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Evaluating Beneficial Uses of Dredged Material from the Illinois Marine Transportation System

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16. Abstract

This project presents several successful case studies in 15 categories of dredged material along with the statutory and regulatory requirements for beneficial use of dredged material in Illinois. The Illinois Environmental Protection Agency classification criteria for contaminated and uncontaminated dredged material are included with emphasis on Illinois requirements and characterization. Nine sites that have sandy dredged material stockpiles in Illinois are presented with suggestions for beneficially using the material. Based on this study, there is a high potential for beneficially using dredged material in Illinois for a range of projects. Currently, it is a state policy in Illinois to formally evaluate the history of possible nearby sources of chemicals that may have impacted the project sediments and to test the dredged material for chemical contamination before accepting for use on any highway project. However, the research team suggest that if the dredged material is mainly uncontaminated sand (e.g., greater than 80% sand) and is from a local site that does not have a history of contamination as determined by a formal evaluation, then the material is unlikely to be contaminated and may be easier to use and require little to no contaminate testing. Nevertheless, this proposed rule needs more testing and examination to be verified.

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EXECUTIVE SUMMARY

This report presents the results for the research project “Evaluating the Beneficial Use of Dredged Material from the Illinois Marine Transportation System.” The objective of this research is to identify possible reuses of nonhazardous dredged material from Illinois Department of Transportation (IDOT) projects instead of landfilling the material at great expense. In coordination with the United States Army Corps of Engineers (USACE) Rock Island District and the Engineering Research and Development Center (ERDC) in Vicksburg, Mississippi, it aims to find the most economical and environmentally friendly applications for reuse of nonhazardous dredged material in Illinois. This research also investigates the origin, distribution, and frequency of dredged material production across Illinois, finds the existing limitations for reuse of such materials, and proposes potential modifications to remove these limitations to increase the reuse of uncontaminated dredged materials.

This report consists of 7 chapters and 10 appendices with supporting supplements. Chapter 1 includes the general introduction of the project with the problem statement. The literature review in Chapter 2 summarizes dredged material reuse case histories, which are divided into 15 categories of beneficial uses of nonhazardous dredged material with a brief description of each case study. Some of these case histories involve beneficial use of contaminated dredged material after decontamination. The 15 categories are:

1. Structural-Grade Fill and Highway-Embankment Fill
2. Brownfield Reclamation
3. Agricultural Amendment on Sandy Soils
4. Island, Marsh, and Wetland Creation and Restoration
5. Beach Nourishment and Shoreline Protection
6. Landfill-Compacted Soil Bottom Liner
7. Park and Recreational Facility Development
8. Lightweight Aggregate Manufacturing
9. Cement Manufacturing
10. Bricks Manufacturing
11. Manufactured Soil
12. Decontamination Using Auto-Shredder By-Product
13. Decontamination Using Geotextile Tubes
14. Decontamination Using Cement/Bentonite Slurry
15. Economic Benefits of Using Dredge Material

USACE also has summarized 131 case studies of beneficial uses of dredged material within the U.S., which can be found at this link: https://budm.el.erdc.dren.mil/casestudies.cfm. These 131 case studies are summarized in Appendix A.

Chapter 3, augmented by Appendix B, discusses various state and federal statutes and regulations regarding the beneficial reuse of dredged material, including those of Midwest states. It summarizes the contamination levels used in Illinois and surrounding Midwest states for classifying and

permitting dredged material for use and disposal purposes. The chapter describes eight scenarios that neighboring states consider for beneficial use of dredged material. All of these scenarios pertain to nonhazardous dredged material:

1. Daily cover at a licensed municipal solid waste landfill
2. Beach nourishment
3. Compost and topsoil manufacture
4. Final cover system at a municipal solid waste landfill
5. Soil cover at a superfund or brownfield site
6. Unrestricted structural fill
7. Restricted structural fill
8. Aggregate (i.e., bonded by lime, asphalt, or cement)

Chapter 4 describes the typical characteristics of material dredged in Illinois for planning purposes. Herein, focus is given to the Illinois River system, because it is the main source of IDOT dredged material. Three rivers provide the main sources of dredged material in Illinois: Illinois, Mississippi, and Kaskaskia. Chapter 4 also identifies the origin, type, location, and distribution of the dredged material produced in Illinois. This chapter also discusses the locations of eight sites along the Illinois Waterway and Upper Mississippi River that have available sandy dredged material for public use: Beardstown, Kingston Mines and Mackinaw River, Senate Island, Duck Island and Copperas Creek, Starved Rock Lock and Dam, Buzzard Island, Keithsburg, and Northeast Missouri Power.

Currently, it is a state policy in Illinois to formally evaluate the history of possible nearby sources of chemicals that may have impacted the project sediments and to test the dredged material for chemical contamination before accepting for use on any highway project. The research team suggests in Chapter 5 a simplified method to screen dredged material for contamination. The suggested method is as follows. If the grain size distribution of a dredged material sample shows 80% or greater of the dredged material is retained on a no. 200 sieve, then the material is coarse-grained in accordance with the unified soil classification system (ASTM D2487). It also suggests that if the sample was obtained from an area that does not have a history of sediment contamination as determined by a formal evaluation, then the dredged material is unlikely to be contaminated. This rule was investigated using five projects in Illinois that have dredged material with potential beneficial reuse: Beardstown, Bull's Island, Starved Rock Lock and Dam, Mackinaw River, and McCluggage Bridge. However, only three of the five projects—Beardstown, Bull's Island, and McCluggage Bridge—had analytical analyses and grain size data available to investigate the applicability of the proposed method. Therefore, the suggested 80% rule of material retained on the no. 200 sieve needs more verification by conducting both chemical testing and grain size testing for IDOT projects.

At Beardstown sites 1 and 5, the grain size distributions of the dredged material show the highest percent passing sieve no. 200, which is 3.9%. This agrees with the suggested rule: if a sample's grain size distribution has greater than 80% of the dredged material retained on the no. 200 sieve, then the material is sand, **and** if there is no history of contamination at these sites as determined by a formal evaluation, then the dredged material is unlikely to be contaminated. The analytical analysis results show that all samples classify as uncontaminated or unrestricted with two out of six samples having a pH of 9.1, which slightly exceeds the maximum allowable pH level of 9.0, and therefore, may be used on-site as fill or disposed of off-site in accordance with Article 202.03 (IDOT, 2022). No other analytic result investigated in accordance with the approved work plan exceeded the applicable criterion for these two dredged material sites.

The dredged material at Bull's Island, Starved Rock Lock and Dam, and Mackinaw River all had the highest percent passing sieve no. 200, but the percentage is still less than 20%. However, only dredged material at Bull's Island had a hazardous, toxic, and radioactive waste (HTRW) screening, and it did not have any HTRW issues. Dredged material at Starved Rock Lock and Dam and Mackinaw River did not have any analytical analysis or HTRW screening performed, so the lack of contamination could not be confirmed.

All 10 sediment samples at McCluggage Bridge were found to be contaminated. These samples had a high percentage of material passing the no. 200 sieve, and there is history of contamination near Peoria, Illinois. All the sediment samples have a percent passing sieve no. 200 greater than 20%, with a range of 38.5% to 97%. Because the samples were contaminated and have a percent passing sieve no. 200 greater than 20%, the suggested 20% passing rule to determine contamination is not applicable and thus not validated by this site.

For Beardstown, Illinois, the grain size distribution relationships do not match any of the IDOT fine aggregate gradations, and, therefore, two methods are suggested below to modify the grain size relationships to match IDOT gradations and increase potential reuse. These two methods and their results are summarized below:

1. Usable percentages of dredged material mechanically blended with external material to meet IDOT gradations FA1 through FA6: The optimum usable percentages of dredged material from Beardstown sites 1 and 5 mixed with additional material to create a mixture that meets IDOT gradations FA1 through FA6 ranges between 40% to 75%.
2. Usable percentages of dredged material mixed with IDOT gradation material to meet IDOT gradations FA1 through FA6: The optimum usable percentages of dredged material from Beardstown sites 1 and 5 mixed with quantities of FA1 through FA6 material to create a mixture that meets IDOT gradations FA1 through FA6 ranges between 20% to 70%. Therefore, contractors can reduce the amount of FA1 through FA6 that they need to purchase by using the dredged material in Beardstown sites 1 and 5 and mechanically blending it with one or two of the FA1 through FA6 gradations.

Chapter 6 discusses a survey of Midwestern DOTs to investigate their reuse of dredged material, beneficial use determination (BUD) requests, and the applicable permits for creating river islands in Illinois. This chapter is augmented by Appendices H, I, and J, which present the additional information that was generated during this project. Chapter 7 is the final chapter of this report and includes a summary and final recommendations.

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CHAPTER 1: INTRODUCTION

PROBLEM STATEMENT

Ninety to ninety-five percent of about 300 million yd^3 (i.e., 270 to 285 million yd^3) of material dredged annually by the U.S. Army Corps of Engineering (USACE) is reusable for beneficial purposes because it is not contaminated (Welch et al., 2016). The remaining material cannot be reused due to chemical contamination and must be disposed of properly (Welch et al., 2016). Currently, it is a state policy in Illinois to formally evaluate the history of possible nearby sources of chemicals that may have impacted the project sediments and to test the dredged material for chemical contamination before accepting for use on any highway project. As a result, there is interest in exploring possible uses of nonhazardous dredged material in roads, ports, intermodal facilities, and other applicable civic improvement programs that are in compliance with environmental regulations. These beneficial uses of dredged material include beach nourishment, habitat restoration, structural and shore protection, recreation, agriculture, solid waste management, mine reclamation, and construction / industrial developments (USEPA and USACE, 2007; Burt, 1996). For example, the Ohio DOT (ODOT) has recommended using dredged sediments to develop lightweight aggregates for use in concrete (Liu et al., 2018). USDOT investigated the use of geotextile tubes filled with fine-grained dredged material, which are chemically stabilized, for sediment containment, shoreline protection, and breakwater applications as well as intermodal freight operation of ports (Vahedifard et al., 2015; Howard et al., 2016). Georgia DOT (GDOT) is investigating the productive reuse of dredged material from the Savannah River for fired bricks (Mezencevova et al., 2012).

The nation's marine transportation system consists of about 25,000 miles of navigable channels, of which about 12,000 miles are commercially important. The system is supported by about 900 federal channel projects, including both deep (greater than 12 ft) and shallow (12 ft or less) draft harbors (USDOT, 1999). Beneficial usage of the 270 to 285 million yd^3 of nonhazardous material dredged annually provides an opportunity to generate both environmental and economic benefits for this required dredging. USACE estimates that only 20% to 30% of the total volume dredged (300 million yd^3) is currently being used beneficially.

The main objectives of this research are to (1) characterize the origin of the subject dredged material because the method of dredging influences the material properties and potential reuse options, (2) quantify dredging volumes across Illinois, (3) identify existing limitations for reuse of such materials, and (4) propose potential modifications to remove these limitations to increase the reuse of uncontaminated dredged materials.

According to the Illinois Environmental Protection Agency (IEPA) in 1998, lake dredging costs varied from \$5 to \$15 and \$8 to \$30 per yd^3 for hydraulic and mechanical dredging, respectively. The maintenance and management of the Illinois Marine Transportation System, which is a significant asset for Illinois, is becoming more complex and expensive due to management of the resulting dredged material. Cost reduction through identifying beneficial use options for resulting dredged material in land-based transportation infrastructure (roadway) applications is needed and provided an impetus for this research. A challenging aspect of beneficially utilizing dredged material is that these options also must comply with environmental and IDOT construction material specifications to produce public, economic, and environmental benefits to Illinois. This project also identifies obstacles that exist for using dredged material in land-based transportation infrastructure applications and develop potential solutions to remove these obstacles.

This research is timely because the U.S. Environmental Protection Agency (USEPA) recently published some guidance documents on beneficial uses of dredged material in Section 404 of the Clean Water Act (CWA, 2002). USEPA concludes that an important goal of managing dredged material is to ensure that the material is used or disposed of in an environmentally sound manner. Much of the 300 million yd^3 of sediment dredged each year from U.S. ports, harbors, and waterways is disposed of in open water, confined disposal facilities, and/or upland disposal facilities. Most of this dredged material could be used in a beneficial manner instead, such as for nourishment of beaches with uncontaminated sand, coastal protection, or development of wetland habitats.

In 2003, the National Dredging Team (NDT) published a new action plan titled "Dredged Material Management: Action Agenda for the Next Decade" (USEPA and USACE, 2007). One of the recommendations listed by the Action Agenda directs the NDT to develop guidance to demonstrate how beneficial uses of dredged material can be incorporated into new and maintenance navigation projects and to explain the role of the federal standard in that process. In response to that recommendation, the NDT prepared a joint report between the USEPA and USACE (2007) as a guide for USACE districts, other federal agencies, state agencies, local governments, and private interest groups on using dredged material as a resource to achieve environmental and economic benefits (USEPA and USACE, 2007). The federal standard is defined in USACE regulations as the least costly dredged material disposal or placement alternative (or alternatives) identified by USACE.

SCOPE OF THIS RESEARCH

The main objective of this project is to identify the most economical and environmentally friendly applications for reuse of nonhazardous dredged material in Illinois. To achieve these goals, five main tasks were proposed in the work plan and completed:

1. **Literature Review:** Perform a literature review to identify innovative nonhazardous dredged material reuse practices used by other states and internationally.
2. **Characterization of Dredged Material:** Review and summarize the results of recent IDOT and USACE dredging projects to characterize dredged material typically encountered in Illinois waterways.
3. **Determination of Feasible Practices:** Develop a list of feasible reuse practices for nonhazardous dredged materials.
4. **Recommendation of Use of Dredged Material:** Develop recommendations for beneficial uses of nonhazardous dredged material in Illinois for IDOT to consider depending on project location and method of dredging.
5. **Final Report:** Develop a final report that summarizes the outcome of this research, including the expected impact of the outcome on IDOT.

CHAPTER 2: LITERATURE REVIEW

There are 200 to 300 million yd^3 of sediment material being dredged annually in the U.S. This material is dredged from harbors, shipping channels, lakes, reservoirs, and waterways. Dredging of this material must be performed annually to maintain and improve the navigation system (USEPA and USACE, 2007). Most of this material is suitable for beneficial use in beach nourishment, habitat creation, land creation, topsoil creation, landfill soil cover systems, shoreline stabilization and protection, artificial reefs creation/restoration, artificial shoals/berms, intertidal marsh creation, mudflat creation, filling dead-end canals/basins, creation of bird/wildlife islands, landfill/brownfields reclamation, aquatic and marine habitats, underwater berms and nesting beaches, forestry, horticulture, agriculture, landscaping soil, construction fill for roadway embankments, flowable fill for construction, strip mine reclamation, and as subsoil for highway projects (Marlin & Demissie, 2004; Landin et al., 1998; Miano, 2015; USEPA and USACE, 2007).

The degree of contamination depends on the type of dredged material and the dredging location. Fine-grained soils, e.g., silts and clays, can bind with contaminants, resulting in contaminated dredged material. In contrast, coarse-grained particles, e.g., sands, gravels, and rock, do not bind with contaminants because of the lack of positively or negatively charged clay minerals. As a result, coarse-grained particles are considered uncontaminated based on grain size analysis and contamination history of the location. Usually, uncontaminated dredged material is more accessible for beneficial reuse in a wide range of applications than contaminated dredged material, which can be reused in a limited range of uses, if any. In the U.S., a significant portion of dredged material is not contaminated. However, only 30% of dredged material in the U.S. is used for beneficial purposes (USEPA and USACE, 2007). Also, 60% by volume of dredging projects performed by USACE occur in the Gulf of Mexico—mainly in the New Orleans, Galveston, and Mobile Districts, where dredging allows for important movement of massive ships (Collins et al., 2015).

Traditional disposal methods for dredged materials include in-stream/in-river disposal, confined disposal facilities (CDFs), ocean disposal, and capped in-water disposal. About 85% (203 million yd^3) of the annually dredged material in the U.S. is disposed in CDFs (Collins et al., 2015). While CDFs are an option when it comes to disposing of dredged material, their construction is time-consuming and expensive, and there is a shortage of available land to create these large facilities (Miano, 2015).

This chapter summarizes relevant case histories identified during the literature review. From these case histories, 15 categories of beneficial uses of dredged material were identified along with some treatment techniques for contaminated dredge materials and examples of economic benefits from utilizing dredge materials. Three of these categories are based on case histories in Illinois, which are “Brownfield Reclamation,” “Agricultural Amendment on Sandy Soils,” and “Beach Nourishment and Shoreline Protection.” The 15 categories are:

1. Structural-Grade Fill and Highway-Embankment Fill
2. Brownfield Reclamation
3. Agricultural Amendment on Sandy Soils

4. Island, Marsh, and Wetland Creation and Restoration
5. Beach Nourishment and Shoreline Protection
6. Landfill-Compacted Soil Bottom Liner
7. Park and Recreational Facility Development
8. Lightweight Aggregate Manufacturing
9. Cement Manufacturing
10. Bricks Manufacturing
11. Manufactured Soil
12. Decontamination Using Auto-Shredder By-Product
13. Decontamination Using Geotextile Tubes
14. Decontamination Using Cement/Bentonite Slurry
15. Economic Benefits of Using Dredge Material

These 15 categories can be classified into three main topics. These topics are (1) types of beneficial uses (categories 1–10), (2) type of treatment of contaminated dredged material (categories 12, 13, and 14), and (3) economic benefits (categories 11 and 15). A brief description of each case study is presented below, to provide IDOT with possible applications for some of the dredged material generated on IDOT projects. USACE has summarized 131 case studies of beneficial uses of dredged material within the U.S., which can be found at: https://budm.el.erdc.dren.mil/successstories.html. These 131 case studies are also summarized in Table 16 in Appendix A.

STRUCTURAL-GRADE FILL AND HIGHWAY-EMBANKMENT FILL

Roscoe and Bradfield (2014) reported a successful dredged material reuse project conducted by the Maryland Port Administration (MPA). To identify the beneficial use of 500,000 yd^3 of dredged material from the Cox Creek Confined Disposal Facility in Baltimore, MPA conducted a demonstration project where steel slag fines were blended with the dredged material for use as a structural-grade fill and highway-embankment fill material for the Baltimore metropolitan market. The project consists of creating five single-lane embankments of different blending ratios and evaluating their performance after aging for over 12 months. The five dredged material and steel slag fines blending ratios used are 100:0, 80:20, 50:50, 20:80, and 0:100, respectively, by percentage. The steel slag was obtained from the Sparrows Point Steel Plant Complex across the Patapsco River from MPA's Cox Creek Dredged Material Containment Facility. The evaluation project finished in 2011, and the embankments have remained in place.

The dredged material contained arsenic of 100 to 240 mg/kg, which is above the Maryland Department of the Environment's Voluntary Cleanup Program standards of 2 and 9 mg/kg for residential and nonresidential sites, respectively. To ameliorate this contamination, MPA added 2% of Portland cement, which immobilized the arsenic metal. After blending, the arsenic was chemically bound to the blend so leaching for the different blends' materials was below the limits of the toxicity characteristic leaching procedure (TCLP) and the synthetic precipitation leaching procedure (SPLP).

The results of long-term testing showed a double increase in blend strengths after 60 days of aging, and no further increase in strength was observed thereafter. For example, adding 20% of steel slag fines decreased the cohesion, c', (the value of Y intercept in the Mohr-Coulomb failure envelope) from 316 psf to zero (cohesionless), but increased the effective stress angle of internal friction, ϕ', from 34° to 52°, both of which are suitable for typical highway embankment construction.

BROWNFIELD RECLAMATION

Darmody and Marlin (2008) described a project in summer 2004, where reclamation of a brownfield site was achieved using dredged sediments from the Illinois River. Brownfields are usually located in urban areas and areas that are not in use due to prior industrial or commercial use that resulted in soil contamination. This brownfield site consists of 573 acres located in south Chicago at the abandoned U.S. Steel South Works. The site contains rubble from the accumulated slag over the past 100 years and the destruction of buildings. The dredged sediments were delivered to the site by 68 barges carrying 94,300 tons of sediments (equivalent to 4,000 semitruck loads) for a distance of 168 miles (Marlin & Darmody, 2005). Figure 1 shows the stages of sediment processing, starting with dredging (viscous paste) through final vegetation. The dredged material was end-dumped onto the brownfield to a depth of about 2 ft. The sediment was allowed to dry for a few weeks and then was pushed up into a level pile of about 3 ft thickness using a bulldozer. Field observations after placement show that the dredged sediment underwent significant shrinkage of volume over a period of 1.5 years.

At the brownfield site, there was no need to create berms to prevent the sediments from flowing because of its high viscosity. After sediments dried, no erosion was encountered due to its high flocculation as a result of the high calcium content, which allowed it to resist water and wind movement. Good vegetation was achieved after one year due to the favorable soil structure that formed as a result of dewatering, cracking, and hardening. Seventy-nine species were reported in the reclaimed brownfield by the Illinois Natural History Survey. Of these 79 species, 17 were wetland species, and some of the volunteer cottonwood trees and weeds grew to 6 ft. These outcomes are the basis for the IEPA considering this project a success (Darmody & Marlin, 2008).

The cost of this project, including dredging, shipping, and placement, was about \$13.30 per ton. However, the cost of dredging the river for marinas and navigation is more than \$7.7 per yd^3. The cost of delivering high-quality topsoil to the Chicago area is \$15.3 per yd^3. After performing chemical characterization tests, they found the sediments have a higher content of lead, zinc, chromium, cadmium, and nickel, with a very high calcium content that exceeds the requirements of topsoil. Because this beneficial use involved restoration of an industrial site, these metal concentrations were deemed acceptable for this topsoil usage.

Figure 1. Photos. Dredged sediment materials (a) are applied to land as a runny paste (mud). After spreading (b), the sediment dries and cracks, initially forming large polygons (c), and as it weathers into smaller aggregates and eventually forms a granular soil structure (d–f). Within a year, the soil develops structure and supports vegetation (g–h) (Darmody & Marlin, 2008).

AGRICULTURAL AMENDMENT ON SANDY SOILS

Darmody and Diaz (2017) conducted a study to enhance sandy soils (Bloomfield fine sand soil series) for agricultural purposes by adding dredged sediments from the Lower Peoria Lake at East Peoria, Illinois (river mile 165) because of the poor agricultural properties of sandy soils. The project took place at the University of Illinois' Sand Farm near Kilbourne in Mason County, Illinois. The sandy soil consists predominantly of sand textured (97% sand, 1% silt, and 2% clay), while the dredged sediment consists of silty clay loam (11% sand, 60% silt, and 29% clay). The sediment was dredged in May 2000 and transported to an abandoned gravel pit where it was left for dewatering and weathering. After one year (May 2001), 89 tons of the weathered dewatered dredged material were transported by trucks to the University of Illinois' Sand Farm. The dredged material was not pretreated and was applied over the sandy soil. Research plots with different thicknesses of dredged sediments (0, ~2.7, 6, and 12 in.) over the sandy soils were created, and corn and soybeans were grown for four years.

Figure 2 shows the crops' response to the sediment addition. The water-holding capacity, crop productivity, soil nutrient levels, organic matter content, and cation exchange capacity significantly increased due to the addition of dredged material. In addition, corn growth was directly proportional to the thickness of applied sediments, where the highest corn growth was found for the plot that has a 12 in. dredged sediment thickness. Concentrations of metals in soils and plant tissues were within normal levels. Soybean metal content, in general, was higher in sediment-treated plots but levels were still low enough not to be considered problematic (Darmody & Diaz, 2017).

