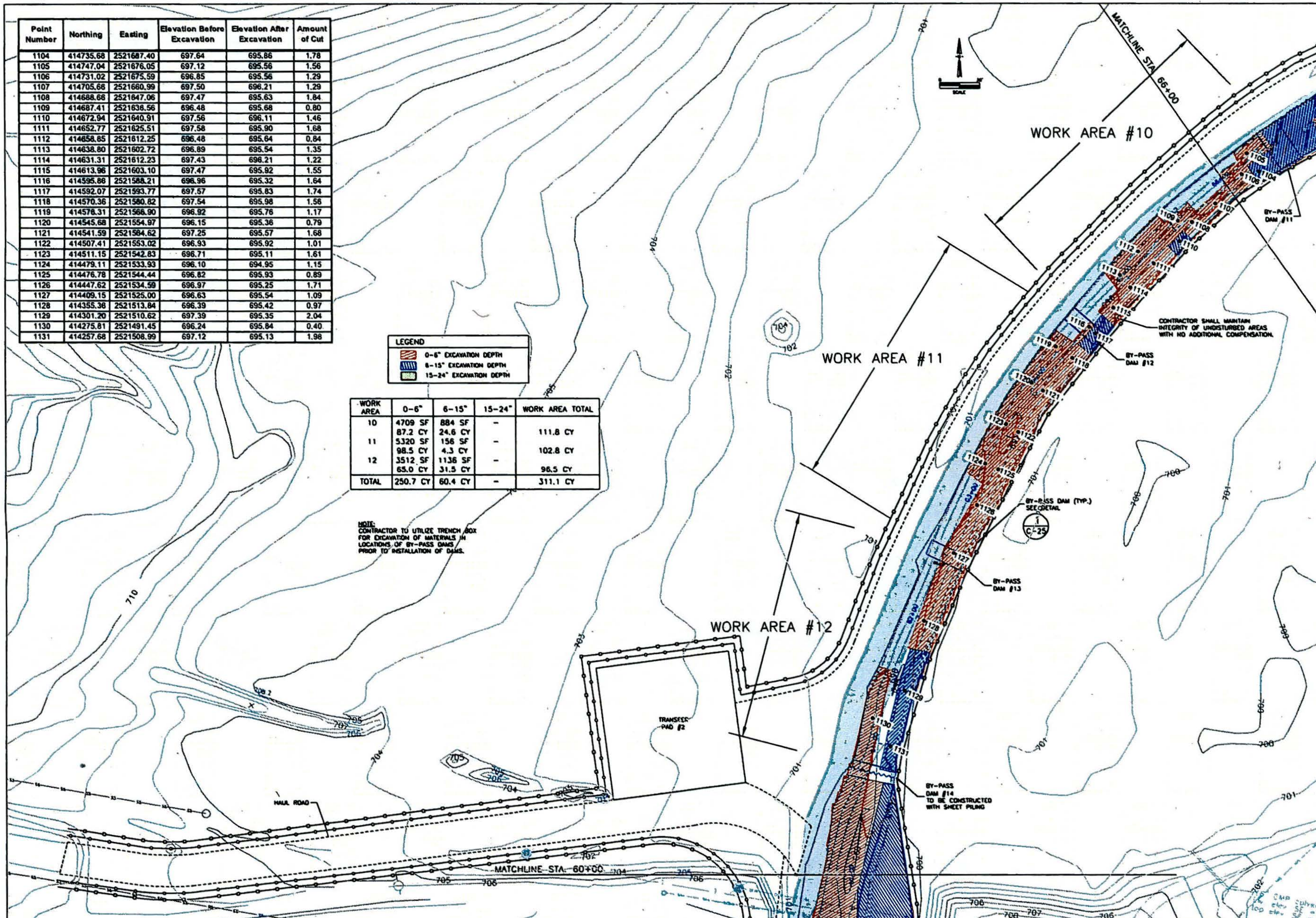
DRAWN M.J.P. | DATE OCTOBER 2009 | DWG. NO. B-5 | REV. NO. D
SCALE 1"=50' | W.A. # 1374.1.003.002.0010 | SHT. 5 OF 6