Figure 2. Photos. Sand Farm sediment research plots: (a) early season view showing sediment irrigation system; (b) late season view showing crop response to sediment addition (Darmody & Diaz, 2017).

ISLAND, MARSH, AND WETLANDS CREATION AND RESTORATION

To restore the 1850s footprint of Deer Island along the Mississippi River, USACE and the Mississippi Department of Marine Resources initiated a project for restoring the island in 2002 by creating a marsh adjacent to the island (Roth et al., 2012; Mears et al., 2016). The excavated sediments from dredging the Biloxi Lateral Channel were used for the marsh restoration project. They started by creating the outer berm of the marsh to contain the excavated 365,000 yd^3 of sediments, forming a 16-hectare containment cell (see Figure 3). After allowing the sediments to dewater and consolidate on their own, small channels were created inside the containment cell to enhance habitat development by improving intertidal circulation, as shown in Figure 3. The planting phase of the project was performed in spring 2005, after which grasses covered 60% of the marsh. The marsh restoration project suffered severely from Hurricane Katrina in 2005 and seasonal tropical storms in subsequent years. The dike was breached, and the vegetation was washed away, as shown in Figure 4.

Following Hurricane Katrina, there was a need to restore the marsh, so reconstruction began in early 2012. Dredged material for the new dike and filling materials within the cell were obtained from dredging the adjacent 10-hectare expansion area. These sediments were also allowed to consolidate along with natural tidal circulation for improving the habitat system. Figure 5 shows the vegetated restored marsh site after completing the project, and it is still performing well (Roth et al., 2012).

Figure 3. Deer Island with channels and marsh grasses planted (pre-Hurricane Katrina, spring 2004) (Roth et al., 2012).

Figure 4. Post-Hurricane Katrina showing storm damage (December 2005) (Roth et al., 2012).

Figure 5. Arial Photos. Restored Deer Island Beneficial Use (BU) site (April 2016) (Roth et al., 2012).

Maristany et al. (2013) described a 200-acre site created for beneficial use of dredged material in Corpus Christi Bay in South Texas. The site is referred to as beneficial use site-6 (BUS-6). It was created for aquatic habitat enhancement using dredged material from the La Quinta channel extension. BUS-6 also serves as a wave protector of the shoreline and La Quinta Channel. Dredging was conducted hydraulicly using a 24 in. diameter suction cutter. The dredged material consisted of fat/lean clay and clayey sand. Approximately 7.7 million yd^3 of dredged material was used to create a levee about 9 ft high and 9,200 ft long to enclose the filling area for BUS-6. After consolidation of the placed dredged material, 25.3 acres of shoal grass and 12.6 acres of marsh vegetation were created within BUS-6. The creation of vegetation was achieved by creating tidal channels that allowed circulation and tidal movement of water between the created inner cells. Sea-level rise over the next 20 years was considered in the design and resulted in increasing the elevation of the berms to prevent flooding of the containment area. Figure 6 shows the aquatic habitat mitigation berms. Smooth cordgrass was planted on the berms, which was designed to be at least partially inundated during tidal cycles. The designed crest at the center of the berms allows the growth of the smooth cordgrass as the sea level rises.

Another earthen protection berm of 1,500 ft in length, covered with a geotextile to resist scour, was constructed for erosion protection. Hurricane Harvey made landfall on San Jose Island on August 26, 2017, which was 25 miles away from BUS-6. Despite high wind speeds of 100 mph and a storm surge of 5 ft, no significant damage occurred to the aquatic habitat and plants, as shown in Figure 7.

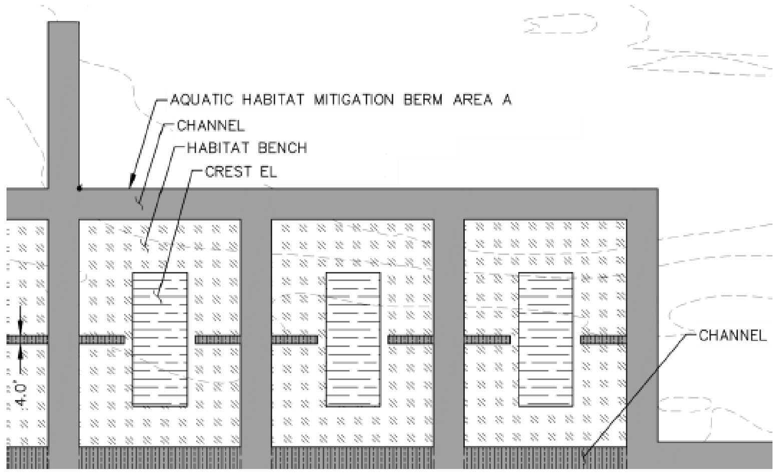

Figure 6. Aquatic habitat mitigation berms (Maristany et al., 2013).

Figure 7. Photo. La Quinta Terminal aquatic habitat mitigation project site (BUS-6) post-Hurricane Harvey (Maristany et al., 2013).

Suedel et al. (2016) reported a successful case study of beneficial reuse of dredged material for creating an island in Atchafalaya River, Louisiana. The USACE New Orleans District created a riverine island in the lower Atchafalaya River. Adjacent to the channel and along the river's shorelines, there were eight wetland development sites. The wetland sites were used as the base foundation over which the riverine island was built. To create the riverine island, 0.5 to 1.8 million yd^3 of material were placed every one to three years. The material was dredged from Horseshow Bend and consisted of shoal materials. It was also mounded at the mid-river open-water placement site. The final area of the created mid-river island is 35 hectares. Figure 8 shows the formation of the island from 1992 to 2009.

Within this small island, four wetland types were exhibited, including emergent, forested, aquatic bed, and scrub-shrub assemblages. Twenty-three animal species and 81 plant species were recorded with an active rookery, where the active rookery is not observed within the lower Atchafalaya River area. The constructed island is considered a successful project when compared to those naturally founded in the same region.

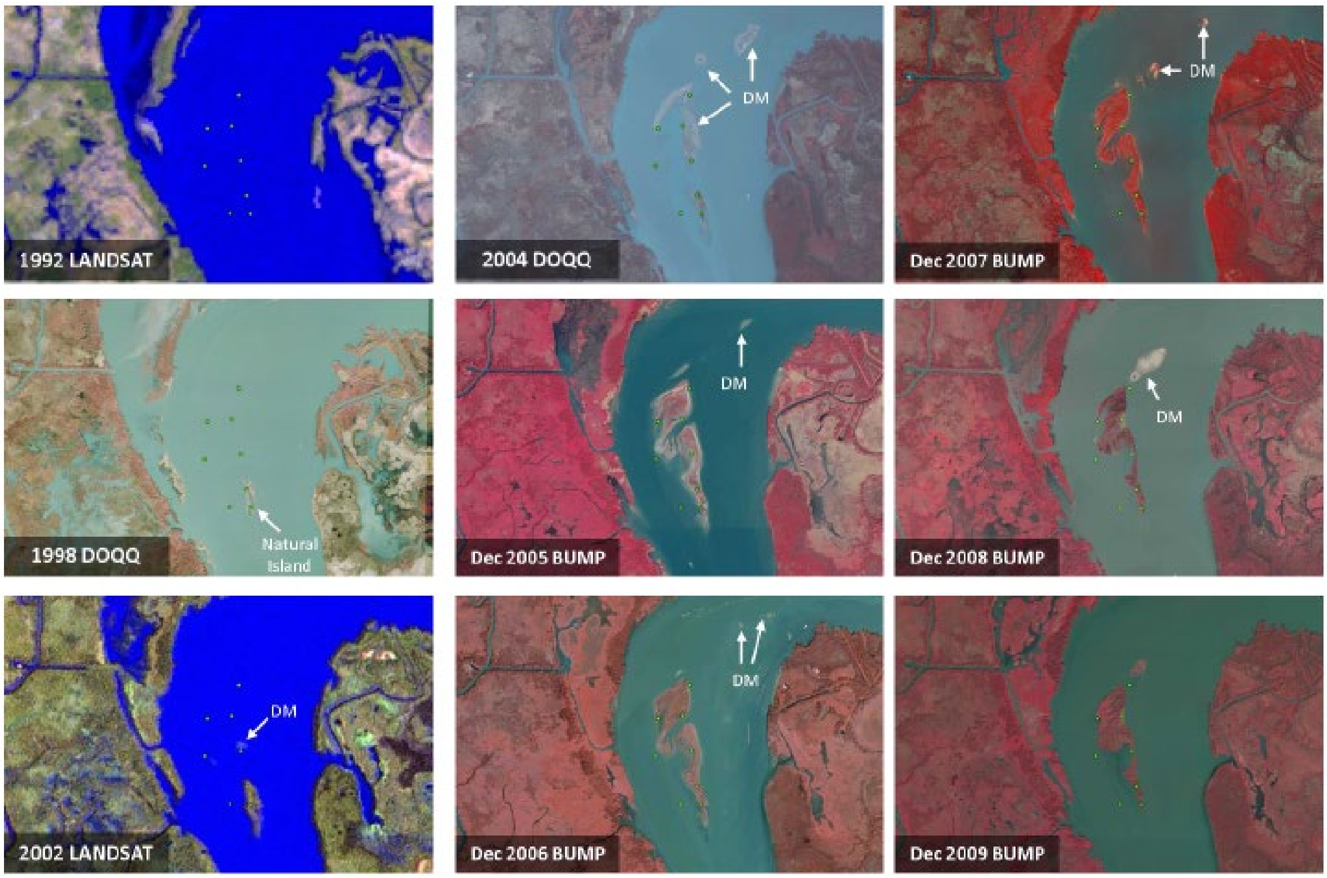

Figure 8. Arial Photo. Imagery displaying island location prior to dredged material (DM) placement and subsequent formation (1992 and 1998 images), establishment, and growth since strategic dredged material placement began in 2002 (Suedel et al., 2016).

One of the largest beneficial uses of dredged material projects in the U.S. and the world is the Houston-Galveston Navigation Channels project in Galveston Bay, Texas. Aspelin and Krueger (2007) note the dredged material excavated from the Galveston Shipping Channel for facilitating the movement of larger vessels was used to create 1,720 hectares of intertidal marsh and islands in a 50-year plan. The channel was deepened from 45 ft deep and 530 ft wide to 50 ft deep and 600 ft wide. Over the next 50 years, it is expected to produce 300 million yd^3 of dredged material. In this project, the hydraulically dredged material consists of silt and clay. The dredged material was stacked up and difficult to flow in dredge pipes less than 24 in. in diameter, and therefore, a 30 in. diameter dredge pipe was used and created a smooth flow of dredged material.

The dredged material was used for marsh creation along the river channel. The marshes were created using a levee to contain the dredged material, allowing the disposed dredged material to be placed inside the levee system and settle. Geotubes were used to protect the exterior of the levees as shoreline protection. A 2.4-hectare island with a wind barrier was also created for bird habitat, which during the seasonal migration serves as a home for thousands of birds.

BEACH NOURISHMENT AND SHORELINE PROTECTION

Erosion at the down-drift zone and accretion at the up-drift zone are typical main threats from the littoral drift for any man-made structure exposed in the sea in deep water. This can be overcome by constructing a breakwater (Panda, 1998). When creating islands, it is essential to construct riprap or geotextile tubes around the island to protect it from erosive waves. An example is in northern Illinois, where several years ago the Fox Waterway Agency placed geotextile tubes that are still performing well (Marlin & Demissie, 2004). Figure 9 shows these geotubes full of fine-grained dredged material in Grass Lake, Illinois (Bhowmik & Demissie, 2001).

(a) (b)

Figure 9. Photos. Geotubes in Grass Lake: (a) geotubes almost full of sediment and (b) geotubes and silt screen in the foreground (Bhowmik & Demissie, 2001).

According to Collins et al. (2015), if dredged material is clean (i.e., not contaminated and generally sand) and dredging is performed along a coast, then the best option for the reuse of dredged material would be beach nourishment. Beach nourishment, or beach filling, is the practice of adding large quantities of sand or sediment to beaches to combat erosion and increase beach width. Sand generally comes from inlets, main offshore waterways, or coastal entrance bars. Figure 10 shows an example of beach nourishment using hydraulically dredged material (Collins et al., 2015).

Figure 10. Photo. Beach nourishment using dredged material in the USACE Galveston District (Collins et al., 2015).

McLellan et al. (1997) presents a study where sandy sediment dredged from the Brazos Island Harbor Channel in the state of Texas was reused into the littoral system. The average erosion rate of the South Padre Island shoreline was up to 8 ft per year. Most of the sediments dredged from the entrance channel is beach quality sand. The entrance channel requires dredging every two years to maintain a good depth of water for navigation. Beach nourishment was essential for the people of the town of South Padre Island due to the importance of national and international tourism. Therefore, 1,550,000 and 1,350,000 yd^3 of dredged sediments were used to create nearshore berm and to overcome the erosion of beaches of South Padre Island, respectively. The berm was 3,500 ft long and 4 ft high, which played a good role in protecting the shore against storm damage and reducing erosion.

De Gennaro (2005) reports a case study where geotextile tubes were used for shoreline stabilization to solve shoreline erosion in front of two townhouse complexes. Shoreline erosion was threatening the foundation of one of the buildings in Assawoman Bay in Worcester County, Maryland, as shown in Figure 11.

Figure 11. Photo. Preconditions of shoreline at project site (De Gennaro, 2005).

Shoreline stabilization was achieved by using geotextile tubes filled with dredged sediments of organic silt from dead-end canals, as shown in Figure 12(a). The geotextile tubes were covered with a thick, nonwoven highly porous drainage geotextile covered by an articulated concrete block mat to accelerate dewatering and consolidation of the geotextile tubes. After dewatering and consolidation of the geotextile tubes, an articulated concrete block mat (ABM) was chosen to be placed above the geotextile tubes instead of rock riprap. This is due to the cheaper cost of ABM ($275/ft) compared to the rock riprap ($410/ft), which resulted in $148,000 savings for the 1,080 ft of shoreline protection. The final look of the project is shown in Figure 12(b) (before planting).

(a)

(b)

Figure 12. Photos. Shoreline stabilization with (a) geobags being filled and (b) finished revetment (De Gennaro, 2005).

Another successful example of using geotubes filled with dredged material for shoreline protection and/or restoration is in Grand Isle, Louisiana. At 22:10 UTC on June 7, 2020, Tropical Storm Cristobal made landfall in Southeast Louisiana, east of Grand Isle at its second peak strength of 50 mph (80 km/h) (Pasch, 2020; Betz, 2020). As a result, 2,000 ft of the “burrito” levee (the west side of the island), on the Gulf of Mexico side of the island, was destroyed, reaching the levee’s core (Baurick, 2020). The Corps built the levee a decade ago by creating a “burrito” core for the levee, which is a geotube filled with dredged sand from nearby locations, and surrounding it with a man-made dune (Snell, 2020). Figure 12 shows the exposed core (geotube) of the levee after damage caused by the storm. The erosion stopped at the tube, and using the tube was effective for stabilizing the core of the levee. If stronger storms would have landed on Grand Isle, more levee damage would have been expected in terms of washing the sand out, but the tube is expected to stay in place. This is not the case for levees where no geotube is used, especially if sand was the primary material used for creating the levee, which might be washed out entirely in the case of a strong storm or a hurricane. The stability and resilience of the core of the levee is important due to its important geotechnical role in the performance of the levee. For example, fixing the levee with the burrito core in place is much easier, quicker, and less expensive than creating a new levee.

Figure 12. Photo. Officials inspect the damage to levees in Grand Isle, Louisiana, on Thursday, June 11, 2020 (Baurick, 2020).

LANDFILL-COMPACTED SOIL BOTTOM LINER

Sheehan et al. (2012) investigated the possibility of combining dredged material with construction and demolition debris (C&DD) to create a compacted soil liner (CSL) for the bottom liner system of a municipal solid waste landfill in Ireland. Several trial mixes were created by mixing dredged material with C&DD waste in different proportions. The best mix was determined based on the least-square regression of a comparison between the material that passed 11 specific sizes with those of typical CSL samples. The chosen mix consists of 70% dredged material with 30% of C&DD by weight. The bottom liner system of a municipal solid waste landfill generally includes a geomembrane as primary protection and an underlying CSL with a hydraulic conductivity (k) of less than 1×10^{-9} m/sec as secondary protection and to limit leakage through geomembrane defects. However, a geomembrane is not required for a C&DD landfill because the waste is considered inert as it mainly consists of C&DD waste.

PARK AND RECREATIONAL FACILITY DEVELOPMENT

USACE (1987) reported a case study where dredged material was beneficially used in a project at Patriots Point Park, which provides recreation to citizens and visitors in the Charleston, South Carolina area. The Patriots Point Project, which is a 182-hectare commercially oriented recreational site (previously known as Hog Island) one mile east of Charleston, was built on an old dredged material placement site. From 1956 to 1970, the site was used for placement of new-channel and maintenance dredged material consisting of clay and sandy silt, in addition to heavy clay that was used for constructing the perimeter dikes. A quasi-state agency, designated the Patriots Point Development Authority, was established in the 1970s to develop and plan a recreational complex. The focal point of the development is a Naval and Maritime Museum with the aircraft carrier Yorktown, moored at the site in early 1976, as the principal attraction. A 300-space recreational vehicle park, a 150-room motor inn with convention facilities, an 18-hole golf course, and a 375-slip marina are included in the Authority's master development plan for the area. Long-range construction includes a restaurant, aquatic theater, man-made lakes, an oceanarium, amphitheater, and permanent mooring for at least three more classes of decommissioned naval ships. Around the site, a dike-top tour route was constructed. Currently, the project attracts 1.5 million visitors annually. Topsoil, including some dredged material, was placed in portions of the site to encourage vegetative growth, particularly in designated buffer zones. Figure 13 depicts the master plan for Patriots Point.

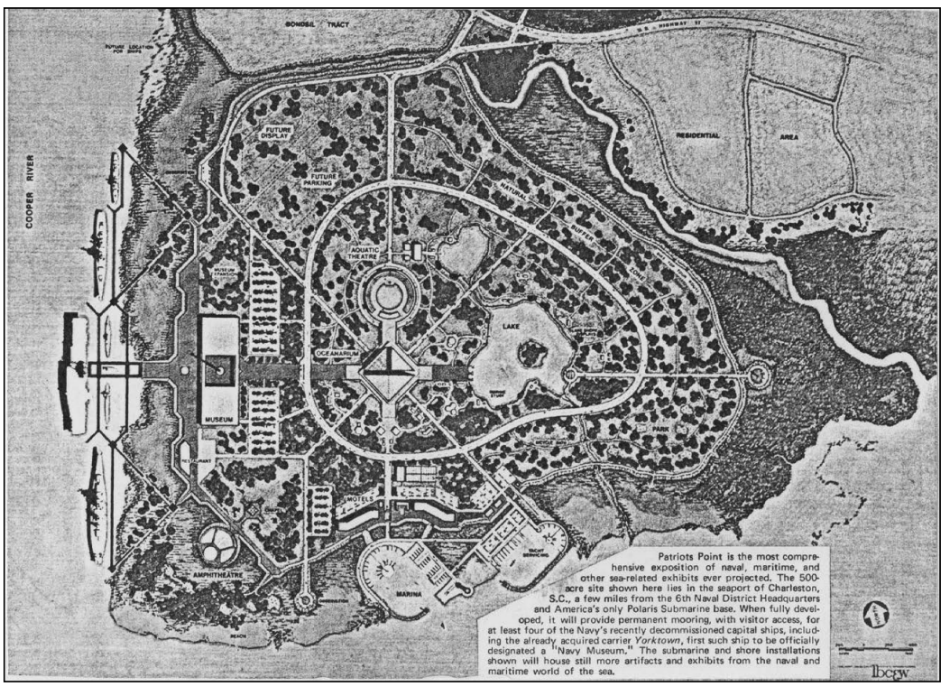

Figure 13. Sketch. Master plan of Patriots Point Naval and Maritime Museum in Charleston, South Carolina (USACE, 1987).

LIGHTWEIGHT AGGREGATE MANUFACTURING

Despite the advantages of lightweight aggregate (LWA), it has a higher cost than conventional aggregate. The Ohio Department of Transportation (ODOT) manufactured LWA material from dredged sediment from the harbors of Cleveland and Toledo to investigate beneficial uses, as shown in Figure 14 (Liu et al., 2018). LWA has a competitive price that is suitable for construction of concrete bridge decks and embankment backfills.

Figure 14. Photo. Lightweight aggregate made from dredged material in Ohio (Liu et al., 2018)

ODOT used two dredged material samples obtained from Cleveland and Toledo Harbors. The Cleveland samples classify as sandy loam, while the Toledo samples classify as silty clay with high plasticity. The following two conditions must be met to use dredged material in LWA manufacturing:

1. During the heating process to the point of incipient fusion, the formation of gases must be achieved.
2. Have sufficient viscosity under high temperatures so the generated gases are entrapped in the resulting ceramic.

The main steps in the process of creating LWA from dredged material are:

(a) Screen after drying and pulverizing the dredged material to remove unwanted materials.

(b) Mix screened dredged material with water to form small pellets with a diameter less than or equal 1 in. (25 mm).

(c) Remove excessive carbon and water molecules from the small pellets by preheating at 550°C.

(d) Sinter under a high temperature (1100°C) for one hour. During sintering, a porous surface and microstructure are created due to the generated gases.

(e) Cool to room temperature.

(f) Crush the small pellets to the desire aggregate size, i.e., fine, coarse, or well graded.

(g) Prepare desired aggregate for shipping to project site.

The water absorption of the produced LWA decreases with increasing duration of heating and temperature. The manufactured LWA from both Ohio sites met ODOT’s aggregate standards, except for the Cleveland samples, which did not meet the L.A. abrasion test. This drawback of the Cleveland samples could be overcome in future projects by increasing either the temperature or duration under sintering, or both. The water adsorption of the Toledo samples was 13%, and the specific gravities ranged between 1.25 and 1.35.

The price of traditional LWA material in the state of Ohio is $40 per ton, while a cost analysis of LWA from dredged material showed the prices are $19.62, $17.60, and $16.43 per ton for 50, 100, and 200 tons per hour manufacturing outputs, respectively. This price analysis shows a competitive potential of manufactured LWA material from dredged material for highways projects.

Tang et al. (2011) also used dredged sediments from the Shihmen Reservoir in Taiwan to create LWA (see Figure 15[a]), concrete, and concrete masonry (see Figure 15[b]). The sediment used was classified as inorganic clay with a low to medium plasticity index. Concrete made with the manufactured LWA from dredged sediments was 29% to 35% lighter than concrete made with traditional aggregate. The strength of the concrete with manufactured LWA met the American Concrete Institute's standards for strength and is comparable to traditional concrete. The process of manufacturing the LWA is the same procedure followed by Liu et al. (2018) for the ODOT project, except that the preheating and burning temperatures were between 500°C to 700°C and 1100°C to 1200°C, respectively.

(a) (b)

Figure 15. Photos. Photographs of (a) appearance of sintered sedimentary LWA and (b) appearance of manufactured concrete masonry units (Tang et al., 2011).

Hamer et al. (2003) and Wang and Tsai (2006) also present successful studies of manufacturing LWA using dredged sediments in Germany and Taiwan, respectively.

CEMENT MANUFACTURING

Dalton et al. (2004) investigated using contaminated dredged material in the production of Portland cement. This involved including the contaminated dredged material into the cement matrix by replacing part of the raw feedstock. The sediments were dredged from New York and New Jersey Harbors. They replaced 1% to 12% of the original feedstock material with contaminated dredged material. Around 220,000 to 440,000 yd^3 of dredged material could be used annually by one concrete-processing facility based on using a 3% to 6% dry mass replacement of dredged material to produce Portland cement. Using this amount of contaminated dredged material allows the replacement of 100%, 45%, and 45% of fly ash, iron, and bauxite, respectively, in the cement-making process. Complete replacement of fly ash and bauxite could be achieved with a 14% replacement using dredged material. This is an important application because of the high carbon footprint associated with manufacturing Portland cement.

BRICKS MANUFACTURING

Hamer and Karius (2002) used dredged material from Bremen's Harbor in Germany to create bricks. They used 40% by weight of dredged material that classifies as clayey to slightly sandy silt, 50% clay, and 10% rejected crushed bricks. Drying of the raw mixture was performed in a steam dryer at 400°C. Afterwards, the dry raw material was exposed to a pressure of 200 bars. The final stage of brick processing is heating at 1050°C (see Figure 16).

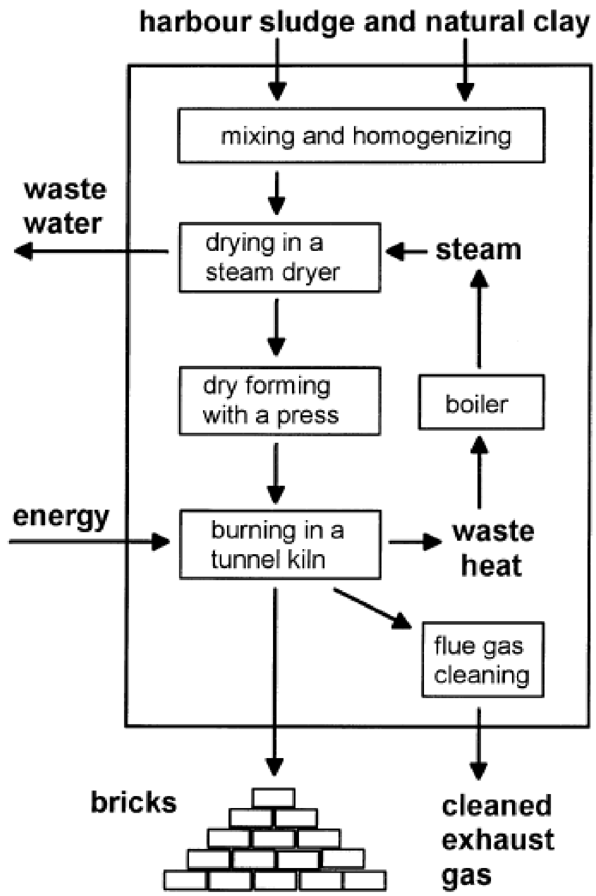

Figure 16. Sketch. Producing bricks of Hanseaten-Stein Brickworks GmbH (Hamer & Karius, 2002).

The manufactured bricks meet German environmental standards based on post-manufacturing testing. The bricks are not suitable for industrial or faced bricks due to microcracks found after frost-resistance testing. However, the bricks were found to be suitable for use as insulating bricks in an insulated brick building.

Chiang et al. (2008) also investigated the production of bricks by creating bricks from five different mixtures. They used the following mixtures by percent of weight of dredged material to clay in the brick process: 100:0, 95:5, 90:10, 85:15, and 80:20. The sediment used was obtained from Shi-Men Dam in Tao-Yuan County, Taiwan. The sintering phase was performed under a temperature of 1050°C to 1150°C, with 1100°C being the optimum temperature for brick production. The bricks were sintered at 1100°C, with 0% clay yielding the highest compressive strength. The produced bricks met Taiwan's environmental and construction standards for building bricks.

Mezencevova et al. (2012) also use dredged sediments from the Savannah Harbor in Georgia to create two mixtures for manufacturing bricks. The two mixtures consist of 100% dredged sediments and 50% sediments with 50% clay bricks. The type of sediment used is a clayey silt. Both mixtures met the building criteria, mainly negligible weathering, after heating at 1,000°C. The compressive strength of the 100% dredged material mix is between 8.3 to 11.7 MPa, while it was 29.4 MPa for the 50:50 dredged material and clay mixture. Figure 17 shows the stages of brick manufacturing for this project.

Figure 17. Photos. Laboratory-scale brick production: (a) raw material mixing, (b) extrusion of a brick column, (c) dried brick, (d) fired bricks (Mezencevova et al., 2012).

MANUFACTURED SOIL

This case history involves the Southport Terminal located just south of the Saint Paul Municipal Airport and was provided in an unpublished article by Chuck Theiling of USACE in 2020. Through the years, dredged material was placed on the Southport Terminal by USACE's Saint Paul District. Minnesota Mulch and Soil, University of Minnesota, and Minnesota Department of Transportation conceived of using the stockpiled dredged material as topsoil. This topsoil was used for highway storm management to decrease water runoff. The dredged material was suitable for use as a drainage medium. The manufactured topsoil consists of mainly sand with wood and manure (or municipal sewage) by-products for carbon and nutrients additives, respectively. Fine sediment from off-channel locations was also used for soil health. One hundred thousand cubic yards were used in a 10-acre site from 2003 (see Figure 18[a]). In 2015, a fertilizer terminal was constructed on top of the site (Figure 18[b]).

(a) (b)

Figure 18. Arial Photos. Saint Paul Port Authority's Southport Marina in (a) 2003 and (b) 2015 after construction of fertilizer terminal.

This project in the Saint Paul District illustrates the economic potential of using dredged material as topsoil after the Southport Terminal Project. In the project, USACE paid \$500,000 to offload 50,000 yd^3 of sand from a bankline stockpile to a location outside of the floodway. The contractor delivered the sand to Southport Marina, where the Port Authority took possession of the sand. Minnesota Mulch and Soil purchased the sand from the Port Authority for \$2.00 per yd^3. The cost to make compost for 1 yd^3 of topsoil is \$3.00. It costs \$1.00 per yd^3 to blend the sand and compost at the Southport Terminal, and \$1 to load its barges, bringing the total manufacturing costs to \$7.00 per yd^3. The compost additions increase the total volume to about 60,000 yd^3 with a value of \$19.00 per yd^3. That results in a profit of \$12.00 per yd^3, or a total profit of \$720,000, exceeding the government cost to handle the material. The soil contractor could have paid for offloading the 50,000 yd^3 of sand at Southport Marina and still profited about \$220,000.

DECONTAMINATION USING AUTO-SHREDDED BY-PRODUCT

Willix and Graalum (1999) studied mixing PROPAT with contaminated dredged sediments to neutralize the contaminants so the resulting mix could be used for beneficial applications. PROPAT is a trademarked auto-shredder by-product developed by Hugo Neu Schnitzer East and is used to create manufactured structural fill material. PROPAT is a nonmetallic chemically stabilized portion of shredded cars such as glass, foam from seats, etc., and it was approved in several states for landfill cover. It can be used for enhancing handling characteristics of dredged sediments as a dehydration agent, reducing the moisture content dramatically (up to 30%), and it can improve strength through the addition of fiber content.

Willix and Graalum (1999) created different mixes of PROPAT, dredged sediments, and kiln dust. (The type of kiln dust was not reported.) They found that the best mix between PROPAT and dredged sediments, after which there is no significant improvement in the amended material properties, is 2:1 PROPAT to sediments by wet weight. Due to the lack of sufficient PROPAT to cover the needs based on the 2:1 proportion, they decided to use a 1:1 mixture of PROPAT and sediment but still added kiln dust. Adding 10% to 20% of kiln dust to the 1:1 mixture would improve its properties to a similar state as the preferred 2:1 mixture. The compressive strength was improved from around 0 psi (viscoplastic state) without PROPAT to 24.1 and 38.8 psi for the 1:1 mixture with 10% and 20% of kiln dust, respectively. This mixture was qualified to be used as a capping material and structural fill. Also, smaller quantities of kiln dust and PROPAT are required if the sediments are sandier or drier than the clayey to silty sediment used.

O'Donnell and Henningson (1999) describe a project in which dredged material along with fly ash and an activator were used for mined land reclamation in Pennsylvania. The material was used to cap the contaminated areas and as fill material. In this study, 150,000 yd^3 were excavated from the Claremont Channel and were used for mined land reclamation after being processed and stabilized with fly ash and an activator. The dredged material excavated from the Claremont Channel was proposed to be amended with PROPAT too because of its high metal concentrations.

DECONTAMINATION USING GEOTEXTILE TUBES

Stephens and Melo (2013) use dredged materials to reduce construction cost of a container and bulk port terminal with an area of 210 acres (the largest in South America) in Santos, Brazil. This substitution of dredged material resulted in a reduction of imported off-site fill of 30%, which created a significant cost saving. This was achieved by using contaminated dredged sediments from the entrance channel that replaced 785,000 yd^3 of imported fill. The savings created are between $230 to $345 million, which is 20% to 30% of the total site development cost of $1.15 billion. Used dredged material consisted of dewatering and containing the contaminated dredged sediments in large geotextile tubes (120 ft circumference by 210 ft long), which would be placed temporarily under the proposed container storage area as a filling material. The geotextile tube consists of high-strength woven monofilament geotextiles.

The construction started in 2010 with geotextile tubes being used to create dewatering cells. These tubes were used to divide the site into multiple areas by constructing +8 ft high internal berms and a +15 ft high impermeable berm around the perimeter of the site. A layer of woven geotextile was placed on the mud surface to act as a separator layer under a 1.5 ft thick layer of gravel, which acts as a drainage blanket, as shown in Figure 19. The geotextile tube was filled to a height of 7 ft and still had a height of 6 ft after dewatering with 2,800 yd^3 of sediments contained in the tube after dewatering.

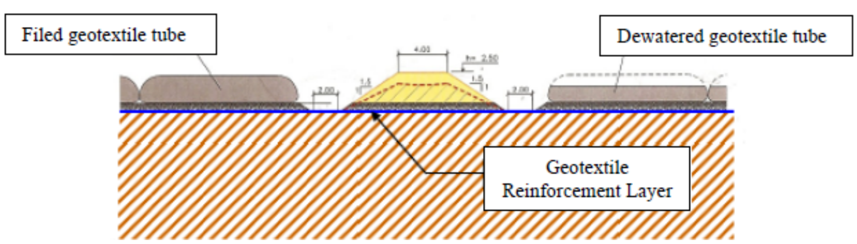

Figure 19. Sketch. Geotextile tube with internal berms (Stephens & Melo, 2013).

To bind the soil particles of the sediments with the contaminants and to flocculent the solids inside the geotextile tube, an organic polymer was mixed with the hydraulically dredged sediments during placement in the tubes. The effluent water from the geotextile tubes was released to the natural environment after being processed through the on-site water treatment plant to remove dissolved heavy metals and obtain a neutral pH of 7. A drainage gravel layer also was placed over the geotextile tube after the dewatering of each cell and before placement of the overburden fill or pressure to further consolidate the sediments in the tubes.

To accelerate sediment consolidation and settlement of the geotextile tubes, overburden pressure of up to 11.4 psi was applied over a geotextile dewatering cell and was removed and placed over the adjacent cell once consolidation and settlement was achieved, as shown in Figure 20. After the end of the overburden consolidation stage, the container area was paved to facilitate traffic access. Figure 21 shows a typical section of the pavement design on top of the consolidated dredged material. Figure 22 shows the container area in Santos, Brazil, after completion.

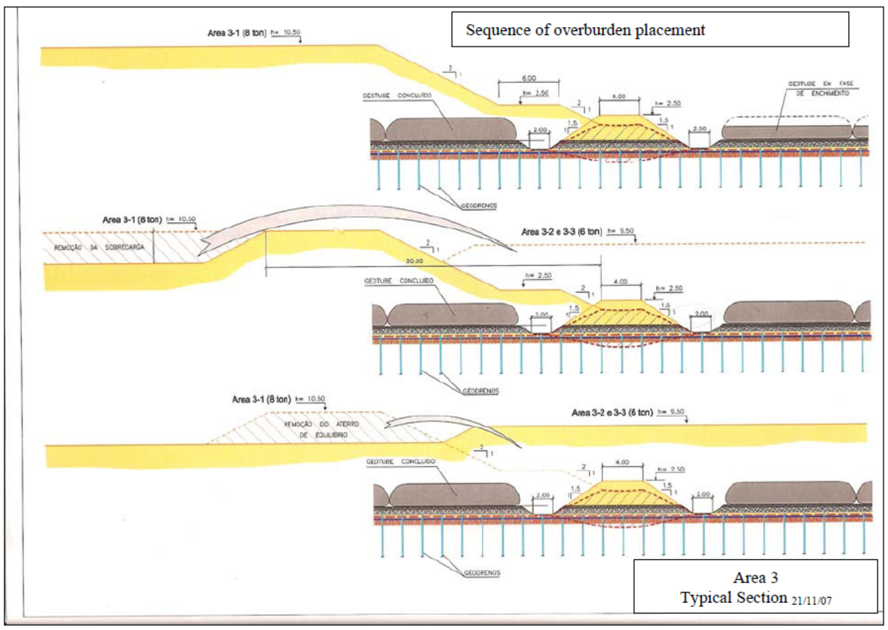

Figure 20. Sketch. Geotextile tube overburden placement sequence (Stephens & Melo, 2013).

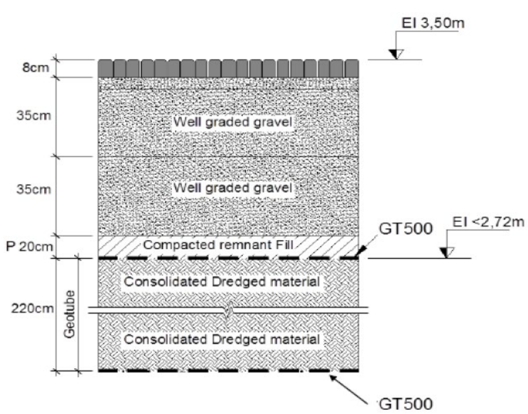

Figure 21. Sketch. Pavement design (Stephens & Melo, 2013).

Figure 22. Arial Photo. Project when completed in 2014 (Stephens & Melo, 2013).

DECONTAMINATION USING CEMENT/BENTONITE SLURRY

Finn (2012) presented a case study of on-site beneficial use of dredged material in a fill area in New Bedford, Massachusetts, to handle contaminated material (see Figure 23). In this case study, the main reason for using dredged material was to eliminate the cost of transporting contaminated material off-site for treatment and disposal. The existence of an oil sheen due to a former manufactured gas plant adjacent to the boat slip area that produced residual coal tar raised an environmental concern about contamination. In other words, the prior history of the site indicated a potential for contamination. The area of the inner and outer slips is 4.5 hectares. To contain the dredged material in the two containment cells, two sheet-pile walls were installed across the width of the inner slip. A slurry of 8% to 10% of Type 1 Portland cement was injected and mixed with around 9,150 yd^3 of dredged material in the slip area to produce a low hydraulic conductivity and high-strength material. The solidification process consists of auger mixing the sediments and the added cement/bentonite slurry.

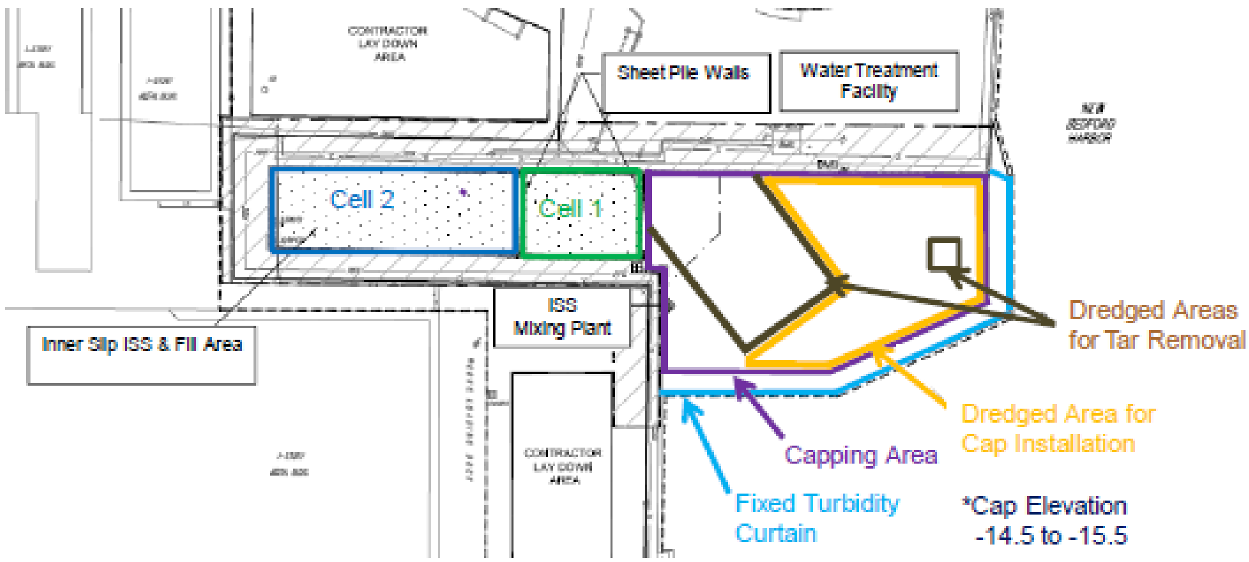

Figure 23. Sketch. Design of sediment remedial action (Finn, 2012).

ECONOMIC BENEFITS OF USING DREDGED MATERIAL

According to Bennett (2021), dredging the lower Mississippi River from 45 to 50 ft could generate $461 million annually for the U.S. soybean industry. At ports along the mouth of the Mississippi River, ships can currently carry a maximum of 2.4 million bushels of soybeans while an extra 5 ft in depth would allow a ship to squeeze in an additional 2.9 million bushels at a small increase in transport costs. Started in 2020 and scheduled for completion by 2022, the Mississippi River Ship Channel Dredging Project will cost roughly $270 million and is expected to return $7.20 for every $1 spent, according to USACE estimates (Bennett, 2021). This project is not only for Louisiana, but is also key for Illinois, Ohio, Iowa, and many other states that export soybeans. The dredged material will be used as shoreline protection by USACE. For example, Louisiana has long struggled with shoreline erosion, so the dredged material will help build resiliency for the Pelican State coastline, including an increase in wildlife habitat.

CHAPTER 3: STATUTES AND REGULATIONS

This chapter summarizes the main statutes and regulations regarding the beneficial reuse of dredged material. Details of the main requirements are presented in Appendix B, including statutory and regulatory definitions, acronyms for regulatory citations, state and federal regulations, and states adjacent to Illinois.

The United States Army Corps of Engineers (USACE) and the United States Environmental Protection Agency (USEPA) develop federal policy and regulations that must also be observed on a state and local level. USACE requirements primarily relate to locations where dredged material could potentially be placed within the waterway and/or the floodplain. The primary responsibilities for USEPA relate to potential human health or ecological impacts associated with dredging and disposal practices as well as protection of surface water and groundwater resources.

The USACE regulates construction, dredging, and fill placement in waters of the United States under permits issued under Section 404 of the Clean Water Act (CWA, 2002). Sediment and soil dredged or excavated as part of a river crossing project cannot be used or disposed of within the floodplain and must be placed in an upland, non-wetland area, unless specifically authorized by USACE, USEPA, or a state agency with delegated authority. USACE regulations are primarily concerned with placement of fill within the floodplain. USACE permits for river crossings do not define “clean” and/or “contaminated” soil or sediment and do not regulate management of dredged spoils.

The Illinois Department of Natural Resources and units of local government (through floodplain development ordinances required for participation in the Flood Insurance Program) also have jurisdiction over placement of fill in the floodplain.

Under the Illinois Environmental Protection Act, the Illinois Pollution Control Board (IPCB) adopts environmental regulations and adjudicates complaints for noncompliance. Illinois EPA is responsible for permitting, compliance, and enforcement; Illinois EPA also has focused rule-making authority. IPCB has adopted regulations that define clean or uncontaminated soil under Section 742 of Part 35 of the Illinois Administrative Code, also known as the Tiered Approach to Corrective Action Objectives (TACO, 1997). In practical terms, the TACO Residential Criteria (1997) define clean or uncontaminated soil. Under these rules, clean soil that meets Residential Criteria, as listed in 35 IAC 742 Subpart E (Illinois Administrative Code), can be used off-site as unrestricted clean fill. IPCB has developed rules for the management of clean construction and demolition debris (CCDD) and uncontaminated soil fill operations (USFO), which rely on maximum allowable contaminant (MAC) concentrations. MAC concentrations are based on the TACO Residential Criteria (1997).

IPCB remediation standards relevant to the use and disposal of potentially contaminated soil, including dredged spoils from river projects, are incorporated into Article 669.05 of IDOT’s *Standard Specifications for Road and Bridge Construction.* These specifications stipulate conditions for use of potentially contaminated soil within IDOT right-of-way (ROW). Specific conditions for individual IDOT construction projects are incorporated as special provisions.

IPCB regulations allow for placement of impacted soils, including sediments, that do **not** meet TACO Residential Criteria (1997), but the fill placement site must be subject to enforceable environmental land-use controls (ELUC) recorded with the deed. Conditions specified in the ELUC would depend on characteristics of the impacted material and could include limitation to commercial/industrial uses only, prohibitions on groundwater use, the construction and maintenance of an engineered barrier to prevent access, construction worker protections, etc. Impacted material may be used beneficially as fill or cover at a commercial or industrial facility, an agricultural amendment, for daily or intermediate cover at a landfill, cover material at a reclaimed strip mine, environmental remediation site, etc. Future requirements for managing the site, including maintenance of engineered barriers, groundwater monitoring, etc. would be addressed in the ELUC.

Illinois EPA has established a permitting process through the Division of Land Pollution Control to request a Beneficial Use Determination (BUD) for material that would otherwise be considered a waste. The permit application requires detailed information about the material to be managed and the location where it would be used, including information on soil and groundwater characteristics (see Appendix I). Where possible, IDOT would beneficially use the dredged material to reclaim former borrow areas. The application would likely be prepared by the district design team with support from IDOT's Bureau of Design and Environment. The necessary timing to accomplish the permitting process is long, often measured in years, and compared to the transportation project design timetable often makes the permitting process impractical.

IPCB has also established rules for soil that can be managed through clean construction or demolition debris (CCDD) fill operations and/or uncontaminated soil fill operations (USFO) (35 IAC 1100) (Illinois Administrative Code). Commercial CCDD and USFO operations are often inactive quarries and former borrow sites. Acceptance criteria for materials that can be managed at CCDD/USFO are based on, but are more stringent than, TACO Residential Criteria (1997). Impacted soil and dredged material can potentially be land-applied to agricultural fields, subject to requirements specified by USEPA, the Illinois Department of Agriculture, and the Illinois EPA.