CHECKED J.A.H. 3/09 | DESIGN ENG. R.H. 3/09 | PROJ. ENG. R.H. 3/09 | PROJ. MGR. R.H. 3/09
APPROVED - | APPROVED - | APPROVED - | APPROVED -

LITTLE MENOMONEE RIVER REMEDY
Milwaukee WISCONSIN

OTIE

REVISION	DATE	APPR.
A	10/08	DRAFT FINAL DESIGN
B	12/08	FINAL DESIGN
C	3/09	ISSUED FOR CONSTRUCTION
D	10/09	VERIFICATION SURVEY



Point Number	Northing	Easting	Elevation Before Excavation	Elevation After Excavation	Amount of Cut
1104	414735.68	2521687.40	697.64	695.86	1.78
1105	414747.04	2521676.05	697.12	695.56	1.56
1106	414731.02	2521675.59	696.85	695.56	1.29
1107	414705.66	2521660.99	697.50	696.21	1.29
1108	414688.66	2521647.06	697.47	695.63	1.84
1109	414687.41	2521636.56	696.48	695.68	0.80
1110	414672.94	2521640.91	697.56	696.11	1.46
1111	414652.77	2521625.51	697.58	695.90	1.68
1112	414658.85	2521612.25	696.48	695.64	0.84
1113	414638.80	2521602.72	696.89	695.54	1.35
1114	414631.31	2521612.23	697.43	696.21	1.22
1115	414613.96	2521603.10	697.47	695.92	1.55
1116	414595.86	2521588.21	696.96	695.32	1.64
1117	414592.07	2521593.77	697.57	695.83	1.74
1118	414570.36	2521580.82	697.54	695.98	1.56
1119	414576.31	2521566.90	696.92	695.76	1.17
1120	414545.68	2521554.97	696.15	695.36	0.79
1121	414541.59	2521564.62	697.25	695.57	1.68
1122	414507.41	2521553.02	696.93	695.92	1.01
1123	414511.15	2521542.83	696.71	695.11	1.61
1124	414479.11	2521533.93	696.10	694.95	1.15
1125	414476.78	2521544.44	696.82	695.93	0.89
1126	414447.62	2521534.59	696.97	695.25	1.71
1127	414409.15	2521525.00	696.63	695.54	1.09
1128	414355.36	2521513.84	696.39	695.42	0.97
1129	414301.20	2521510.62	697.39	695.35	2.04
1130	414275.81	2521491.45	696.24	695.84	0.40
1131	414257.68	2521508.99	697.12	695.13	1.98

LEGEND

- 0-6" EXCAVATION DEPTH
- 6-15" EXCAVATION DEPTH
- 15-24" EXCAVATION DEPTH

WORK AREA	0-6"	6-15"	15-24"	WORK AREA TOTAL
10	4709 SF	884 SF	-	
	87.2 CY	24.6 CY		111.8 CY
11	5320 SF	156 SF	-	
	98.5 CY	4.3 CY		102.8 CY
12	3512 SF	1136 SF	-	
	65.0 CY	31.5 CY		96.5 CY
TOTAL	250.7 CY	60.4 CY	-	311.1 CY

NOTE:
CONTRACTOR TO UTILIZE TRENCH BOX FOR EXCAVATION OF MATERIALS IN LOCATIONS OF BY-PASS DAMS PRIOR TO INSTALLATION OF DAMS.