Currently, it is a state policy in Illinois to formally evaluate the history of possible nearby sources of chemicals that may have impacted the project sediments and to test the dredged material for chemical contamination before accepting for use on any highway project. However, according to Title 35 of the Illinois Administrative Code "Environmental Protection," Subtitle C "Water Pollution," Chapter II "Environmental Protection Agency," Part 395 "Procedures and Criteria For Certification of Applications For Federal Permits or Licenses For Discharges Into Waters of The State," Section 395.204 "Material Testing Exemptions" (Illinois Administrative Code, 35):

Dredge and fill material will be considered nonpolluted and, therefore exempt from testing if all of the following conditions exist:

a) The material is composed predominantly of sand, gravel or other naturally occurring sedimentary material with particle size larger than silt, as defined in Section 395.205 (a) (1).

b) The characteristics of the material at the disposal site are similar to the excavated material.

c) The excavation site is removed from known sources of pollution, toxic contamination and incidence of spills.

d) The discharge does not occur in waters of Lake Michigan or any waters determined to be nondegradation waters.

e) The discharge does not interfere with or threaten municipal or other public and food processing water supply sources.

f) The discharge is adjacent to the disposal site and the quality of the discharge is similar to natural background conditions.

Section 395.205 (a) (1) is (Illinois Administrative Code, 35):

> Particle size analysis (or sand/fine split) using a No. 230 U.S. sieve. For material resulting in 20 percent or greater passage of the sieve, resuspension testing is required.

Furthermore, starting on February 25, 2022, the Chicago District will be adopting the Nationwide Permit (NWP) Program in its entirety and will be transitioning out of the Illinois Regional Permit Program until it expires on April 1, 2022 (USACE, 2022). According to the Nationwide Permits in Illinois—Fact Sheet No.8 (IL)—Effective March 19, 2017 (USACE, 2017):

> Backfill used within trenches passing through surface water of the State, except wetland areas, shall be clean coarse aggregate, gravel or other material which will not cause siltation. Excavated material may be used only if:
>
> A. Particle size analysis is conducted and demonstrates the material to be at least 80% sand or larger size material, using a #230 U.S. sieve; or
>
> B. Excavation and backfilling are done under dry conditions.

The Midwest States Survey conducted in this study (see Chapter 6 and Appendix H) show that for Michigan, Iowa, Minnesota, and Ohio dredged material is considered to be uncontaminated if it has less than 10%, 10%, 7%, and 20% of fine-grained material passing sieve no. 200, respectively.

Therefore, the research team suggest that if the dredged material is mainly uncontaminated sand (e.g., greater than 80% sand) and is from a local site that does not have a history of contamination, as determined by a formal evaluation, then the material is unlikely to be contaminated and maybe easier to use and require little to no contaminate testing. This suggested rule will be further examined in Chapter 5.

CHAPTER 4: CHARACTERIZATION OF ILLINOIS DREDGED MATERIAL

This chapter describes the typical characteristics of material dredged in Illinois for planning purposes. More focus has been given to the Illinois River system, because it is the main source of dredged material in Illinois. Materials eroded from Illinois' stream banks, beds, and farmlands make up most of backwater sediments (Marlin, 2002). Heavier suspended particles drop out of suspension quicker than lighter particles in waters with high velocity. Fine-grained particles drop out of suspension when water reaches a low velocity. Therefore, sand sediments are usually found in the commercial navigation channels on large rivers in Illinois. Fine-grained sediments are usually found inside channels, backwaters, and marinas because of the low water velocity in these places. However, in the case of tributaries, sand, i.e., coarse-grained deposits, can be deposited away from the main channel, forming deltas. Sediments in Illinois mostly result from urban runoff and erosion from farmland, beds, and stream banks. Therefore, a site-specific criterion and determination is usually needed to determine the locations of sand and fine sediments due to the different flow velocities of the sites (Marlin & Darmody, 2005). Also, reservoirs in Illinois accumulate sediments and do not have navigation channels, so there are limited sand deposits.

Three rivers are the main sources of dredged material in Illinois: Illinois, Mississippi, and Kaskaskia. The Illinois River in central Illinois (see Figure 24) is critical for large river fish and migratory birds in North America (Marlin & Darmody, 2005). The Illinois River is the main river system through Illinois, so it is a focus in this section. Due to degradation of the river habitats since 1900, many fish species, benthic insects, waterfowl, floodplain hardwoods, aquatic plants, and mussels have declined (Marlin & Darmody, 2005). According to a 1985 survey, the Illinois River's backwater lakes have degraded by 70% because of low water depth. Aquatic habitats are greatly affected by reduced water depth, e.g., fish need more than 7 ft (2 m) of water for overwintering. Most sediments in the Illinois River's navigational channel are sandy and may be classified as uncontaminated, while sediments in backwaters are fine grained (Marlin, 2004). The sediment depth in Peoria Lakes near the intersection with the navigation channel reaches a depth of about 10 ft (3 m) (Marlin & Darmody, 2005).

The topsoil in central Illinois is considered fertile soil because of its high moisture-holding capacity, presence of calcium, favorable pH, organic matter, and high amounts of extractable potassium, sulfate, phosphorus, and magnesium, with no excessive amounts of zinc and copper (Darmody & Marlin, 2008). This favorable topsoil is similar to dredged material because the Illinois River's sediments are derived from the river's watershed and surface soil (Marlin & Darmody, 2005). The watershed location of the Illinois River is shown in Figure 24. There are thousands of acres of farmland with sandy topsoil along the river, resulting in sandy dredged material (Marlin, 2002). Therefore, for some places where the soil is sandy, water-holding capacity can be improved by adding sediment (Darmody & Marlin, 2008).

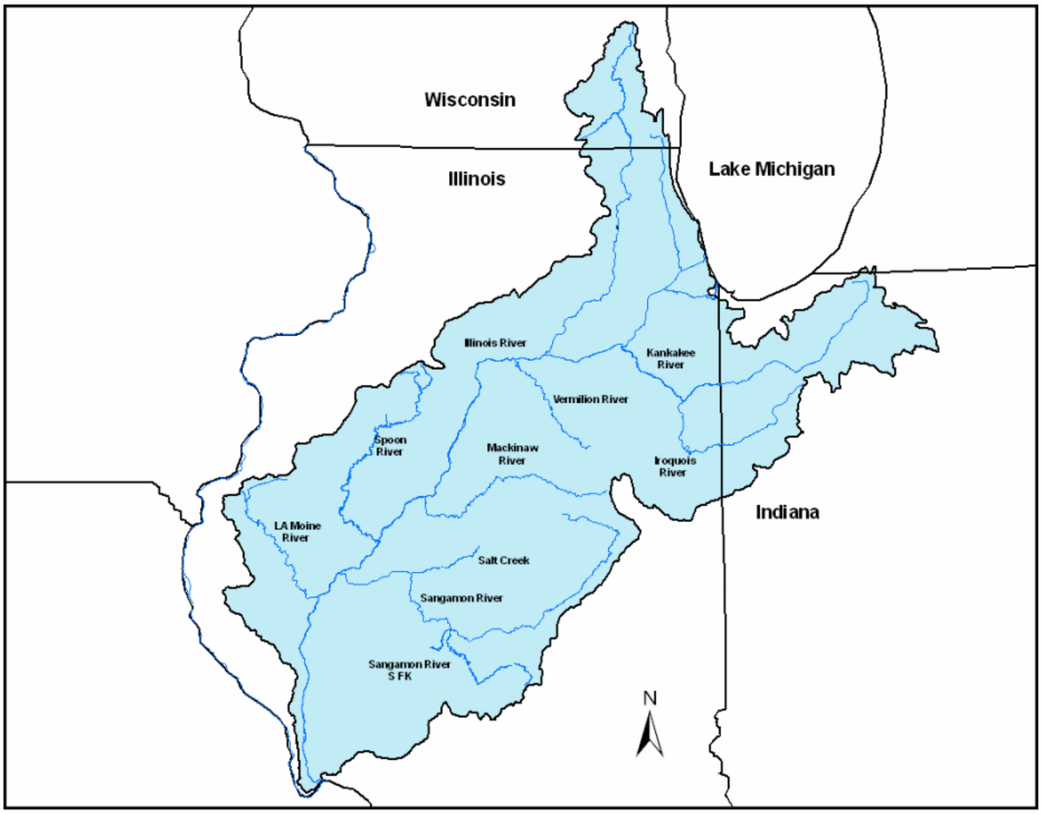

Figure 24. Map. Illinois River drainage basin (White et al., 2005).

Dredging the Peoria Pool has the potential to yield about 130 million yd^3 of dredged material over the next 20 years, with annual dredging of 6.5 million yd^3 of sediments (Marlin & Darmody, 2005). Annually, about 6.5 million yd^3 is dredged to maintain the Illinois River in this area, which is in addition to the Peoria Pool (Marlin & Darmody, 2005). The annually delivered sediments to the river valley are about 13.8 million tons, and 8.2 million tons are carried out to the valley (i.e., floodplains, channel lakes, and backwaters). The other 5.6 million tons are deposited in the Mississippi River.

Marlin and Darmody (2005) suggest that dredged material could be mixed with biosolids, compost, or other materials for beneficial uses. Darmody and Marlin (2008) show that there is about 155 million yd^3 of material that could be dredged from the Peoria Lakes just north of Peoria on the Illinois River. Darmody and Marlin (2002, 2008) show that Peoria River sediments consist of silty clays and silty clay loams with organics matter of 3% to 5%, so this material may be favorable for topsoil depending on the contaminants and measured concentrations. Dredged material in the Peoria Lakes consists primarily of fine-grained silt and clay particles (Marlin & Demissie, 2004) off the main channel, so it has a high potential for contamination. In fact, it has a higher metal concentration than that of the material considered for topsoil (Darmody & Marlin, 2008). The source of the higher metal concentration in the dredged sediments is the industrial inputs along the Illinois River watershed (Darmody & Marlin, 2008; Darmody et al., 2004). However, the concentration of these metals is not known and variable. As a result, 72% of the storage capacity of the backwater lakes was depleted by 1990 (Darmody & Marlin, 2008). Due to the annual accumulated sediments in the Peoria Lakes of the Illinois River, the average water depth decreased from 7.6 to 2.0 ft in 1986 (Darmody & Marlin, 2008).

Most sediments from the Peoria Lakes' river consist of mainly silty clays and silty clay loams with little sand (Marlin & Demissie, 2004).

The strength of the freshly deposited sediments is low because of its high water content, absence of coarse spoils, and lack of contrasting compacted layers. However, this low strength can be an advantage for agricultural purposes because plant growth is better in compressible soil. Also, this soil can be blended with sandy soils to increase its water capacity and decrease pollutant leaching (Darmody et al., 2004).

The Mississippi River parallels the western boundary of the State of Illinois (see Figure 24) and is vital for commerce. Data on the material dredged from the Mississippi River were obtained from USACE's Saint Louis District. The next two paragraphs summarize data on the characteristics of the Mississippi River's dredged material.

Data from 1995 to 2018 provided by USACE show dredged material from the Mississippi River is predominantly poorly graded sand, with a Unified Soil Classification System (USCS) (ASTM D2487) designation of SP. This sandy material mainly consists of about 75% medium sand, 20% fine sand, and less than 5% coarse sand. In some places, the fine sand and/or coarse sand can be about 50%, but the sand still classifies as poorly graded (SP). The dredged material consists of less than 1% fines, i.e., percent passing through the no. 200 sieve and less than 1% gravel retained on the No. 4 sieve. However, the percentages of fines and/or gravel can reach as high as 4% to 8%. In certain locations, the dredged material consists of sandy silt with more than 50% passing the no. 200 sieve.

The characteristics of the Mississippi River's dredged material did not change significantly from 1995 to 2018. However, small variations in the percentages of soil type were observed frequently, but the USCS designation did not change from SP. In particular, it is common for small increases in fine sand and/or coarse sand to occur with a decrease in the percentage of medium sand. Between 1995 and 2018, an increase in fines was not observed, so the source of fines may be caused by local activities.

The Kaskaskia River Basin, or watershed, encompasses approximately 3,675,000 acres (10.2% of Illinois' land area) and is the second-largest river basin in Illinois (Metzke & Hinz, 2017). Typical soils in the Kaskaskia River Basin contain high silt and clay content (Knapp, 1990). The upland soils are comprised of loam and clay, but lowlands are dominated by river deposits like sand and gravel (Metzke & Hinz, 2017). The extreme upper reaches of the Kaskaskia River are extensively channelized to drain prairie soils of brown silt loam and black clay loam (Larimore et al., 1973). South of the Shelbyville Moraine (near Shelbyville) the basin is generally rolling farmland of silty clay soils, dissected by many small streams (Larimore et al., 1973).

AVAILABLE SANDY DREDGED MATERIAL FOR PUBLIC USE

USACE's Rock Island District (n.d.) provides details for sites along the Illinois Waterway and Mississippi River, where dredged materials consisting of mainly uncontaminated sand are freely available to the public. Appendix C shows the locations of eight sites along the Illinois Waterway and the Upper Mississippi River: Beardstown sites, Kingston Mines and Mackinaw River sites, Senate Island, Duck Island and Copperas Creek sites, Starved Rock Lock and Dam sites, Buzzard Island, Keithsburg, and Northeast Missouri Power. Theiling (2020) in an unpublished article reported the quantities and particle size distribution for the previously mentioned sites in Illinois (except Senate Island and the Duck Island and Copperas Creek sites) and another site (Bull's Island).

The Starved Rock Lock and Dam stockpile is located behind gates in the boat yard. It is a small site of less than 2 acres with 100,000 yd^3 of material. The material is mostly fine sand, but one site had mixed gravel, sand, and clay (Theiling, 2020).

The Mackinaw River and Kingston Mines sites are near Pekin, Illinois, at the mouth of the Mackinaw River. The Mackinaw site has an area of 60 acres and has nearly achieved its full capacity of being larger than 1 million yd^3. The Mackinaw River transports coarser material than the Illinois River, where the stockpiled material consists of gravelly coarse to fine sand (Theiling, 2020).

The Beardstown site, located near Highway 67 at Beardstown, Illinois, has over 500,000 yd^3 of material in one 14-acre site and a smaller 5-acre site. Bedload from the Sangamon River is finer than the Mackinaw River. Material at the Beardstown site is gravelly, medium to fine sand (Theiling, 2020). Bull's Island is about 7.5 acres, with 300,000 yd^3 consisting of medium to fine sand near Ottawa, Illinois (Theiling, 2020).

CONSTRAINTS FOR BENEFICIAL USE OF DREDGED MATERIALS

One of the first stages of studying the feasibility of beneficial use of dredged material is the logistical and economic constraints. There are many factors that can impede the beneficial use of Illinois' dredged material besides the level of contamination. These common factors include transportation distance between the beneficial use site and the source of dredged material, dredging method and its cost, time and cost of the dewatering process, seasonal availability of the dredged material, the difference between the market prices of traditional materials and dredged material, and community concerns (Great Lakes Dredging Team, 2004).

According to Paragon (n.d.), the latest data from the National Private Truck Council show the average trucking cost per mile in the U.S. for private fleets is $2.90. Transportation costs of dredged material are of great importance. It could be the determining factor for the feasibility of a project and exploring other transportation alternatives could reduce the costs. There are several options for transporting dredged material from its source to the beneficial use site, such as by barge, truck, rail, conveyor system, and hydraulic/slurry transportation. The lowest cost per mile is by rail and barge, but these modes also have the least availability. If the required transportation distance is low, i.e., less than a few miles, hydraulic dredges can be the best option. It is usually beneficial to dewater, decontaminate, and/or stabilize the dredged material before transportation because the wet material has more volume and weight, which is directly proportional to the transportation cost (Great Lakes Dredging Team, 2004).

CHAPTER 5: IDENTIFYING AND EVALUATING DREDGING PROJECTS FOR POTENTIAL BENEFICIAL REUSE IN ILLINOIS

This chapter discusses Illinois dredging projects that could be used for potential beneficial reuse applications. This includes identifying the dredged material's type and grain size distribution and performing contamination and analytical analyses of the dredged material. Five Illinois projects were investigated in this section: Beardstown, Bull's Island, Starved Rock Lock and Dam, Mackinaw River, and McCluggage Bridge. Appendices F and G present data on sediment material from the Centennial Bridge and Rockton projects, respectively.

BEARDSTOWN, ILLINOIS

As mentioned in Chapter 4, USACE's Rock Island District (n.d.) provides details for sites along the Illinois Waterway and Mississippi River, where dredged materials consist of mainly uncontaminated sand and are freely available to the public. Of relevance to this section are the Beardstown sites located near Highway 67 in Beardstown, Illinois. An aerial photo with the location of the Beardstown sites is shown in Figure 25 and in Appendix C. The Beardstown sites have over 500,000 yd^3 of material in one 14-acre area. Site 1 is about 9 acres, and site 5 is a smaller, 5-acre site (shown in Figure 25 and Figure 26, respectively). Materials at the Beardstown sites are gravelly, medium to fine sand (Theiling, 2020).

WOOD Environment & Infrastructure Solutions, Inc. (WOOD) was tasked by IDOT's Bureau of Design and Environment to investigate the dredged material from sites 1 and 5 at the Beardstown sites. Sites 1 and 5 were sampled at 16 and 8 locations, respectively, for testing. The investigation consisted of characterizing volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, polychlorinated biphenyls (PCBs), herbicides, pesticides, and fecal coliform. The test results show elevated pH levels in site 1. No other analytic result surpassed an applicable criterion.

Aerial photos showing the sampling locations for sites 1 and 5 are shown in Figure 25 and Figure 26, respectively. WOOD completed 24 soil borings (S1-1 through S1-16 at site 1 and S5-1 through S5-8 at site 5) at the dredged materials management sites. The boring depth for the sampling at every location was 4 ft.

Analytical Analysis

WOOD collected six dredged material samples from the project area for laboratory analysis, where four samples were collected from site 1 and two samples were collected from site 5. Samples were shipped to Test America Laboratories in Chicago (a National Environmental Laboratory Accreditation Program [NELAP]-accredited laboratory) under chain-of-custody procedures in accordance with the IDOT-approved Statement of Procedures and in accordance with the analysis depicted on Table 1 upon completion of sampling activities. Fecal coliform analysis was completed by PDC Laboratories, Inc. in Peoria, Illinois (a NELAP-accredited laboratory). Appendix D provides a comparison of the analytical results for the dredged materials and the applicable regulatory criteria. Field evidence of VOCs was not observed during PID headspace screening of site soils.

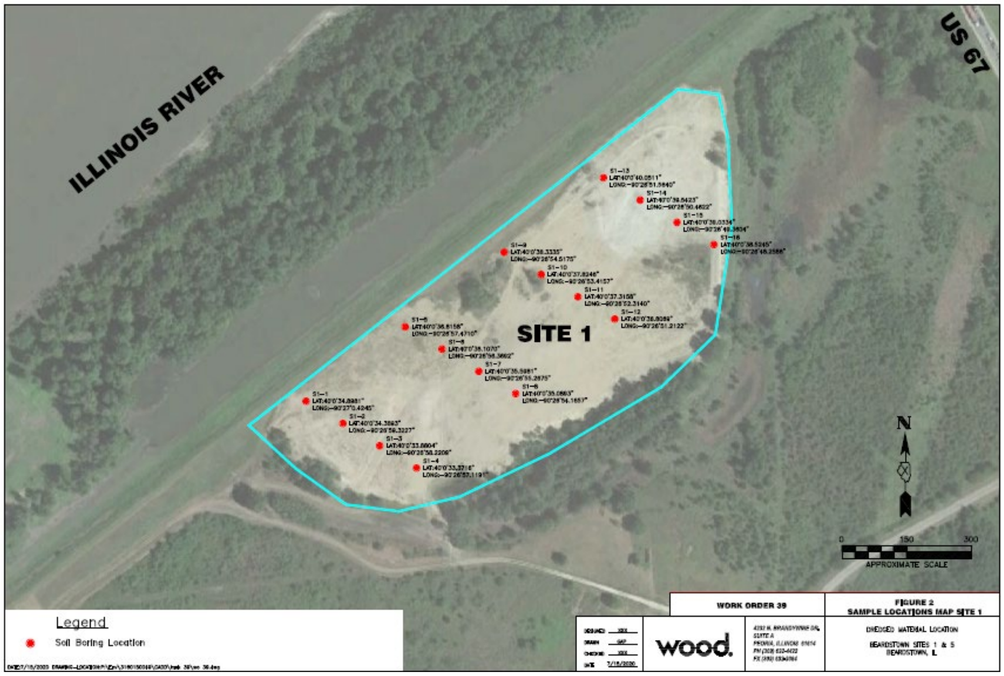

Figure 25. Arial Photo. Sample locations for Beardstown site 1.

Figure 26. Arial Photo. Sample locations for Beardstown site 5.

WOOD also evaluated sample pH levels and the results of PID headspace screening pursuant to 35 IAC 1100.201(g) and 205(b)(1), respectively. Soil pH must be between 6.25 and 9.0 standard units for the soil to be accepted at a clean construction demolition debris (CCDD) facility or an uncontaminated soil-fill operation (USFO). Soils with a pH measurement outside of the acceptable range but otherwise not impacted by VOCs may be used on-site as fill or disposed of off-site in accordance with Article 202.03 (IDOT, 2022). The obtained analytical results are below criteria for the contaminants of concern that were analyzed, except for pH. The pH results for the composite soil sample S1 (S1-5 through S1-8) and composite dredged material samples S1 (S1-9 through S1-12) is 9.1, which slightly exceeds the maximum allowable concentration (MAC) (Illinois Administrative Code) criteria for a pH of 9.0. No other analyte investigated in accordance with the approved work plan exceeded applicable criterion. Table 1 summarizes boring information, analytical results, and IDOT classification for soil management.

Table 1. Boring Information and Analytical Results (WOOD, 2020-b)

Boring ID	S-1 (S1-1 to S1-4)	S-1 (S1-5 to S1-8)	S-1 (S1-9 to S1-12)	S-1 (S1-13 to S1-16)	S-5 (S5-1 to S5-4)	S-5 (S5-5 to S5-8)
pH	8.9	9.1	9.1	8.8	9	8.8
PID Reading	0	0	0	0	0	0
Contaminants of Concern Above Total Metal, TCLP, and SPLP Criteria	None	None	None	None	None	None
Contaminants of Concern Above TCLP and/or SPLP Criteria	None	None	None	None	None	None
Contaminants of Concern Above TACO Construction Worker Criteria	None	None	None	None	None	None
Contaminants of Concern Above a MAC	None	None	None	None	None	None
Off-Site Management: Eligible for CCDD or USFO?	Yes	No	No	Yes	Yes	Yes
Classification	Unrestricted	Uncontaminated	Uncontaminated	Unrestricted	Unrestricted	Unrestricted
IDOT 669 Designation of the Standard Specifications for Road and Bridge Construction (IDOT, 2022)	n/a	Article 669.05 (b)(1) (IDOT, 2022)	Article 669.05 (b)(1) (IDOT, 2022)	n/a	n/a	n/a

IDOT 669-05 (a-5): Soil Analytical Results Do Not Exceed Most Stringent MAC. When the soil analytical results indicate that detected levels do not exceed the most stringent MAC, the excavated soil can be utilized within the right-of-way as embankment or fill, when suitable, or managed and disposed of off-site according to Article 202.03 of the Standard Specifications for Road and Bridge Construction (IDOT, 2022). However, the excavated soil cannot be taken to a CCDD facility or an USFO for any of the following reasons:

(1) The pH of the soil is less than 6.25 or greater than 9.0.

(2) The soil exhibited PID or FID readings in excess of background levels.

Grain Size Analysis

As stated previously, all six samples of the Beardstown dredged material were uncontaminated, so there is no restriction on their beneficial use. The suggested method for assessing reuse of dredged material if grain size distribution shows more than 80% of the dredged material is retained on the no. 200 (75 μm) sieve (ASTM E11), then the dredged material is coarse grained, i.e., sand, and thus is unlikely to be contaminated if dredged from an area that does not have a history of contamination. The contamination history of a site is derived from a formal evaluation process used by IDOT. Therefore, grain size analysis was performed on all six composited dredged material samples to determine the percent passing the no. 200 sieve, and the results are shown in Figure 27 and Figure 28 for sites 1 and 5, respectively. Particle size analysis of the composited dredged material samples show the material is dominated by sand-sized particles (89% or higher) with minor percentages of silt and clay. Composited dredged material sample S5 (S5-5 through S5-8) has a gravel-sized particle percentage of 7.1%, whereas the other analyzed composite soil samples have a gravel-sized particle percentage between 0.0%–1.6%. The percent passing the no. 200 sieve ranges between 2.0% to 3.9% for all samples, which is less than 20%. The six samples were found to be uncontaminated or unrestricted, so this is in agreement with the suggested method herein of using the no. 200 sieve to determine if the material is unlikely to be contaminated (e.g., according to the Minnesota Pollution Control Agency (MPCA), no permit is required for the management of dredged material when the material has greater than or equal to 93% of sand based on the No. 200 sieve [Stollenwerk et al. 2014]). However, IDOT may need to evaluate the dredged material on a case-by-case basis due to the liabilities associated with the proper management of regulated substances, to include hazardous, special, and non-special waste. Currently, it is a state policy in Illinois to formally evaluate the history of possible nearby sources of chemicals that may have impacted the project sediments and to test the dredged material for chemical contamination before accepting for use on any highway project. The boring logs for the 16 borings in site 1 and the 8 samples in site 5 are shown in Appendix D.

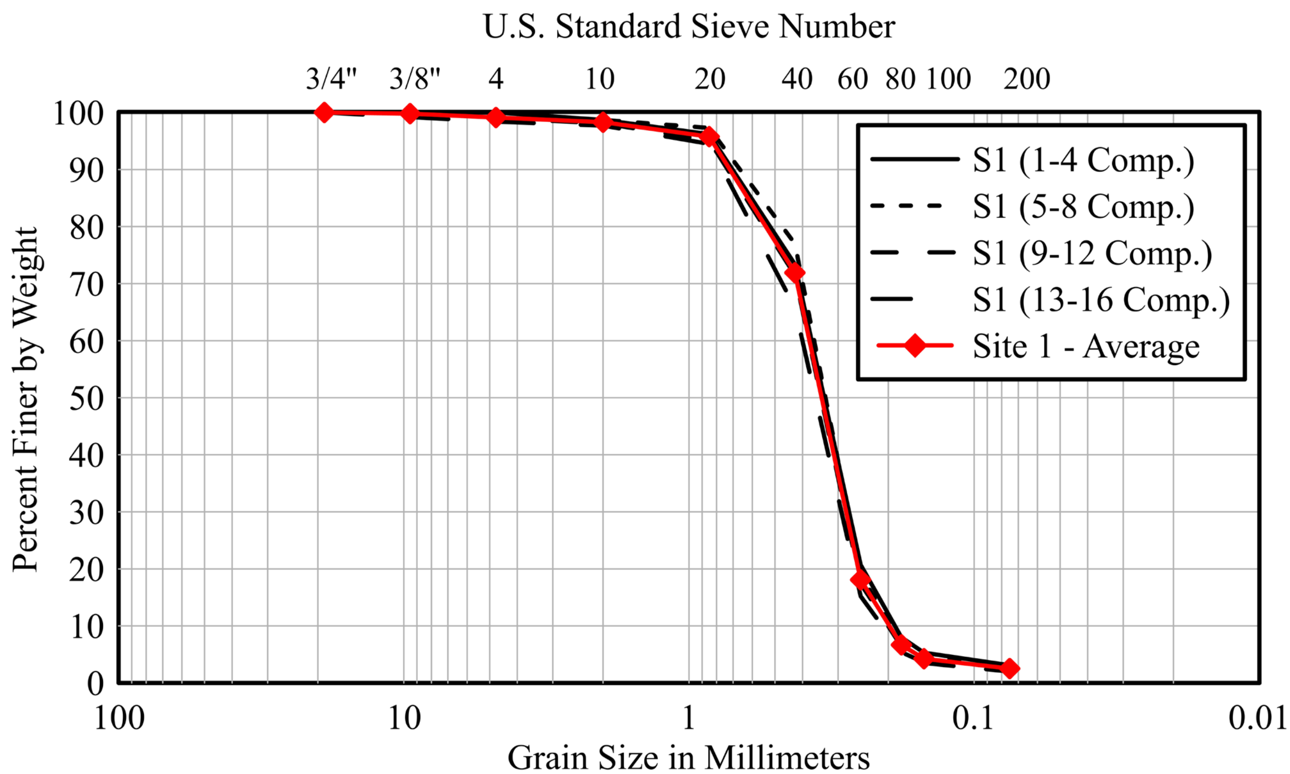

Figure 27. Graph. Beardstown site 1 soil gradations.

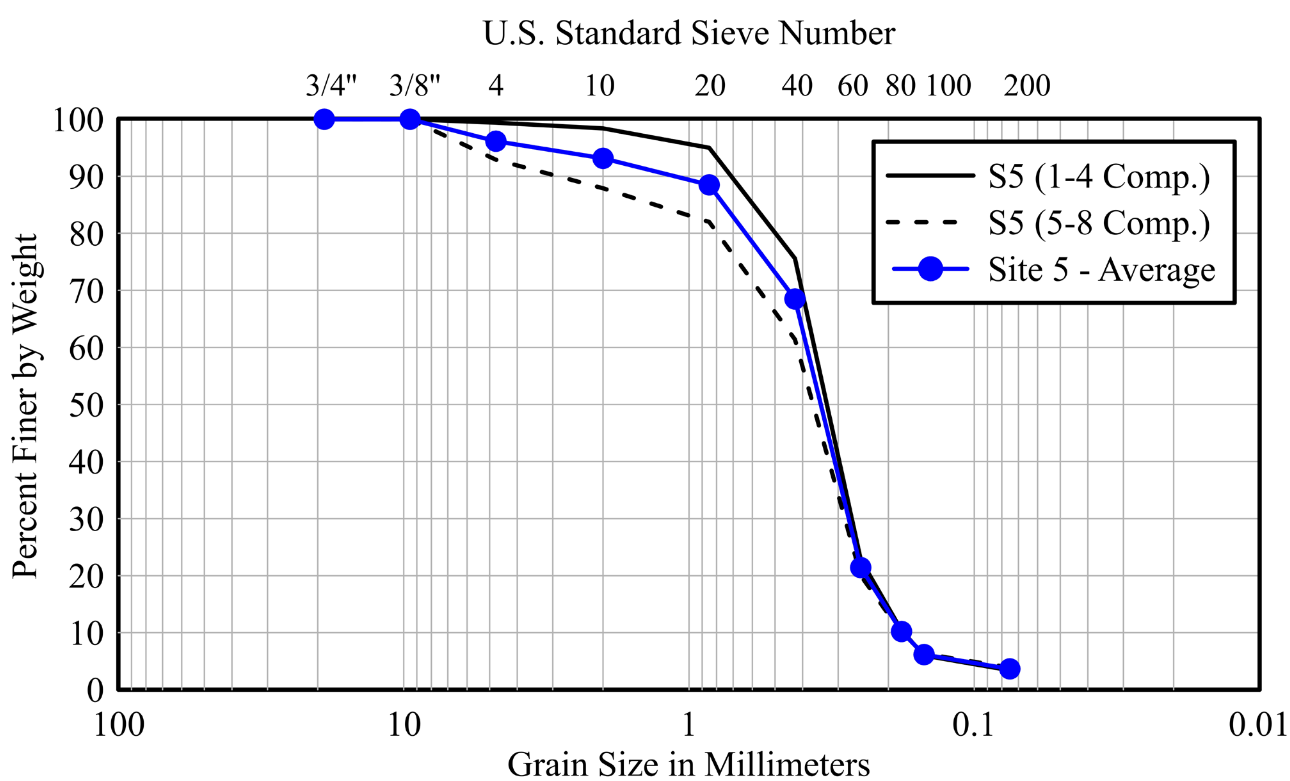

Figure 28. Graph. Beardstown site 5 soil gradations.

Because the sandy dredged material at sites 1 and 5 in Beardstown is uncontaminated, this material could be used in a variety of applications such as creating sandbags for flood control, as shown in Figure 29. The sand piles at Beardstown could be filled in plastic bags and used as a barrier around houses or other facilities to protect against temporary floods. Figure 29 demonstrates an example of flood-control sandbags that were taken by the first author (Timothy D. Stark) in 2011 in Ohio when Ohio River flooding occurred.

(a)

(b)

(c)

(d)

Figure 29. Photos. Photographs of (a) and (b) sandbags to protect a residence and (c) and (d) a public sandbag filling area in Ohio when Ohio River flooding occurred in 2011 (Photos taken by T. D. Stark).

On the other hand, the piled sand at Beardstown could be modified by mixing additional soils with specific gradations to meet IDOT's fine aggregate gradations criteria for IDOT construction, as discussed in the following sections.

Usage of Dredged Material to Meet IDOT Fine Aggregate Gradations

Dredged material must meet established IDOT aggregate gradations to be geotechnically acceptable for use as an aggregate in IDOT projects. The material could also be used as borrow soil for embankment construction (Section 204 of IDOT, 2022). If it is used as borrow soil, then it would not need to be blended. However, it would be classified as “restricted-use” under Article 1009.04 of IDOT (2022) due to its high sand composition which makes it susceptible to erosion and would need to be capped with a more erosion-resistant soil, which is classified as “suitable soil” in Article 1009.04 of IDOT (2022). This section illustrates how dredged material from Beardstown sites 1 and 5 can be used to create a gradation that meets one of IDOT’s fine aggregate gradations labelled FA1 through FA6. The gradations for the dredged material from Beardstown sites 1 and 5 currently do not meet IDOT gradations FA1 through FA6. However, the dredged material from Beardstown sites 1 and 5 can be mechanically blended with additional material(s) to meet IDOT gradations FA1 through FA6, which can then be used on IDOT projects. For example, the material could be blended to create an FA1 or FA2 gradation for use as select fill for construction of a Mechanically Stabilized Earth (MSE) wall. However, it would need to meet the physical and chemical properties criteria outlined in Article 1003.07 of IDOT (2022). Material from Beardstown sites 1 and 5 will be referred to hereafter as “dredged material.” Additional material that will be added to or combined with the existing dredged material will be referred to hereafter as “added material.”

This section is organized in the following three subsections: (1) a description of the dredged material in Beardstown sites 1 and 5, (2) IDOT fine aggregate gradations FA1 through FA6, and (3) the recipe to create usable percentages of dredged material from Beardstown sites 1 and 5 to create an IDOT gradation of FA1 through FA6.

IDOT Fine Aggregate Gradations FA1 through FA6

According to Section 1003 from the *Standard Specifications for Road and Bridge Construction* (IDOT, 2022), common uses for fine aggregate gradations in IDOT projects are Portland cement concrete and mortar, hot-mix asphalt, bedding, trench backfill, porous granular backfill, sand backfill for underdrains and French drains, membrane waterproofing, and controlled low-strength material. To qualify as “fine aggregate” for use in IDOT projects, fine aggregate materials shall comply with the following criteria:

- Fine aggregate material shall fit the description of sand, silica sand, stone sand, chats, wet bottom boiler slag, slag sand, granulated slag sand, steel slag sand, crushed concrete sand, or construction and demolition debris sand. Further details on these descriptions can be found in Section 1003.01(a) of IDOT (2022).
- Fine aggregate material shall meet quality control in sodium sulfate (Na_2SO_4) soundness, minus no. 200 (75 mm) sieve material, organic impurities check, and deleterious materials check. Further details on these quality checks can be found in Section 1003.01(b) of IDOT (2022).
- Fine aggregate material shall comply with the gradation limits listed in Table 2. The results presented in the subsequent section derive from gradations FA1 through FA6 only.

Table 2. IDOT Fine Aggregate Gradations (IDOT, 2022)

Fine Aggregate Gradations											
Grad No.	Sieve Size and Percent Passing										
	3/8	No. 4	No. 8	No. 10	No. 16	No. 30	No. 40	No. 50	No. 80	No. 100	No. 200
FA 1	100	97±3			65±20			16±13		5±5	
FA 2	100	97±3			65±20			20±10		5±5	
FA 3	100	97±3		80±15			50±20		25±15		3±3
FA 4	100				5±5						
FA 5	100	92±8								20±20	15±15
FA 6		92±8								20±20	6±6
FA 7		100		97±3			75±15		35±10		3±3
FA 8			100				60±20			3±3	2±2
FA 9			100					30±15		5±5	
FA 10				100			90±10		60±30		7±7
FA 20	100	97±3	80±20		50±15			19±11		10±7	4±4
FA 21	100	97±3	80±20		57±18			30±10		20±10	9±9
FA 22	100				8±8						2±2
FA 23	100	80±10	57±13		39±11	26±8		18±7		12±6	10±5
FA 24	100	95±5	77±13		57±13	35±10		19±6		15±6	10±5

Figure 30 and Figure 31 show the average gradation relationships from sites 1 and 5, respectively, along with the upper and lower bounds of IDOT fine aggregate gradations FA1 through FA6. Figure 30 and Figure 31 show that the gradations from the dredged material from Beardstown sites 1 and 5 currently do not meet IDOT gradations FA1 through FA6. However, the dredged material from Beardstown sites 1 and 5 can be combined with fine aggregate material to meet IDOT gradations FA1 through FA6. The results are presented in two manners:

1. In the first analysis, dredged material is combined with added material pertaining to sieves between 3/8" and no. 200 as needed to achieve a gradation of FA1 to FA6. This means the added material does not have to follow a standard gradation.
2. In the second analysis, dredged material is combined with additional material that meets one or more of IDOT gradations FA1 through FA6 to produce a mix that meets one of these IDOT gradations. This means the added material corresponds to a material complying with IDOT fine aggregate gradations FA1 through FA6 so the contractor can reduce the amount of the gradation that needs to be purchased for a project by purchasing a small amount of an IDOT gradation and mixing it with the available dredged material at sites 1 and 5.

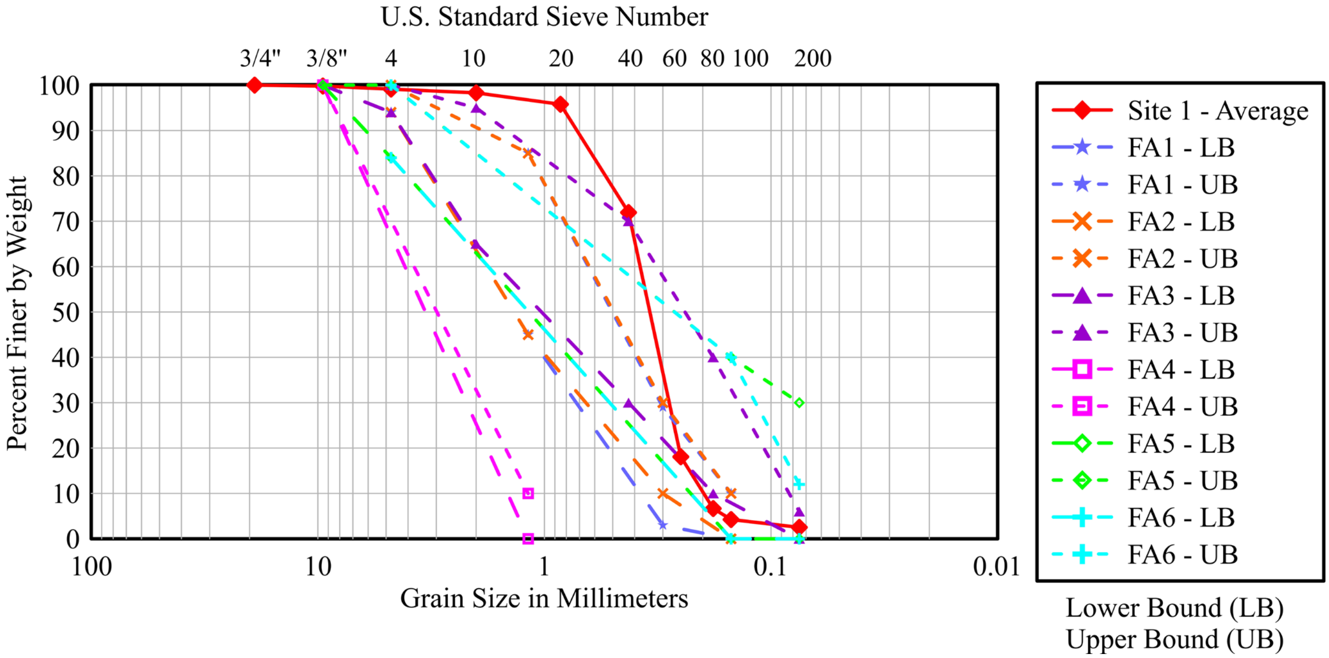

Figure 30. Graph. Beardstown site 1 soil gradations.

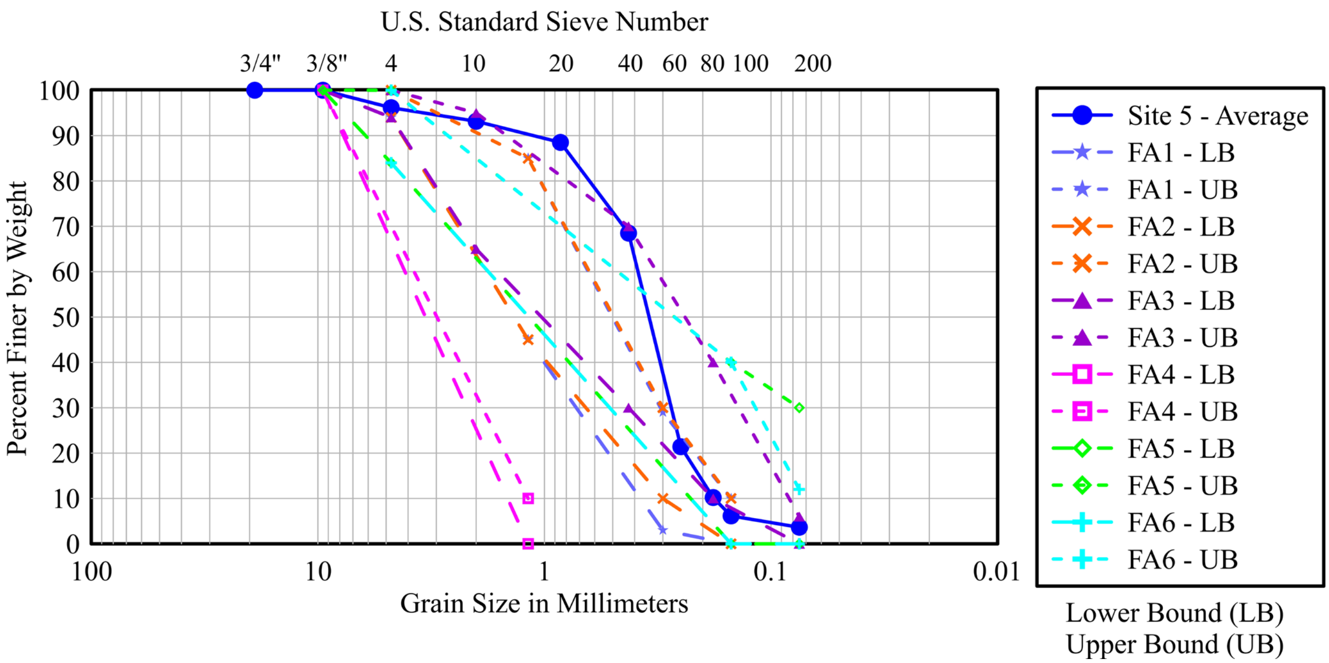

Figure 31. Graph. Beardstown site 5 soil gradations.

Usable Percentages of Dredged Material Mixed with External Material to Meet IDOT Gradations FA1 through FA6

For dredged materials to be used as an aggregate in IDOT projects, the gradation must comply with one of IDOT's aggregate gradations. IDOT fine aggregate gradations FA1 through FA6 can be met by combining a percentage of dredged materials from sites 1 or 5 with some external material to create an IDOT aggregate gradation. The gradation of the added material must be such that when combined with the dredged material, the final mix falls within the upper and lower bounds of one of IDOT's fine aggregate gradations.

Methodology

A script was written in MATLAB (2021) to determine the maximum usable percentage of dredged material to meet one of IDOT gradations FA1 through FA6 using added material between sieves 3/8" and no. 200. The workflow of the script is shown in Figure 32, and the results are summarized below.

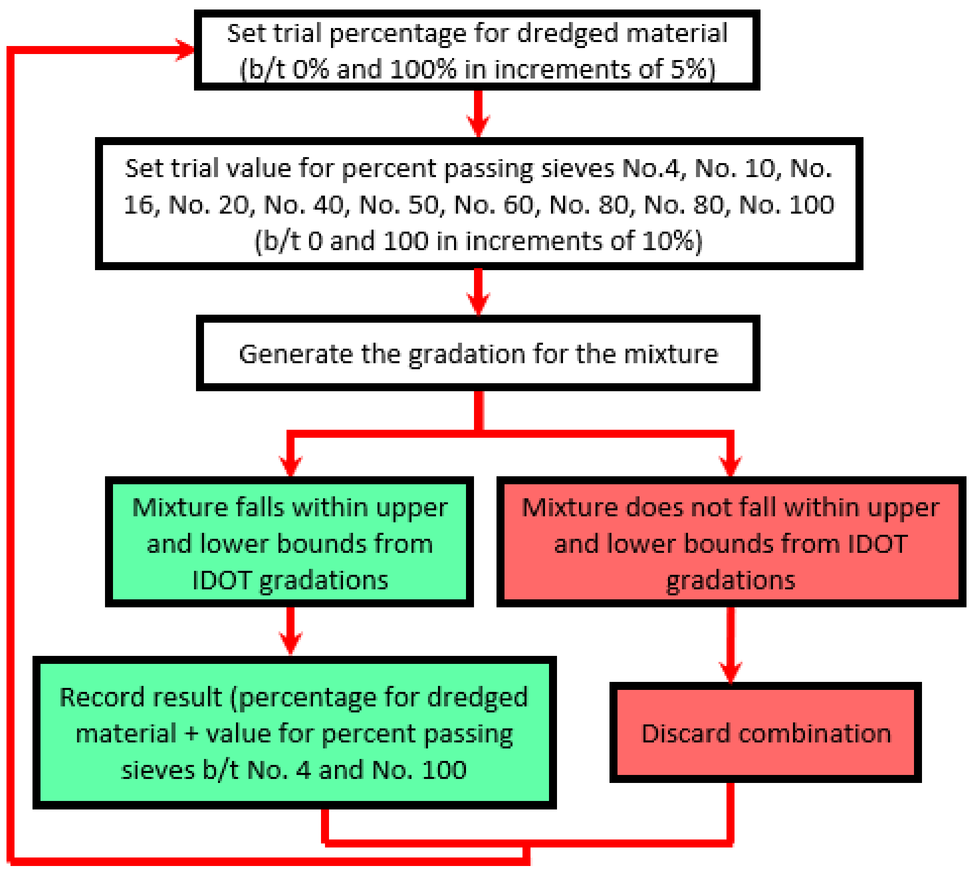

Figure 32. Sketch. Workflow to obtain results deriving from added material pertaining to sieves between 3/8" and no. 200.