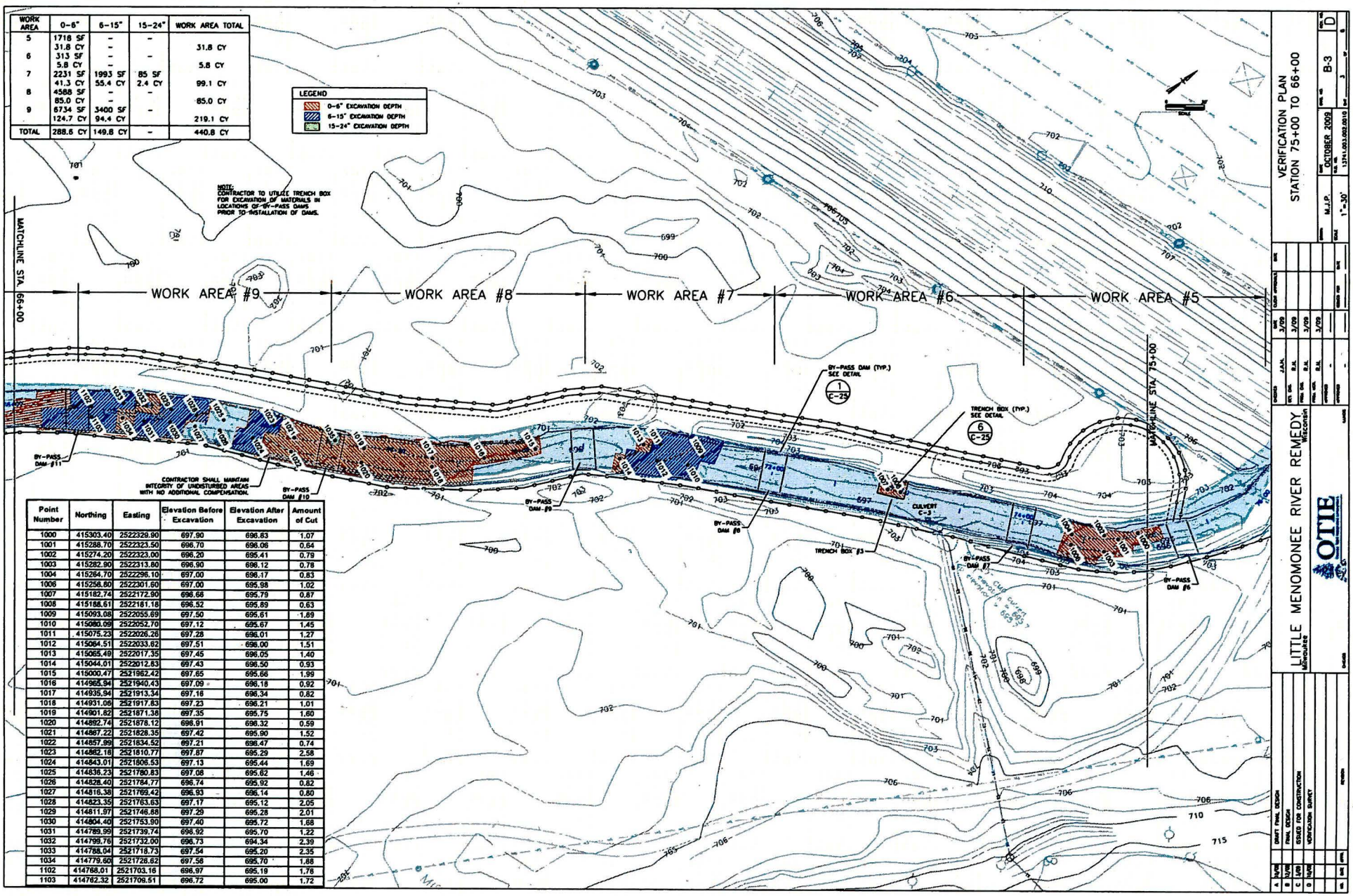
A	10/08	DRAFT FINAL DESIGN
B	12/08	FINAL DESIGN
C	3/09	ISSUED FOR CONSTRUCTION
D	10/09	VERIFICATION SURVEY