Results

Table 3 and Table 4 provide the required gradation and amount of added material to be combined with the dredged material from sites 1 and 5, respectively, to match one or more of IDOT gradations FA1 through FA6. For example, consider that 1,000 tons of sand matching the IDOT FA1 gradation is needed for an IDOT project. If using the dredged material from site 1, a contractor can use 40% dredged material from site 1, i.e., 400 tons, and 60% added material, i.e., 600 tons, to match the FA1 gradation (see row 1 in Table 3). Figure 33 shows the gradation of the combined material described in this previous example. Following the order of the legend, the first relationship (see the red line with diamond symbols) represents the average dredged material gradation from site 1. The next two relationships represent the upper and lower boundaries for IDOT gradation FA1. The fourth curve (see the green line with triangle symbols) represents the gradation of the mixture resulting from using 40% of dredged material from site 1 and 60% added material, which falls within the upper and lower bounds of the FA1 gradation (see Table 3, row 1). A comprehensive set of figures summarizing the results from Table 3 and Table 4 are presented in Appendix D.

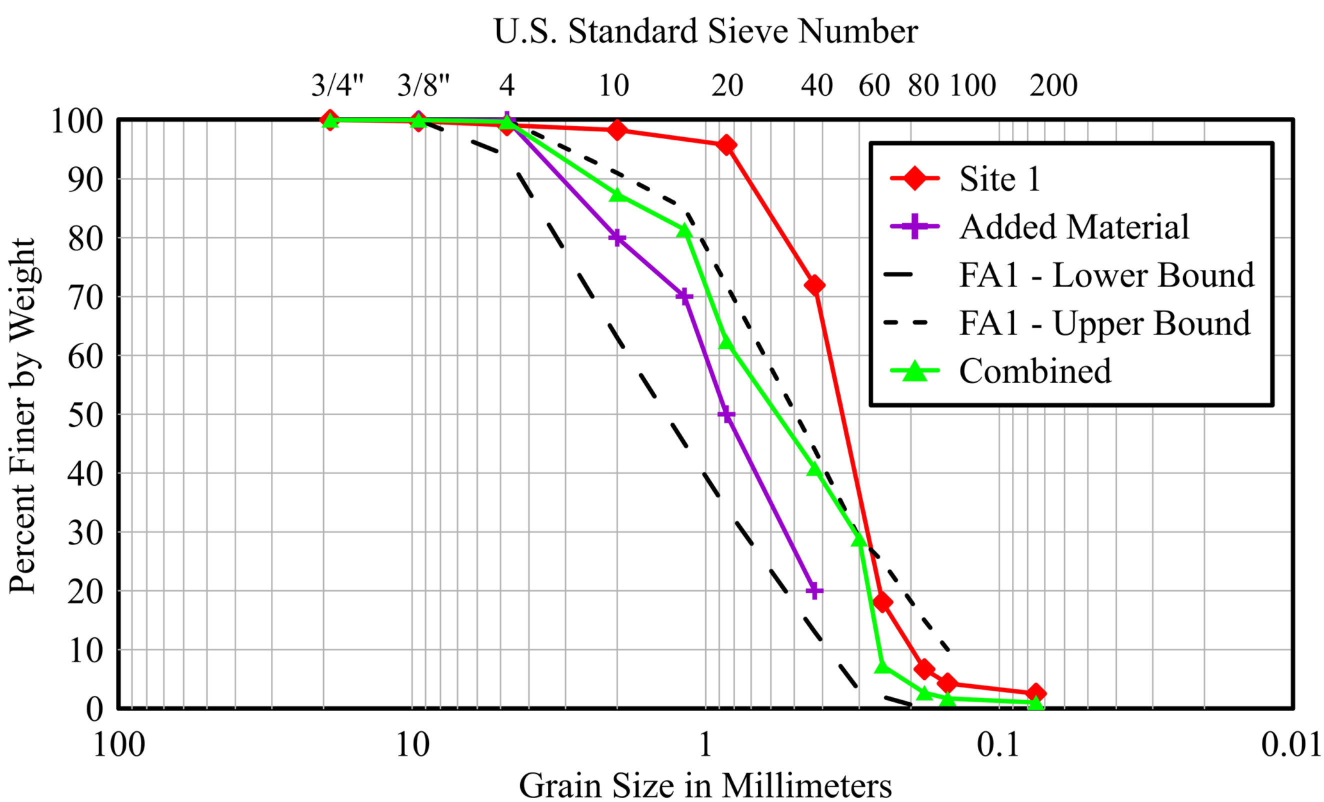

Figure 33. Graph. Obtaining IDOT FA1 gradation with 40% dredged material from site 1 plus added material.

Table 3. Use of Dredged Material from Beardstown Dredged Material Site 1

IDOT Gradation	Weight-wise percentage of dredged material to be used (%)	Sieve Size and Percent Passing for the Added Material										
		3/8″	No. 4	No. 10	No. 16	No. 20	No. 40	No. 50	No. 60	No. 80	No. 100	No. 200
FA1	**40**	100	100	70 ± 10	55 ± 15	35 ± 15	15 ± 5	0	0	0	0	0
FA2	**40**	100	100	70 ± 10	50 ± 20	35 ± 15	15 ± 5	0	0	0	0	0
FA3	**70**	100	100	70 ± 10	50 ± 10	35 ± 5	35 ± 5	22.5 ± 2.5	22.5 ± 2.5	22.5 ± 2.5	22.5 ± 2.5	0
FA4	**5**	100	67 ± 2	25 ± 3	3 ± 1	0	0	0	0	0	0	0
FA5	**70**	100	80 ± 20	40 ± 10	15 ± 5	7.5 ± 2.5	7.5 ± 2.5	0	0	0	0	0
FA6	**70**	100	80 ± 20	40 ± 10	15 ± 5	7.5 ± 2.5	7.5 ± 2.5	0	0	0	0	0

Note: Percentages are expressed weight-wise.

Table 4. Use of Dredged Material from Beardstown Dredged Material Site 5

IDOT Gradation	Weight-wise percentage of dredged material to be used (%)	Sieve Size and Percent Passing for the Added Material										
		3/8″	No. 4	No. 10	No. 16	No. 20	No. 40	No. 50	No. 60	No. 80	No. 100	No. 200
FA1	**40**	100	100	70 ± 10	55 ± 15	35 ± 15	15 ± 5	0	0	0	0	0
FA2	**40**	100	100	70 ± 10	55 ± 15	35 ± 15	15 ± 5	0	0	0	0	0
FA3	**75**	100	95 ± 5	80 ± 20	45 ± 15	45 ± 15	45 ± 15	17.5 ± 7.5	17.5 ± 7.5	17.5 ± 7.5	17.5 ± 7.5	0
FA4	**5**	100	67 ± 2	25 ± 3	3 ± 1	0	0	0	0	0	0	0
FA5	**75**	100	85 ± 15	50 ± 10	15 ± 5	7.5 ± 2.5	7.5 ± 2.5	0	0	0	0	0
FA6	**75**	100	85 ± 15	50 ± 10	15 ± 5	7.5 ± 2.5	7.5 ± 2.5	0	0	0	0	0

Note: Percentages are expressed weight-wise.

Usable Percentages of Dredged Material Mixed with IDOT Gradation Material to Meet IDOT Gradations FA1 through FA6

Methodology

A script was written in Python (Van Rossum & Drake, 2009) to determine the maximum usable percentage of dredged material to meet IDOT gradations FA1 through FA6 using added material to achieve one of IDOT gradations FA1 through FA6. The workflow of the script is described in Figure 34, and the results are summarized in the next subsection.

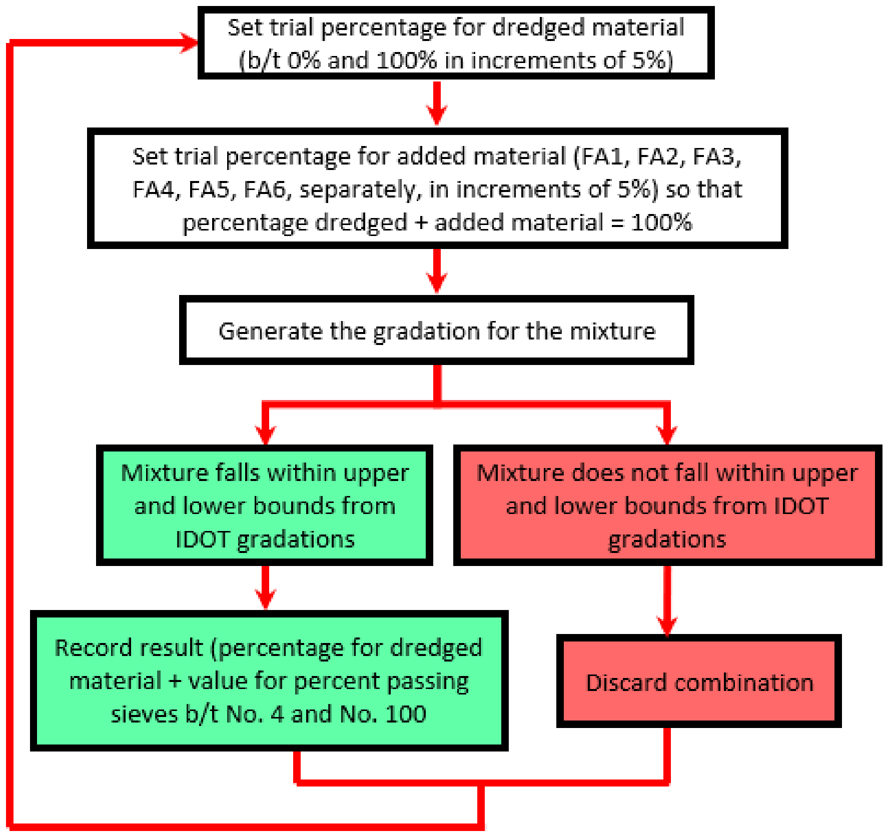

Figure 34. Sketch. Workflow to obtain results deriving from added material meeting IDOT gradations FA1 through FA6.

Results

Table 5 through Table 13 provide the required percentages of the added material to meet one or more of IDOT gradations FA1 through FA6 using dredged material from sites 1 and 5. In a conversation with IDOTs Central Bureau of Materials' Chief Geologist Andrew Stolba on May 18, 2022, "the use for a particular gradation is dependent upon the availability and distance to a project. This goes along with the current projects of a particular District. Natural sand gradations of FA1 are generally used downstate, whereas FA2 are used in the northern Districts. That said, the FA1 and FA2 gradations have the most use for IDOT." In consequence, the results in Table 5 through Table 13 are limited to combinations that involve using the Beardstown dredged material to create either FA1 or FA2, where possible. For example, consider that 1,000 tons of sand matching the FA1 IDOT gradation are needed for an IDOT project. If using the dredged material from site 1, a contractor can use 25% dredged material from site 1, i.e., 250 tons, 65% added material of FA1, i.e., 650 tons, and 10% added material of FA4, i.e., 100 tons (see Table 5, row 2) to create the needed 1,000 tons of FA1. Figure 35 shows the combined material gradation (see the green line with triangle symbols). Following the order of the legend, the first relationship (see the red line with diamond symbols) represents the gradation of dredged material from site 1. The next two relationships represent the upper and lower boundaries for IDOT gradation FA1. The fourth relationship (see the green line with triangle symbols) represents the gradation of the mixture resulting from using 25% of dredged material from site 1, 65% of added material of FA1, and 10% added material of FA4. A comprehensive set of tables and figures summarizing the results from Table 5 through Table 13 with combinations that do not involve FA1 and FA2 are presented in Appendix D.

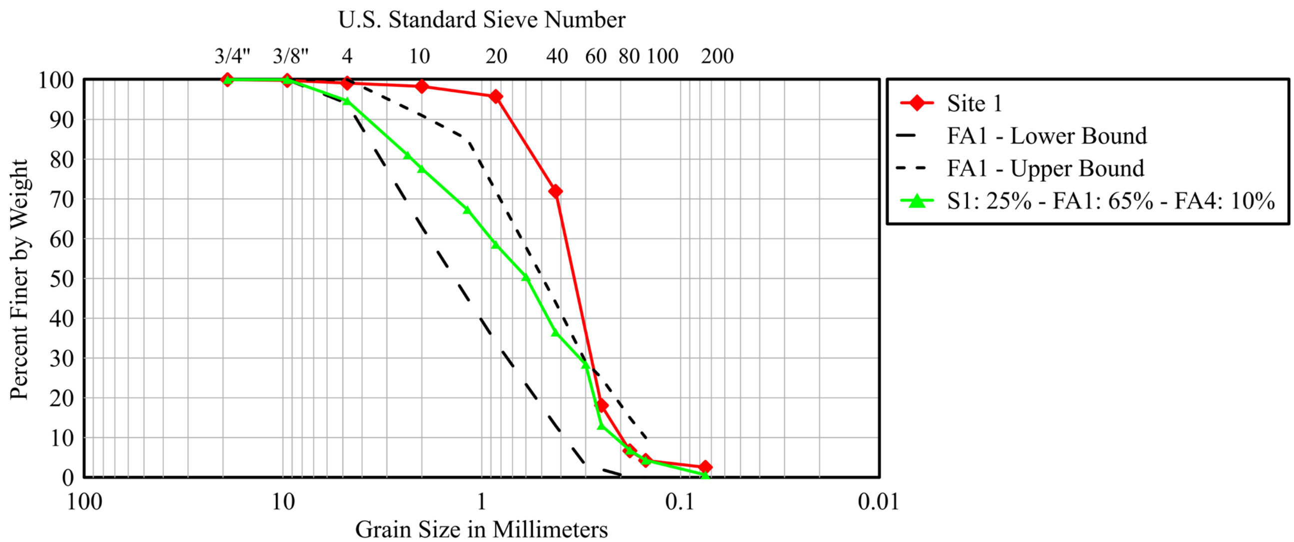

Figure 35. Graph. FA1 with dredged material from site 1 plus added material from IDOT gradations FA1–FA6.

Table 5. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA1—Site 1

Site 1	FA1	FA2	FA3	FA4	FA5	FA6
20	80	0	0	0	0	0
25	65	0	0	10	0	0

Note: Percentages are expressed weight-wise.

Table 6. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA2—Site 1

Site 1	FA1	FA2	FA3	FA4	FA5	FA6
25	75	0	0	0	0	0
25	65	0	0	10	0	0
25	70	0	0	5	0	0

Note: Percentages are expressed weight-wise.

Table 7. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA5—Site 1

Site 1	FA1	FA2	FA3	FA4	FA5	FA6
30	0	70	0	0	0	0
30	70	0	0	0	0	0
60	0	10	0	30	0	0
60	0	15	0	25	0	0
60	15	0	0	25	0	0

Note: Percentages are expressed weight-wise.

Table 8. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA6—Site 1

Site 1	FA1	FA2	FA3	FA4	FA5	FA6
30	0	70	0	0	0	0
30	70	0	0	0	0	0
60	0	10	0	30	0	0
60	0	15	0	25	0	0
60	15	0	0	25	0	0

Note: Percentages are expressed weight-wise.

Table 9. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA1—Site 5

Site 5	FA1	FA2	FA3	FA4	FA5	FA6
20	80	0	0	0	0	0
25	70	0	0	5	0	0

Note: Percentages are expressed weight-wise.

Table 10. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA2—Site 5

Site 5	FA1	FA2	FA3	FA4	FA5	FA6
25	75	0	0	0	0	0
25	70	0	0	0	0	5
25	70	0	0	0	5	0
25	70	0	0	5	0	0

Note: Percentages are expressed weight-wise.

Table 11. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA3—Site 5

Site 5	FA1	FA2	FA3	FA4	FA5	FA6
70	15	0	0	0	0	15
70	15	0	0	0	15	0

Note: Percentages are expressed weight-wise.

Table 12. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA5—Site 5

Site 5	FA1	FA2	FA3	FA4	FA5	FA6
70	0	5	0	25	0	0
70	5	0	0	25	0	0

Note: Percentages are expressed weight-wise.

Table 13. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA6—Site 5

Site 5	FA1	FA2	FA3	FA4	FA5	FA6
70	0	5	0	25	0	0
70	5	0	0	25	0	0

Note: Percentages are expressed weight-wise.

BULL'S ISLAND, SOUTH OTTAWA TOWNSHIP, ILLINOIS

Bull's Island in Illinois' South Ottawa Township has a Dredged Material Management Plan (DMMP). According to Theiling (2020), Bull's Island DMMP is about 7.5 acres of USACE fee title property with 300,000 yd^3 of medium to fine sand, as shown in Figure 36. The site does not have public access, but there are roads with easements for USACE access across private property at an adjacent Archer-Daniels-Midland (ADM) terminal. Access from the water is feasible, and USACE has an improved landing area to drive equipment and material from barges to land. Limited site access would restrict the potential for soil manufacturing, but the area is large enough to work with river transport. Grain size analysis was performed on two samples by the USACE (IL-241.0R and IL-241.1R). The percent passing sieve no. 200 is only 0.3%, with the soil classified as SP (medium to fine sand) according to the Unified Soil Classification System, as shown in Figure 37. This dredged material meets the suggested rule: 80% or more of the material is retained on the no. 200 sieve.

Figure 36. Arial Photo. Bull's Island in South Ottawa Township, Illinois (Theiling, 2020).

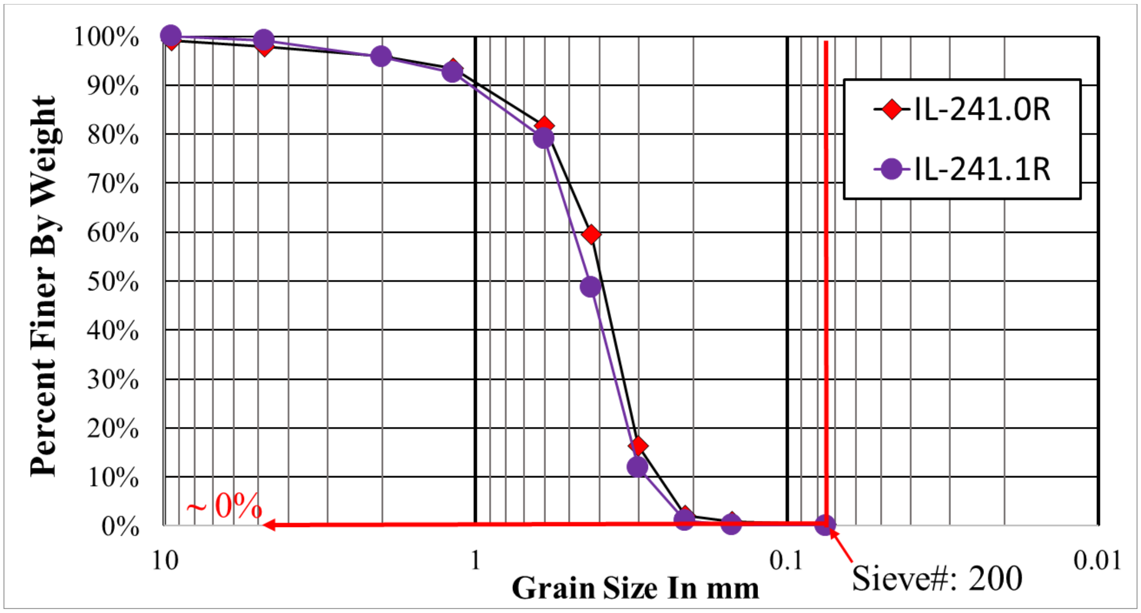

Figure 37. Graph. Bull's Island grain size distributions.

Bull's Island Hazardous, Toxic, and Radioactive Waste

A Phase I HTRW (hazardous, toxic, and radioactive waste) environmental site assessment (ESA) was performed by USACE (2020) for the Bull's Island project area. Information was obtained through site reconnaissance, informal interviews, and a review of maps and aerial photographs, IDOT district records, and federal and state environmental databases. These screening methods were selected based on the nature of the proposed project site and the characteristics of the dredged material. The Phase I ESA indicated that one recognized environmental condition (REC) is present in the area. The REC is based on part of the proposed project site being a former coal mining area. These coal mines have been reclaimed according to state and federal regulations; therefore, no HTRW issues or conditions are present. However, there could be some prior contamination that impacted the dredged materials. According to USACE (2020), no further HTRW investigations are warranted, in compliance with ER 1165-2-132.

STARVED ROCK LOCK AND DAM, LASALLE COUNTY, ILLINOIS

The Starved Rock Lock and Dam in Illinois' LaSalle County also has a DMMP. According to Theiling (2020), a dredged material stockpile is located behind gates in the boat yard. It is a small site of less than 2 acres with 100,000 yd^3 of material, as shown in Figure 38. The dredged material is mostly fine sand, but one site has mixed gravel, sand, and clay. The site has good road access, but it would need to be coordinated with the lockmaster, and river access could be facilitated (Figure 38). This site is too small and restricted to support soil blending on-site, so the dredged material would need to be moved off-site by truck or barge. Grain size analysis was performed on five samples by USACE (IL-230.45R, IL-230.55R, IL-230.7R, IL-230.8R, and IL-DUP) of the dredged material, and the highest percent passing sieve no. 200 is 10.8%, which meets the proposed rule of 80% or greater being retained on the no. 200 sieve. These dredged material samples are classified as SP (fine sand) for samples IL-230.55R, IL-230.7R, and IL-DUP; SP-SC (clayey fine sand) for sample IL-230.45R; and SP-SC (clayey gravelly fine sand) for sample IL-230.8R, according to the Unified Soil Classification System, as shown in Figure 39. Unfortunately, no chemical analysis or HTRW screening was performed for this site to confirm the proposed rule of 80% or greater being retained on the no. 200 sieve.

Figure 38. Arial Photo. Starved Rock Lock and Dam in LaSalle County, Illinois (Theiling, 2020).

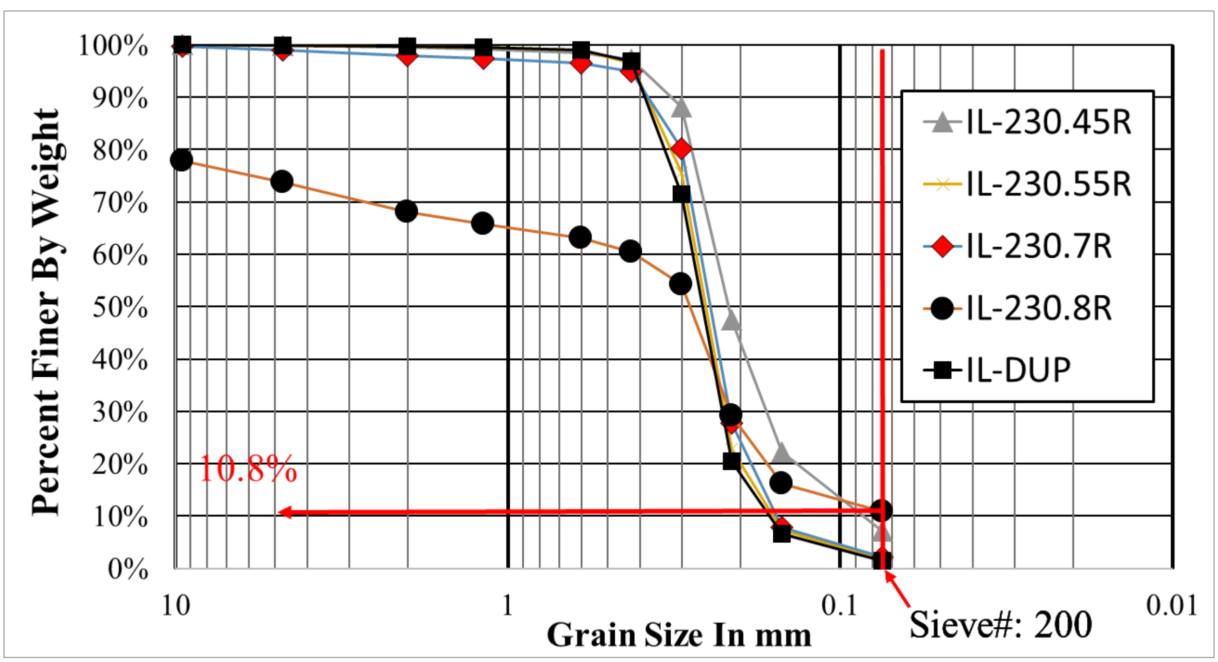

Figure 39. Graph. Starved Rock Lock and Dam grain size distribution.