LITTLE MENOMONEE RIVER REMEDY
Milwaukee Wisconsin

OTIE

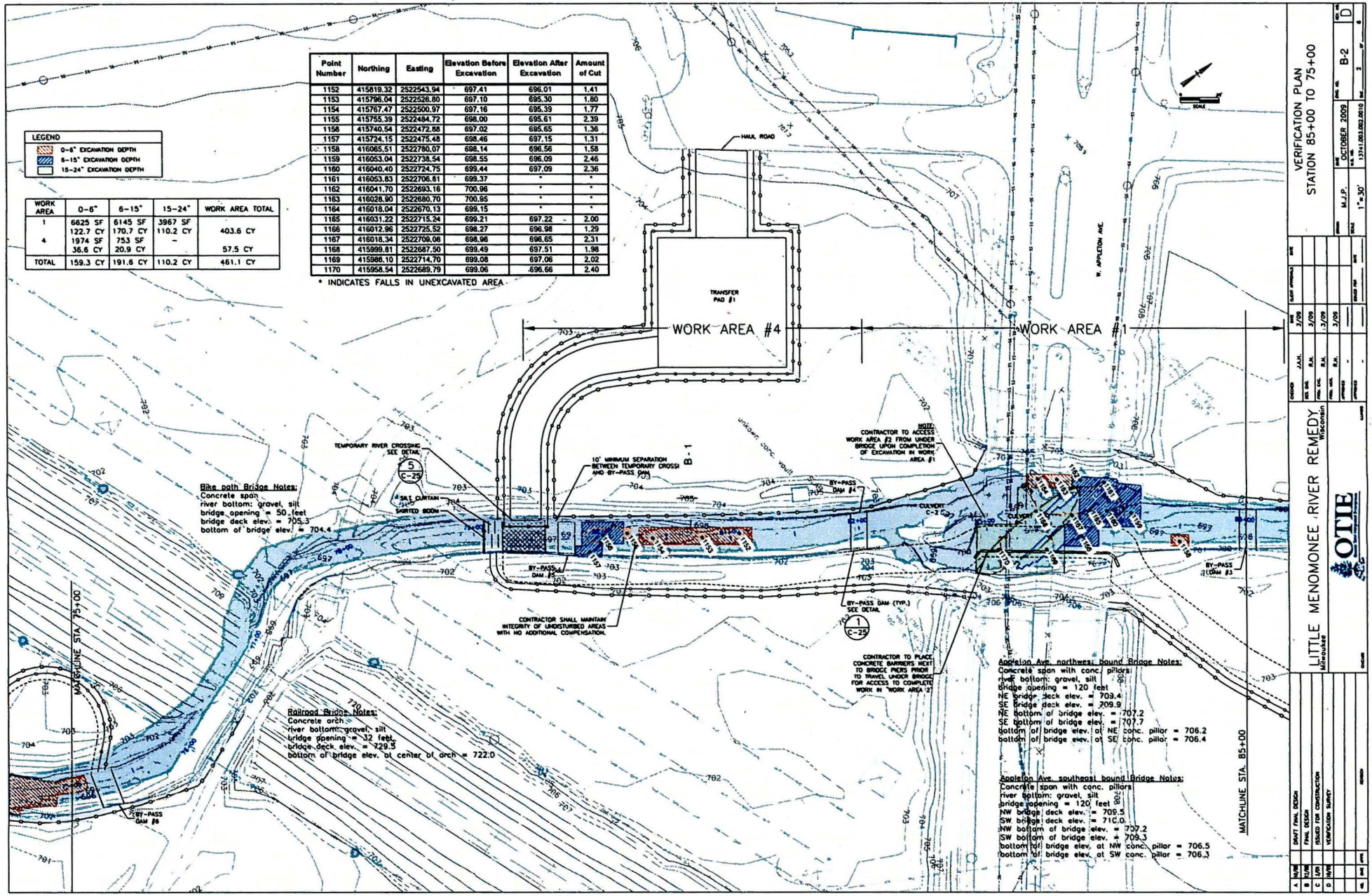
VERIFICATION PLAN
STATION 66+00 TO 60+00

M.J.P. — OCTOBER 2009 — 1"=30' — B-4 — D



WORK AREA	0-6"	6-15"	15-24"	WORK AREA TOTAL
5	1718 SF	-	-	31.8 CY
	31.8 CY	-	-	
6	313 SF	-	-	5.8 CY
	5.8 CY	-	-	
7	2231 SF	1993 SF	85 SF	99.1 CY
	41.3 CY	55.4 CY	2.4 CY	
8	4588 SF	-	-	85.0 CY
	85.0 CY	-	-	
9	6734 SF	3400 SF	-	219.1 CY
	124.7 CY	94.4 CY		
TOTAL	288.6 CY	149.8 CY	-	440.8 CY

Point Number	Northing	Easting	Elevation Before Excavation	Elevation After Excavation	Amount of Cut
1000	415303.40	2522328.90	697.90	696.83	1.07
1001	415288.70	2522321.50	696.70	696.06	0.64
1002	415274.20	2522323.00	696.20	695.41	0.79
1003	415282.90	2522313.80	696.90	696.12	0.78
1004	415264.70	2522296.10	697.00	696.17	0.83
1006	415256.80	2522301.60	697.00	695.98	1.02
1007	415182.74	2522172.90	696.68	695.79	0.87
1008	415188.61	2522181.18	696.52	695.89	0.63
1009	415093.08	2522055.69	697.50	695.81	1.69
1010	415080.09	2522052.70	697.12	695.67	1.45
1011	415075.23	2522026.26	697.28	696.01	1.27
1012	415064.51	2522033.62	697.51	696.00	1.51
1013	415065.49	2522017.35	697.45	696.05	1.40
1014	415044.01	2522012.83	697.43	696.50	0.93
1015	415000.47	2521962.42	697.65	695.66	1.99
1016	414965.94	2521940.43	697.09	696.18	0.92
1017	414935.94	2521913.34	697.16	696.34	0.82
1018	414931.06	2521917.83	697.23	696.21	1.01
1019	414901.82	2521871.38	697.35	695.75	1.60
1020	414892.74	2521878.12	696.91	696.32	0.59
1021	414867.22	2521828.35	697.42	695.90	1.52
1022	414857.99	2521834.52	697.21	696.47	0.74
1023	414862.18	2521810.77	697.87	695.29	2.58
1024	414843.01	2521806.53	697.13	695.44	1.69
1025	414836.23	2521780.83	697.08	695.62	1.46
1026	414828.40	2521784.77	696.74	695.92	0.82
1027	414816.38	2521769.42	696.93	696.14	0.80
1028	414823.35	2521763.63	697.17	695.12	2.05
1029	414811.97	2521746.88	697.29	695.28	2.01
1030	414804.40	2521753.90	697.40	695.72	1.68
1031	414789.99	2521739.74	696.92	695.70	1.22
1032	414799.76	2521732.00	696.73	694.34	2.39
1033	414788.04	2521718.73	697.54	695.20	2.35
1034	414779.60	2521728.62	697.58	695.70	1.88
1102	414768.01	2521703.16	696.97	695.19	1.78
1103	414762.32	2521709.51	696.72	695.00	1.72