MACKINAW RIVER, PEKIN, ILLINOIS

The Mackinaw River site is near Pekin, Illinois, and located at the mouth of the Mackinaw River (see Figure 40). The Mackinaw site is large, with an area of 60 acres, and it has nearly achieved its full capacity of more than 1 million yd^3 of material dredged from the Mackinaw River. The Mackinaw River transports coarser material than the Illinois River, so the stockpiled material consists primarily of gravelly coarse to fine sand (see Figure 41). The Mackinaw River site is 3.5 miles off the highway on gravel roads (see Figure 40), and, therefore, it is accessed via a narrow to unimproved access road. Water access over the levee for barge loading from the Mackinaw site could be achieved.

Grain size analysis was performed on three samples by USACE (IL-147.7L, IL-147.8L, and IL-147.9L) from the Mackinaw River site, and the highest percent passing sieve no. 200 is 7.8%. The samples are classified as SP-SC (clayey medium to fine sand) for sample IL-147.7L, SP (medium to fine sand with trace gravel) for sample IL-147.8L, and SP (gravelly coarse to fine sand) for sample IL-147.9L, according to the Unified Soil Classification System, as shown in Figure 41. No chemical analysis or HTRW screening was performed for this site to confirm the proposed rule of 80% or greater being retained on the no. 200 sieve.

Figure 40. Arial Photo. Mackinaw DMMP road and river access (Theiling, 2020).

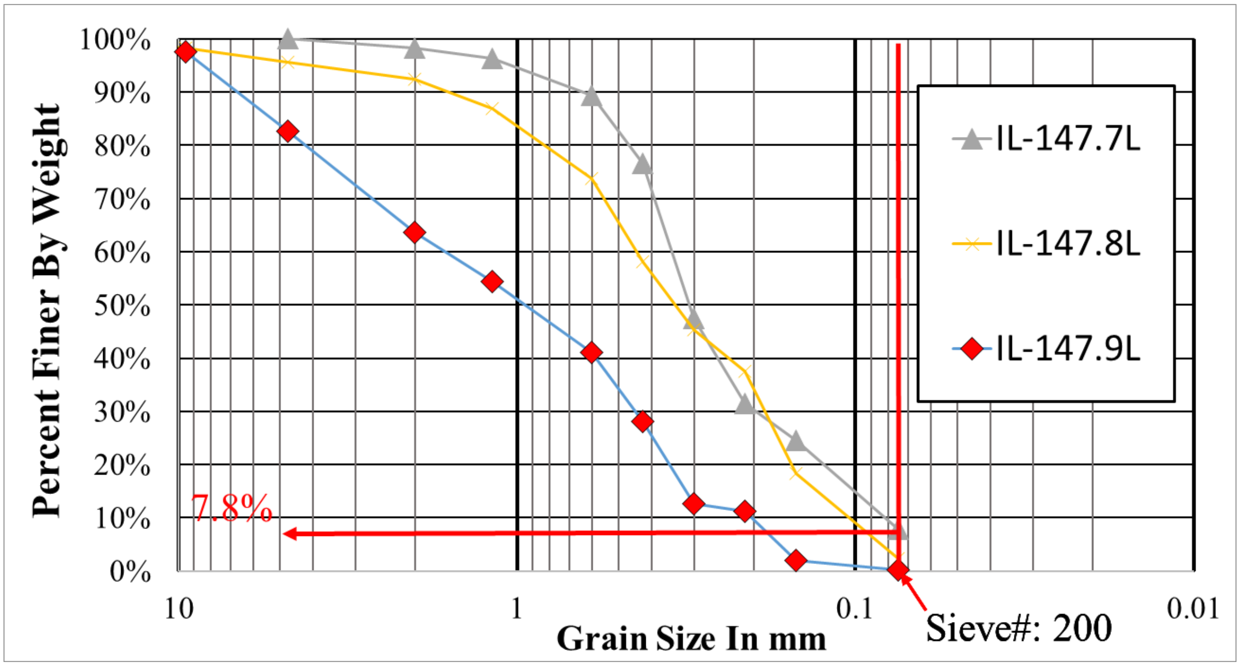

Figure 41. Graph. Mackinaw River grain size distribution.

MCCLUGGAGE BRIDGE, ILLINOIS

A portion of the river channel at McCluggage Bridge for US Route 150 over the Illinois River in Peoria, Illinois, is proposed to be dredged during construction of a new bridge. Part of this project was to investigate the contamination of dredged material from the McCluggage Bridge area and to perform particle size analysis to determine if the proposed rule of 80% or greater being retained on the no. 200 sieve is applicable to this site. This was a question because of the long industrial history and presence of contaminated dredged material in the Illinois River near Peoria.

This section describes the sediment sampling and the subsequent particle size and analytical testing (chemical and fecal coliform) of the river sediments from the Illinois River at the McCluggage Bridge. WOOD was tasked by IDOT to evaluate the potential environmental impacts and exposure concerns related to the beneficial reuse of the dredged river sediments that are being created as part of the bridge construction. Field investigation activities were completed by WOOD on June 16, 2021.

Potential RECs at the McCluggage Bridge site include contaminants entering the river from (1) pesticides and herbicides from farm runoff, (2) metals, volatile and semi-volatile organic compounds, and polychlorinated biphenyls (PCBs) from upstream industry, and (3) fecal coliform from agricultural runoff and sanitary waste discharges as well as combined (storm and sanitary) sewer overflows.

Field Investigation Procedures

WOOD, on behalf of IDOT's Bureau of Design and Environment with assistance from the Illinois State Water Survey (ISWS), collected six soil cores with a length of 10 ft just downstream of the existing bridge (see Figure 42). Three of the ten soil cores were collected from the shallower areas outside of the main navigation channel of the Illinois River, as shown in Figure 42. The soil borings and sampling locations are depicted in Figure 42. WOOD collected ten soil samples in total, two from each soil core collected by ISWS except for borings Peoria-1 and Peoria-6, where only one sample could be collected from the soil core. Details of the samples are shown in Table 14. The sampling events and scheduling was coordinated with IDOT personnel at the bridge site. The final location of each sampling location was recorded by ISWS using a GPS device.

Table 14. Details of Sediment Samples Obtained near McCluggage Bridge (WOOD, 2022)

Boring ID	Depth to Groundwater (ft bgs*)	Range of PID Readings (ppm)	Depth of interval of highest PID readings (ft)	Observed evidence of potential contamination	Depth of interval sampled (ft bgs*)
Peoria 1 (1’)	N/A	0	N/A	N/A	1
Peoria 2 (1’)	N/A	0	N/A	N/A	1
Peoria 2 (7’)	N/A	0	N/A	N/A	7
Peoria 3 (0.5’)	N/A	0	N/A	N/A	0.5
Peoria 3 (6.5’)	N/A	0	N/A	N/A	6.5
Peoria 4 (1’)	N/A	0	N/A	N/A	1
Peoria 4 (7’)	N/A	0	N/A	N/A	7
Peoria 5 (0.6’)	N/A	0	N/A	N/A	0.6
Peoria 5 (6.6’)	N/A	0	N/A	N/A	6.6
Peoria 6 (1’)	N/A	0	N/A	N/A	1

*bgs = below ground surface

Following sediment core collection by ISWS, the recovered cores were transported by ISWS from the sampling location to a boat ramp where WOOD personnel were located. The core sleeve was opened by ISWS personnel, and WOOD screened the recovered soil using a photoionization detector (PID). One soil sample was collected from each 5 ft interval of the borings, showing the highest PID reading, or in the absence of PID readings, from the depth representative of the proposed construction interval most likely to be impacted by the identified REC. If 100% recovery of the 10 ft length of the sediment core was not achieved, the length of the recovered core was measured, and one sample was collected from each half of the recovered core. The resulting soil samples were shipped to Test America Laboratories in Chicago for analytical testing. Fecal coliform analysis was completed by PDC Laboratories, Inc. in Peoria, Illinois.

Figure 42. Arial Photo. Sample locations at McCluggage Bridge.

Field Investigation Results

River sediment samples collected for laboratory analysis were analyzed for VOCs, SVOCs, total metals, toxicity characteristic leaching procedure (TCLP) metals, pH, pesticides, herbicides, PCBs, fecal coliform, and synthetic precipitation leaching procedure (SPLP) analysis. The detailed results of this testing are shown in Appendix E. Particle size analysis was also performed on all 10 samples, and the results are shown in Figure 43. The soil boring logs and photographs of the six split soil cores are provided in Appendix E.

Table 15 summarizes the constituents of concern that exceed IDOT-specific criteria categories. Table 15 provides a summary of the constituents of concern, the IDOT-specific criteria categories, and the IDOT soil management classification per Article 669(a)(5) of IDOT 669 designation (IDOT, 2022). The analytical results that are above IDOT criteria are arsenic, benzo(a)pyrene, cadmium, chromium, iron, lead, manganese, mercury, and nickel. These results were expected given the long history of industrial activity upstream of the sampling locations. WOOD also evaluated sample pH levels, and the results of PID headspace screening pursuant to 35 IAC 1100.201(g) and 205(b)(1), respectively.

Soil pH must be between 6.25 and 9.0 standard units for the soil to be accepted at a CCDD facility or USFO. Soils with a pH measurement outside of the acceptable range but otherwise not impacted by contaminants of concern may be used on-site as fill or managed and disposed of off-site in accordance with Article 202.03 (IDOT, 2022).

Grain Size Analysis

As stated previously, all 10 sediments samples were found to be contaminated. Therefore, the proposed rule of 80% or greater of the dredged material being retained on the no. 200 sieve and not being considered unlikely to be contaminated could be confirmed at this site if the sediments classified as a sand. A grain size analysis was performed on all 10 sediment samples to measure the percent passing the no. 200 sieve, and the results are shown in Figure 43. Figure 43 shows that all 10 sediment samples have greater than 20% passing sieve no. 200. In particular, the percent passing sieve no. 200 ranges between 38.5% and 97%, so the sediments are primarily fine grained and subject to contamination binding because of the presence of clay minerals. Because all the sediment samples were found to be contaminated and have a percent passing sieve no. 200 greater than 20%, the suggested 20% passing rule to determine contamination was not violated by this site. It is recommended that sediment sampling be conducted at other sites with a long history of industrial activity and/or contamination to confirm the proposed rule of 80% or greater being retained on the no. 200 sieve.

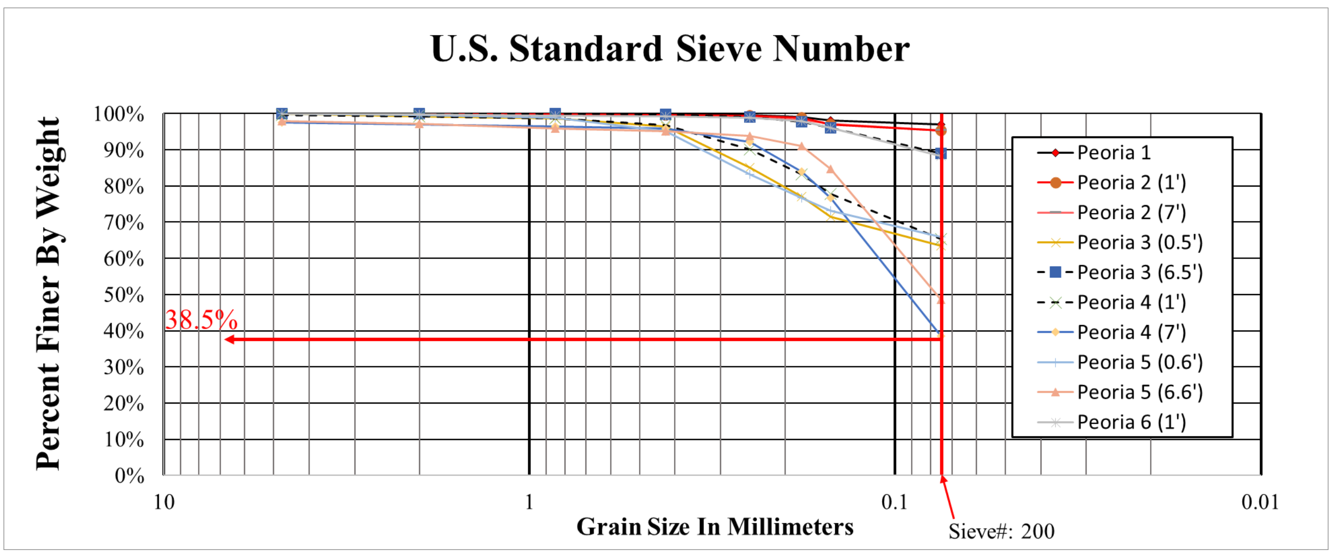

Figure 43. Graph. Grain size relationships for the 10 sediment samples obtained downstream of the McCluggage Bridge near Peoria, Illinois.

Table 15. Summary of McCluggage Bridge Soil Impacts and Contaminants of Concern (WOOD, 2022)

Boring ID	pH	Contaminations of concern above total metal, TCLP, and SPLP criteria	Contaminations of concern above TCLP and/or SPLP criteria	Contaminations of concern above TACO criteria	Contaminations of concern above MAC	Eligible for CCDD or USFO?	Classification	IDOT 669 Designation of the Standard Specifications for Road and Bridge Construction (IDOT, 2022)
Peoria 1 (1′)	7.8	None	Cadmium, Lead, Manganese	Mercury	Benzo(a)pyrene, Chromium, Iron	No	Non-Special	(a)(5)
Peoria 2 (1′)	7.8	None	Manganese	Mercury	Benzo(a)pyrene, Chromium, Iron	No	Non-Special	(a)(5)
Peoria 2 (7′)	7.9	Iron	Arsenic, Lead, Manganese, Nickel	Mercury	Benzo(a)pyrene, Arsenic, Iron	No	Non-Special	(a)(5)
Peoria 3 (0.5′)	7.6	None	Arsenic, Manganese, Nickel	Mercury	Benzo(a)pyrene, Chromium, Iron	No	Non-Special	(a)(5)
Peoria 3 (6.5′)	8.1	None	Arsenic, Cadmium, Manganese, Nickel	Mercury	Benzo(a)pyrene, Chromium, Iron	No	Non-Special	(a)(5)
Peoria 4 (1′)	7.2	None	Cadmium, Lead, Manganese, Nickel	Mercury	Benzo(a)pyrene, Chromium, Iron	No	Non-Special	(a)(5)
Peoria 4 (7′)	7.9	None	Manganese	Mercury	None	No	Non-Special	(a)(5)
Peoria 5 (0.6′)	7.5	None	Manganese	Mercury	Benzo(a)pyrene, Chromium, Iron	No	Non-Special	(a)(5)
Peoria 5 (6.6′)	7.7	Iron	Arsenic, Iron, Lead, Manganese, Nickel	Mercury	Benzo(a)pyrene, Arsenic, Iron	No	Non-Special	(a)(5)
Peoria 6 (1′)	7.7	Iron	Iron, Manganese, Nickel	Mercury	Benzo(a)pyrene, Chromium	No	Non-Special	(a)(5)

CHAPTER 6: MIDWEST STATES SURVEY, BUD REQUESTS, AND APPLICABLE PERMITS FOR ISLAND CREATION

This chapter discusses additional information investigated in this project: the Midwest states survey, beneficial use determination (BUD) requests, and applicable permits for creating river islands.

MIDWEST STATES SURVEY

A survey was created and distributed to Midwest states to summarize their DOT activities related to beneficial use of dredged material. These states are Kentucky, Wisconsin, Michigan, Minnesota, Iowa, Kansas, Missouri, and Ohio. The questions asked in the survey are shown below:

1. What is the typical size of dredged material reuse projects that you have worked on?
2. What type of soil (fine or coarse grained) was used in your previous reuse of dredged material projects?
3. Identify any applicable rules or constraints for reusing dredged material, e.g., contaminant concentrations and/or routes of exposure.
4. How do you justify the beneficial use? Cost savings?
5. What are typical locations and/or applications of the reuse?
6. What type of chemical testing/screening of the dredged material is required?
7. Do you have a screening criteria based on the grain size particle of the dredged material? (For example, passing sieve no. 200 or no. 230)
8. Does your state allow use of coarse-grained dredged material, i.e., a small % passing no. 200 sieve, without restrictions?
9. Do you have any additional comments to add regarding the beneficial use of dredged material in your state?

Each state's responses are provided in Appendix H, and the results are summarized here. Kentucky, Kansas, and Missouri reported no activities related to beneficial reuse of dredged material (BRDM). Wisconsin, Minnesota, and Ohio reported minimal activities related to BRDM, while Iowa and Michigan have more BRDM activities. All states that have BRDM activities preferred using coarse-grained dredged material than fine-grained dredged material due to no or limited chemical screening required. They reported that dredged material is considered to be uncontaminated if it has less than 10%, 10%, 7%, and 20% of fine-grained material passing sieve no. 200 for Michigan, Iowa, Minnesota, and Ohio, respectively.

BENEFICIAL USE DETERMINATION REQUESTS

Part of this project was to contact the Illinois Environmental Protection Agency to obtain recent BUD applications to identify other potential reuses of dredged material by other parties in Illinois and the potential reuses that are being approved by the IEPA. A BUD is a determination that an industrial or manufacturing by-product material, otherwise destined for disposal, can be used in a specific and beneficial manner. If the dredged material is classified as a special waste, the generator (e.g., IDOT) can prepare a BUD for review and approval by the IEPA. The permit application requires detailed information about the material to be managed and the location where it would be used, including information on soil and groundwater characteristics, to assess the potential for subsurface contamination. If approved by the IEPA, this BUD would allow the dredged material to be used in only the approved site-specific application. As a result, each site and use require a BUD evaluation by the IEPA.

According to the IEPA (n.d.), the needed documents to be submitted for a BUD request are:

- applications that must demonstrate compliance with Section 22.54 of the Illinois Environmental Protection Act
- form LPC-PA27
- additional information identified in the instructions to LPC-PA27, including a process description, analysis, and affidavits or certifications

LPC-PA27 is the application to request a BUD and is shown in Appendix I. To show an example of an actual BUD request for beneficially reusing dredged material in Illinois, a BUD application that IEPA received from the Chicago Park District/USACE Calumet Dredged Material Confinement Facility was obtained by the research team through a Freedom of Information Act request with application log no. BUD20-001 (IEPA, 2020-b). This BUD application was for reuse of dredged material for the final soil cover of the Dredged Material Confinement Facility. The application was withdrawn because the IEPA determined that their existing Illinois Bureau of Water permit would control the process, and the IEPA BUD was not needed. However, the application is provided in Appendix I and shows an example of an actual BUD request application. A summary of this application is provided below:

- Use dredged material from Calumet Harbor as fill material to expand the Chicago area confined disposal facility 10 ft vertically
- Owner: Chicago Park District
- Operator: US Army Corps of Engineers
- Consultant: Steven A. Fisher, P.E., USA COE
- 150,000 yd^3 of material
- Proposed Use: “General Fill” or “Satisfactory Fill”
- It was determined the existing Illinois Bureau of Water permit would control the process, so the application was withdrawn

APPLICABLE PERMIT(S) FOR CREATING ILLINOIS RIVER ISLANDS

This section describes the applicable permit(s) required for creating Illinois River islands as possible placement areas for uncontaminated dredged material obtained near Peoria. This is important because of the shallow depth of the Illinois River and the lack of a sufficient Dredged Material Confinement Facility to contain the resulting dredged material. Creating Illinois River islands using dredged materials will need to comply with both Part 3700 (Floodway Construction—Construction in Floodways of Rivers, Lakes and Streams) and Part 3704 (Public Water Activity—Regulation of Public Waters) administrative rules. According to the Illinois Department of Natural Resources (IDNR, n.d.-a), construction projects in Illinois' waterways, floodplains, and wetlands require state and federal authorization using a joint application process to the USACE and IEPA. The joint permit application, permit application instructions, and permit fee notice are provided in Appendix J to facilitate future submissions. Part 3700 and part 3704 can be found in 17 Illinois Administrative Code (IAC), Chapter 1.

Figure 42 shows an example of a river island created by USACE in the early 2000s. The island is located to the north of the McCluggage bridge in the photo. Geotextile tubes were first placed and hydraulically filled to create the island shoreline. Then, the interior of the island was hydraulically filled. The construction took several years. Freezing of the river during winter and seasonal flooding were some factors that contributed to the overall time that was required to complete the construction.

CHAPTER 7: SUMMARY AND CONCLUSIONS

This report discusses successful beneficial use of dredged material in projects to investigate the potential for IDOT to beneficially use some of the dredged material generated during construction of major river crossings instead of landfilling it. The successful projects are separated into 15 applications or categories and show the potential for reuse of dredged material in a wide range of applications locally (in Illinois), nationally (in the U.S.), and internationally. This report also presents the statutory and regulatory background, agency jurisdiction, and application process for reusing dredged material in Illinois. These 15 categories can be classified into three main topics. These topics are (1) types of beneficial uses (categories 1–10), (2) type of treatment of contaminated dredged material (categories 12, 13, and 14), and (3) economic benefits (categories 11 and 15). The 15 categories for reuse of dredged material in other states are:

1. Structural-Grade Fill and Highway-Embankment Fill
2. Brownfield Reclamation
3. Agricultural Amendment on Sandy Soils
4. Island, Marsh, and Wetland Creation and Restoration
5. Beach Nourishment and Shoreline Protection
6. Landfill-Compacted Soil Bottom Liner
7. Park and Recreational Facility Development
8. Lightweight Aggregate Manufacturing
9. Cement Manufacturing
10. Bricks Manufacturing
11. Manufactured Soil
12. Decontamination Using Auto-Shredder By-Product
13. Decontamination Using Geotextile Tubes
14. Decontamination Using Cement/Bentonite Slurry
15. Economic Benefits of Using Dredge Material

These applications show that transportation costs of dredged material are the most important factor among the logistical and economical constraints for determining the feasibility of reusing dredged material. In other words, if there is a nearby dredged material stockpile, this will greatly increase the feasibility of reusing the material on a future IDOT project, which can be considered during design. Illinois' allowable contamination standards are discussed and presented in detail along with the required geotechnical and chemical testing parameters.

Five dredging projects in Illinois with potential beneficial reuse of dredged material are discussed in detail. This includes identifying the type of dredged material, grain size analysis, and contamination and analytical analysis of the dredged material. These five projects/sites are Beardstown, Bull's

Island, Starved Rock Lock and Dam, Mackinaw River, and McCluggage Bridge. In addition, sediments at Centennial Bridge and Rockton in Illinois are discussed in Appendix F and G, respectively.