LEGEND
0-6" EXCAVATION DEPTH
6-15" EXCAVATION DEPTH
15-24" EXCAVATION DEPTH
WORK AREA | 0-6" | 6-15" | 15-24" | WORK AREA TOTAL
1 | 6625 SF | 6145 SF | 3967 SF |
122.7 CY | 170.7 CY | 110.2 CY | 403.6 CY
4 | 1974 SF | 753 SF | - |
36.6 CY | 20.9 CY | | 57.5 CY
TOTAL | 159.3 CY | 191.6 CY | 110.2 CY | 461.1 CY
Point Number | Northing | Easting | Elevation Before Excavation | Elevation After Excavation | Amount of Cut
1152 | 415819.32 | 2522543.94 | 697.41 | 696.01 | 1.41
1153 | 415796.04 | 2522526.80 | 697.10 | 695.30 | 1.80
1154 | 415767.47 | 2522500.97 | 697.16 | 695.39 | 1.77
1155 | 415755.39 | 2522484.72 | 698.00 | 695.61 | 2.39
1156 | 415740.54 | 2522472.88 | 697.02 | 695.65 | 1.36
1157 | 415724.15 | 2522475.48 | 698.46 | 697.15 | 1.31
1158 | 416065.51 | 2522780.07 | 698.14 | 696.56 | 1.58
1159 | 416053.04 | 2522738.54 | 698.55 | 696.09 | 2.46
1160 | 416040.40 | 2522724.75 | 699.44 | 697.09 | 2.36
1161 | 416053.83 | 2522706.81 | 699.37 | * | *
1162 | 416041.70 | 2522693.16 | 700.96 | * | *
1163 | 416028.90 | 2522680.70 | 700.95 | * | *
1164 | 416018.04 | 2522670.13 | 699.15 | * | *
1165 | 416031.22 | 2522715.24 | 699.21 | 697.22 | 2.00
1166 | 416012.96 | 2522725.52 | 698.27 | 696.98 | 1.29
1167 | 416018.34 | 2522709.08 | 698.96 | 696.65 | 2.31
1168 | 415999.81 | 2522687.50 | 699.49 | 697.51 | 1.98
1169 | 415986.10 | 2522714.70 | 699.08 | 697.06 | 2.02
1170 | 415958.54 | 2522689.79 | 699.06 | 696.66 | 2.40
* INDICATES FALLS IN UNEXCAVATED AREA
HAUL ROAD
TRANSFER PAD #1
WORK AREA #4
WORK AREA #1
W. APPLETON AVE.
B-1
TEMPORARY RIVER CROSSING SEE DETAIL 5 C-25
10' MINIMUM SEPARATION BETWEEN TEMPORARY CROSSI AND BY-PASS DAM
BY-PASS DAM #4
BY-PASS DAM #5
BY-PASS DAM #3
BY-PASS DAM #6
BY-PASS DAM (TYP.) SEE DETAIL 1 C-25
CULVERT C-2
unknown conc. vault
NOTE: CONTRACTOR TO ACCESS WORK AREA #2 FROM UNDER BRIDGE UPON COMPLETION OF EXCAVATION IN WORK AREA #1
CONTRACTOR SHALL MAINTAIN INTEGRITY OF UNDISTURBED AREAS WITH NO ADDITIONAL COMPENSATION.
CONTRACTOR TO PLACE CONCRETE BARRIERS NEXT TO BRIDGE PIERS PRIOR TO TRAVEL UNDER BRIDGE FOR ACCESS TO COMPLETE WORK IN WORK AREA 2
MATCHLINE STA. 75+00
MATCHLINE STA. 85+00
Bike path Bridge Notes:
Concrete span
river bottom: gravel, silt
bridge opening = 50 feet
bridge deck elev. = 705.3
bottom of bridge elev. = 704.4
Railroad Bridge Notes:
Concrete arch
river bottom: gravel, silt
bridge opening = 32 feet
bridge deck elev. = 729.5
bottom of bridge elev. at center of arch = 722.0
Appleton Ave. northwest bound Bridge Notes:
Concrete span with conc. pillars
river bottom: gravel, silt
bridge opening = 120 feet
NE bridge deck elev. = 708.4
SE bridge deck elev. = 709.9
NE bottom of bridge elev. = 707.2
SE bottom of bridge elev. = 707.7
bottom of bridge elev. at NE conc. pillar = 706.2
bottom of bridge elev. at SE conc. pillar = 706.4
Appleton Ave. southeast bound Bridge Notes:
Concrete span with conc. pillars
river bottom: gravel, silt
bridge opening = 120 feet
NW bridge deck elev. = 708.5
SW bridge deck elev. = 710.0
NW bottom of bridge elev. = 707.2
SW bottom of bridge elev. = 709.3
bottom of bridge elev. at NW conc. pillar = 706.5
bottom of bridge elev. at SW conc. pillar = 706.3
VERIFICATION PLAN
STATION 85+00 TO 75+00
LITTLE MENOMONEE RIVER REMEDY
Milwaukee Wisconsin
OTIE
M.J.P.
OCTOBER 2009
B-2
1"=30'
1.3741.003.3002.00110
A DRAFT FINAL DESIGN
B FINAL DESIGN
C ISSUED FOR CONSTRUCTION
D VERIFICATION SURVEY