At Beardstown sites 1 and 5, the grain size distribution results show that the highest percent passing sieve no. 200 is less than 20%. However, two samples have a pH equal to 9.1, which slightly exceeds the maximum allowable pH level of 9.0. No other analyte investigated in accordance with the approved workplan exceeds an applicable criterion. This is in agreement with the proposed 20% rule of less than or equal to material passing sieve no. 200 being considered unlikely to be contaminated if it is from an area that does not have a history of prior contamination. If greater than 80% of the dredged material is retained on the no. 200 sieve, then the material classifies as a sand and, thus, can be assumed to not be contaminated unless it is an area of prior industrial activity and/or contamination. Only three of the Illinois projects—Beardstown, Bull's Island, and McCluggage Bridge—had an analytical analysis and grain size analysis data available, so the suggested 20% rule of material passing sieve no. 200 needs more verification by conducting both analytical and grain size analysis for future IDOT projects.

For Beardstown, the grain size relationship for the stockpiled dredged material does not match any of IDOT's fine aggregate gradations, i.e., FA1 through FA6. Therefore, two methods are suggested to modify the grain size gradations of the Beardstown dredged material to satisfy one or more of the IDOT fine aggregate gradations. These two methods and their results are:

1. Usable percentages of dredged material mixed with external material to meet IDOT gradations FA1 through FA6:

   The optimum usable percentages of dredged material from Beardstown sites 1 and 5 mixed with additional material to create a mixture of material that meets IDOT gradations FA1 through FA6 ranges between 40% to 75%.

2. Usable percentages of dredged material mixed with IDOT gradation material to meet IDOT gradations FA1 through FA6:

   The optimum usable percentages of dredged material from Beardstown sites 1 and 5 mixed with FA1 through FA6 material to create a mixture of material that meets IDOT gradations FA1 through FA6 ranges between 20% to 70%. Therefore, a contractor can use 20% to 70% dredged material from Beardstown to create FA1 or FA2 aggregate and save considerable material costs.

In summary, there is a high potential for reuse of dredged material for many projects in Illinois. Currently, it is a state policy in Illinois to formally evaluate the history of possible nearby sources of chemicals that may have impacted the project sediments and to test the dredged material for chemical contamination before accepting for use on any highway project. The research team did suggest that if the dredged material is mainly uncontaminated sand (e.g., greater than 80% sand) and is from a local site that does not have a history of contamination as determined by a formal evaluation, then the material is unlikely to be contaminated and may be easier to use and require little to no contaminate testing. This proposed rule is not violated in this study, and therefore, more testing is needed before validating it. However, if the material fails to be classified as sand within

Illinois' regulation, it still can be possibly beneficially used in projects after testing for chemical/toxic contaminants and being deemed chemical satisfactory (for example, see Darmody & Marlin [2008], Illinois Brownfield Reclamation) within Illinois' regulations. If IDOT and/or IEPA are interested in any changes to the governing regulations, then Illinois Pollution Control Board action is required and more projects need to be studied to further investigate the suggest rule of if 80% of the dredged material is retained on sieve #200, then the material in unlikely to be contaminated given no history of contamination at the site of the dredged material as determined by formal evaluation.

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APPENDIX A: USACE CASE STUDIES

Table 16 below summarizes 131 case studies of beneficial uses of dredged material within the U.S. provided by the USACE, which can be found at: https://budm.el.erdc.dren.mil/successstories.html.

Table 16. Case Studies of Beneficial Uses of Dredged Material in the U.S.

BU	Project	State	Event	Sediment	Location	References
Agriculture	Herbert Hoover Dike	FL	1990s	sand, marl	Lake Okeechobee	Lee et al. (1997). The concept for rehabilitation of problem soil dike using manufactured soils. Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997, p. 25., Sturgis et al. (1997).
Agriculture	Ft. Drum	NY	1990s	(N/I)	Ft. Drum	Palazzo et al. (1997). Manufactured soil concept in the rehabilitation of housing demolition soil and military training land. Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997, pp. 48-49.
Agriculture	Mobile- landfill cover	AL	1998	silt-clay mixture	Blakeley Island CDF	(None)
Agriculture	New York/New Jersey Harbor Demonstration	NJ	1996	fine grained	Port of Newark	Lee et al. (1997). Manufactured Soil from Contaminated NY/NJ Harbor Dredged Material . USACE ERDC, Vicksburg, MS. Sturgis, T. C., Lee, C. R., Banks Jr, H. C., Burchell, M. R., & Johnson, K. (2001). Evaluation of Manufactured Soil Using Dredged Material from New York/New Jersey Harbor Newton Creek Site. Phase 1: Greenhouse Bench-Scale Test. ENGINEER RESEARCH AND DEVELOPMENT CENTER VICKSBURG MS ENVIRONMENTAL LAB.

BU	Project	State	Event	Sediment	Location	References
Agriculture	Jacksonville Harbor	FL	2000	sand, silt, clay	Bartram Island, Jacksonville	Lee et al. (2000). Evaluation of Manufactured Soil Using Dredged Material from Bartram Island CDF in Jacksonville, FL. Technical Report. ERDC/EL SR-00-X, U.S. Army ERDC, Vicksburg, MS.
Agriculture	Mobile River and Harbor	AL	1997	sand, silt, clay	Pinto, North and South Blakley, and Mud Lake CDFs	Sturgis et al. (1997). Manufactured Soil from Mobile, AL Harbor Dredged Material. USACE, WES, Vicksburg, MS. page 46. Sturgis, T. C., Lee, C. R., Banks Jr, H. C., Johnson, K., & Langan, J. P. (2002). Evaluation of manufactured soil using dredged material from confined placement facilities in Mobile, Alabama. Phase 1: Greenhouse bench-scale test. ENGINEER RESEARCH AND DEVELOPMENT CENTER VICKSBURG MS ENVIRONMENTAL LAB.
Aquaculture	Brownsville DMCA	TX	1980s	(N/I)	Brownsville	Konikoff et al. (2001). Managing legal and institutional constraints on aquaculture in dredged material containment areas. MS-Alabama Sea Grant Program Publication No. MASGP 011. Tatem, H. E. (1990). Determination of the chemical suitability of a dredged material containment area for aquaculture.
Aquatic habitat	Slaughter Creek	MD	1989	silt, sand	Slaughter Creek, Chesapeake Bay	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Aquatic habitat	Big Island Mining	LA	1998	(N/I)	Atchafalaya Bay southwest of Morgan City	(None)
Aquatic habitat	Twitch Cover Seagrass Plantings	MD	1989	sand	Twitch Cove, Chesapeake Bay	(None)

BU	Project	State	Event	Sediment	Location	References
Beach nourishment	Long Branch	NJ	1948	dredged sediment	0.5 miles offshore of Long Branch	Beach Erosion Board, USACE. (1950). Test of Nourishment of the Shore by Offshore Deposition of Sand. Technical Memorandum No. 17, Long Branch, NJ. McLellan, T. N. (1990). Nearshore mound construction using dredged material. Journal of Coastal Research, 99-107.
Beach nourishment	Morro Bay	CA	1990	medium sand, silt	near Morro Bay	Burke et al. (1991). Nearshore Berms - Update of the United States Experience. Proceedings of the CEDA-PIANC Conference 1991, The Netherlands.
Beach nourishment	Mobile Bay berm	AL	1987-1988	silt, sand	Gulf of Mexico off entrance to Mobile Bay	(None)
Beach nourishment	Miami Beach	FL	1978	beach quality sand	Miami Beach	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Beach nourishment	New River	NC	1976	dredged sediment	southwest of New River Inlet	Schwartz and Musialowski. (1977). Nearshore Disposal: Onshore Sediment Transport. Proceedings of the Coastal Sediments 1977 Conference, VA.
Beach nourishment	Brazos-Santiago Pass	TX	1987	dredged sediment	north of Brazos-Santiago Pass	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997.
Beach nourishment	Fire Island	NY	1987	sand	1.5 miles west of Fire Island Inlet and 1,200 ft offshore	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997. McLellan et al. (1988). Nearshore Placement Techniques for Dredged Material. Proceedings of 21st Annual Dredging.

BU	Project	State	Event	Sediment	Location	References
Beach nourishment	Bayou des Glaises	LA	1995	(N/I)	Couvillion Road in Moreauville, Avoyelles Parish	(None)
Beach nourishment	Grays Harbor	WA	1992-1994	fine to coarse grained sediments	Grays Harbor, Westport	Sumeri and Nelson. (1997). Uses of dredged material to combat erosion at Westport, Washington. Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997, pp. 154-156.
Beach nourishment	Green Bay Harbor, Milwaukee	WI	1998	(N/I)	Green Bay Harbor, Milwaukee	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997., Miller. (1998). Confined Disposal Facilities on the Great Lakes. Great Lakes & Ohio River Division USACE.
Beach nourishment	Homer	AK	2000	sand, gravel	Homer	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997.
Capping	Port of Los Beach Channel Deepening Project	CA	2002	silt, sand	San Pedro Bay	USACE & Port of Long Beach. (1995). Port of Long Beach Main Channel Deepening Environmental Impact Statement/Environmental Impact Report.
Capping	Palos Verdes Shelf Pilot Capping Project	CA	2001	silt, sand	Palos Verdes Shelf	USACE. (2002). Field Pilot Study of In Situ Capping of Palos Verdes Shelf Contaminated Sediments. ERDC TR-02-5, U.S. Army ERDC., Vicksburg, MS.
Capping	Buzzards Bay	MA	1980s	fine grained	Buzzards Bay, New Bedford Harbor	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.

BU	Project	State	Event	Sediment	Location	References
Capping	Georgia Pacific Log Pond	WA	2000	debris in sand-clay-silts	Whatcom Waterway, inner Bellingham Bay, Whatcom County	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997.
Capping	Historical Area Remediation Site	NJ	1997	dredged sediment	near Sandy Hook, within the inner New York Bight	(None)
Construction	Palmyra Cove Demonstration Project	NJ	1990s	(N/I)	Palmyra Cove CDF	(None)
Construction	Ninilchick	AK	1995-2000	sand, coarse sand, pea gravel, cobble	Ninilchick	(None)
Construction	Mayport	FL	1997, 1999	fine grained	bench-scale test	Zeller et al. (1999). Recycling Materials: Eco-Blocks. American Society of Agronomy Abstracts, p13., Murray and Associates. (1999). Compressed Blocks from Dredged Material from US Naval Station, Mayport, FL CDF. Contract Report.
Construction	Dillingham	AK	2000	sand, silt, clay	Dillingham	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997.
Construction	Duluth CDF	MN	1990s	sand	Duluth	(None)
Construction	Galbraith Golf Course	CA	1996-2000	(N/I)	Oakland	U.S. Army Corps of Engineers. 1994. Final Supplemental Environmental Impact Report/Environmental Impact Statement, Oakland Harbor Deep Draft Navigation Improvements, SCH91073031. USAED, San Francisco. Loose-leaf pub. n.p.

BU	Project	State	Event	Sediment	Location	References
Construction	Sediment Processing Facility	NJ	1990s	(N/I)	Port of New Jersey District	(None)
Construction	Sediment Decontamination Demo	NJ	1990s	contaminated sediment	New Jersey	(None)
Construction	Savannah Brick Production	GA	1990s	(N/I)	Savannah	Cousins et al. (1997). Brick manufacture from dredged material, a reality!. Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997, p. 141.
Construction	Wilmington	NC	2004	sand	Eagle Island CDF	Sturgis and Lee. (1997). Manufactured Soil from Eagle Island CDF, Wilmington, NC Harbor Dredged Material, Storm Debris and Biosolids. USACE, ERDC, Vicksburg, MS.
Construction	Bronx	NY	2001	sand	Van Cortlandt Park	Lee et al. (2001). Evaluation of the Beneficial Use of Van Cortlandt Lake Sediment for Manufactured Topsoil. USACE ERDC, Vicksburg, MS.
Construction	Vintondale- athletic fields	PA	2003	sand	AMD & ART Park	AMD&ART, Inc. (1999). Transforming Environmental Liabilities into Community Assets. The Bottleworks, (November 1999), Johnstown, PA.
Forestry	Vintondale- trees and shrubs	PA	(N/I)	sand	AMD & ART Park	Lee, C.R. (2001). Manufactured Soil Field Demonstrations on Brownfields and Abandoned Minelands. DOER Technical Notes Collection. ERDC-TN-DOER-C25. U.S. Army ERDC, Vicksburg, MS. PDF.
Habitat development	Lake Vancouver, Vancouver	WA	1970s	silt, sand	an oxbow of the Columbia River, Vancouver	(None)
Habitat development	Miller Sands Island	OR	1974-1976	sand, volcanic material	near Lewis and Clark National Wildlife Refuge	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026,

BU	Project	State	Event	Sediment	Location	References
						USACE, Office of the Chief of Engineers, Washington, D.C.
Habitat development	Bussey Lake	IA	1994-1996	(N/I)	Upper Mississippi River National Wildlife and Fish Refuge	Muncy et al. (1996). National review of Corps environmental restoration projects. IWR Report 96-R-27, 123.
Habitat development	Claremont Channel	NJ	1990s	(N/I)	Claremont Channel in Jersey City	O'Donnell and Henningson. (1999). The beneficial use of dredged material to mitigate acid mine drainage. Proceedings of the 19th WEDA Conference and 31st Texas A&M University Dredging Seminar, Louisville, KY.
Horticulture	Hamlet City Lake	NC	1990s	Lake sediment	Hamlet	Payonk et al. (1997). Beneficial use of contaminated dredged material from Hamlet City Lake. Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997, p. 69.
Horticulture	Toledo Harbor	OH	1996	fine grained	Toledo Harbor CDF	Cadet et al. (1997). Manufactured Soil from Toledo Harbor Dredged Material and Organic Waste Materials. USACE ERDC, Vicksburg, MS. Sturgis, T. C., Lee, C. R., & Banks Jr, H. C. (2001). Evaluation of Toledo Harbor Dredged Material for Manufactured Soil. Phase 1: Greenhouse Bench-Scale Test. ENGINEER RESEARCH AND DEVELOPMENT CENTER VICKSBURG MS ENVIRONMENTAL LAB.
Industrial development	Anacortes Site	WA	(N/I)	Sand, clay, grain size fine	Anacortes	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.

BU	Project	State	Event	Sediment	Location	References
Island habitat	Tarpon Cove Restoration Area	FL	2019	dredged sediment	approx. 1.2 miles south of the Town of Palm Beach docks	(None)
Island habitat	Atlantic Intracoastal Waterway Islands	(N/I)	1930-1940s	silt, sand	adjacent to channel and harbors	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997.
Island habitat	Gulf Coast Intracoastal Waterway Islands	(N/I)	1930-1950s	silt, sand	adjacent to channel and harbors	(None)
Island habitat	Pacific Coast Islands	(N/I)	1930-1950s	sand, aggregate, volcanic material	adjacent to channel and harbors	(None)
Island habitat	Upper Newport Bay Ecosystem Restoration Project	CA	2004	Silt, sand, mud	Newport Bay	(None)
Island habitat	Jetty Island	WA	1989	sand	near Everett, Puget Sound	(None)
Island habitat	Mott Island, Columbia River	OR	1950s	sand	lower Columbia River	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Island habitat	Polander Lake	MN	2000	sand	Polander Lake	Verstegen. (2000). New islands benefit nature, navigation. Engineer Update, US Army Corp of Engineers, 24:13.

BU	Project	State	Event	Sediment	Location	References
Island habitat	Nott Island	CT	1975	silt, sand	Connecticut River	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Island habitat	Barataria Bay Waterway, Grand Terre	LA	1996	(N/I)	south of New Orleans in Jefferson Parish	(None)
Island habitat	Barren Island	MD	1984-1996	sand	Chesapeake Bay	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997. USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Island habitat	Columbia River Islands	OR	1950s	sand	lower Columbia River	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997. USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Island habitat	Core Sound Islands	NC	1978-1979	sand	near Atlantic Intracoastal Waterway	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997.
Island habitat	Craney Island CDF	VA	1980s	silt	near Norfolk Harbor navigation channel, 36.9090N, 76.3703W	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997.
Island habitat	Folly Island	SC	1980s	silt, sand	Folly River near Charleston County Park, Charleston	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997.

BU	Project	State	Event	Sediment	Location	References
Island habitat	Gaillard Island CDF	AL	1980-1981	silt, sand	Two miles into Mobile Bay from Theodore	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997. USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Island habitat	Great Lakes Islands	MI	1950s	sand, cobble	harbors and shipping channels	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997.
Island habitat	Hillsborough Bay CDF	FL	1978-1979	sand	Hillsborough Bay near Tampa	(None)
Island habitat	Hart-Miller Island CDF	MD	1980s	silt, sand	Hart and Miller Islands in Chesapeake Bay near Baltimore Channel	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997. USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Island habitat	Wine Island	LA	1991	silt, sand	Wine Island, Houma Navigation Canal, Terrebonne Parish	(None)
Island habitat	Baptiste Collette	LA	1977-1995	(N/I)	Plaquemines Parish	Gunn. (1997). MS River outlets, Venice, LA: Wetland development and bird island development at Baptiste Collette. Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997, pp. 50-51.
Mine reclamation	Bark Camp Run Demo	PA	2000	Manufactured sediment	Moshannon State Forest,	(None)

BU	Project	State	Event	Sediment	Location	References
					Clearfield County	
Nearshore placement	Silver Strand	CA	1988-1989	sand	near Silver Strand Park and San Diego Harbor	Burke et al. (1991). Nearshore Berms - Update of the United States Experience. Proceedings of the CEDA-PIANC Conference 1991, The Netherlands.
Nearshore placement	Breton Island	LA	1993	fine grained (0.01 mm)	off southern tip of the Chandelier Island	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997.
Nearshore placement	Sand Island Bar	AL	1987	sand (0.22 mm)	south of Dauphin Island and west of the Mobile Bay entrance	Hands and Bradley. (1990). Results of Monitoring the Disposal Berm at Sand Island, Alabama. Technical Report. TR-DRP-90-2. U.S. Army ERDC, Vicksburg, MS. PDF.
Other uses	Norfolk	VA	2000	sand, silt, clay	Norfolk	(None)
Other uses	Saylorville Lake	IA	2000	sand	bench-scale test; winter weather test	(None)
Other uses	Tuscaloosa	AL	2000	sand	bench-scale test	(None)
Other uses	Wilmington	NC	2002	sand	bench-scale test	(None)
Recreation	Mission Bay, San Diego	CA	1980s-1997	sands	Mission Bay Park, San Diego	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Recreation	Patriots Point Park	SC	1970s	silty loam, grain size fine	Charleston	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.

BU	Project	State	Event	Sediment	Location	References
Recreation	Tennessee-Tombigbee Waterway, MS, AL	MS	1980s	silt, sand	along Tennessee-Tombigbee Waterway	(None)
Shore protection	Aransas National Wildlife Refuge	TX	1993-1994	silty sand, silt	north of Corpus Christi along the Gulf Intracoastal Waterway	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997. Streever, W. J. (2000). Spartina alternifloramarshes on dredged material: a critical review of the ongoing debate over success. Wetlands Ecology and Management, 8(5), 295-316.
Shore protection	Kelly Island	DE	1990s	silt, sand	Kelly Island	Irish and Davis. (1997). Design of sand dike for wetlands and beach restoration at Kelly Island, Delaware. Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997, p. 33.
Shore protection	Morehead City Nearshore Placement Area	NC	1995	beach quality sand	near west side of Beaufort Inlet	Small et al. (1997). Beneficial use of dredged material in nearshore placement areas in North Carolina. Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997, p. 152.
Shore protection	Mobile outer mound	AL	1988-1990	Dredged sediment	south of Dauphin Island	Hands and Bradley. (1990). Results of Monitoring the Disposal Berm at Sand Island, Alabama. Technical Report. TR-DRP-90-2. U.S. Army ERDC, Vicksburg, MS. PDF.

BU	Project	State	Event	Sediment	Location	References
Shore protection	Marina Del Rey	CA	1990s	sandy sediment w/lead, zinc, and copper contaminants	Marina Del Rey	Fowler and Trainer. (1997). Overview of geocontainer projects in the United States. Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997.
Shore protection	Shamrock Island	TX	1998-1999	sand	Shamrock Island, Corpus Christi Bay	Moseley et al. (2000). Habitat Enhancement and Protection, Shamrock Island, Texas. Proceeding of the 13th National Conference on Beach Preservation Technology, Melbourne, FL.
Shore protection	Santa Barbara Harbor	CA	1935	sand	downdrift of the Santa Barbara Harbor entrance	Beach Erosion Board. (1950). Test of Nourishment of the Shore by Offshore Deposition of Sand: Long Branch, New Jersey. Technical Memorandum No. 17, USACE.
Shore protection	West Bay	TX	1992-1993	silty sand, silt	West Bay, Gulf Intracoastal Waterway	(None)
Wetland habitat	Port of Los Angeles Channel Deepening Project	CA	2002-2005	silt, sand, mudstone	San Pedro Bay	USACE & Port of Los Angeles. (2000). Port of Los Angeles Channel Deepening Project Final Supplemental Environmental Impact Statement/Environmental Impact Report.,
Wetland habitat	Apalachicola Bay Island	FL	1974-1976	silt	Apalachicola Bay	(None)
Wetland habitat	Armand Bayou	TX	1995	(N/I)	Galveston Bay, Harris County	Streever. (2000). Spartina alterniflora marshes on dredged material: A critical review of the ongoing debate over success. Wetlands Ecology and Management 8: 295-316. Shafer, D. J., & Streever, W. J. (2000). A comparison of 28 natural and dredged material salt marshes in Texas with an

BU	Project	State	Event	Sediment	Location	References
						emphasis on geomorphological variables. Wetlands Ecology and Management, 8(5), 353-366.
Wetland habitat	Harkers Island	NC	1987	sand	Atlantic Intracoastal Waterway near Beaufort	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997. Streever, W. J. (2000). Spartina alternifloramarshes on dredged material: a critical review of the ongoing debate over success. Wetlands Ecology and Management, 8(5), 295-316.
Wetland habitat	Houston Ship Channel	TX	1980s, 1995	(N/I)	Houston Ship Channel	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Wetland habitat	Lake of the Woods, Warroad	MN	1980s	silt, sand	near Warroad	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Wetland habitat	Lake Salvador Wetland Development	LA	1998-1999	(N/I)	Lake Salvador	Powers. (2001). Louisiana completes marsh creation demo projects. International Dredging Review 20: 2, 13-15.
Wetland habitat	Kenilworth	MD	1993	silt, sand	National Aquatic Gardens, Anacostia River	Davis and Landin. (1997). Proceedings of the national workshop on geotextile tube applications. Technical Report. TR-WRP-RE-17. U.S. Army ERDC, Vicksburg, MS. PDF.

BU	Project	State	Event	Sediment	Location	References
Wetland habitat	Mississippi River Gulf Outlet	LA	1980s	silt, sand	adjacent to the Mississippi River Gulf Outlet	(None)
Wetland habitat	Pointe Mouillee CDF	MI	1976-1983	silt, sand	Pointe Mouillee Waterfowl Management Area near Flat Rock	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Wetland habitat	Mobile- thin layer placement	AL	1988	silty sediment	Lower Mobile Bay	(None)
Wetland habitat	Mitchell Energy Corporation Sites	TX	1991, 1993	silt, sand	near Aransas National Wildlife Refuge	Streever. (2000). Spartina alterniflora marshes on dredged material: A critical review of the ongoing debate over success. Wetlands Ecology and Management 8: 295-316. Shafer, D. J., & Streever, W. J. (2000). A comparison of 28 natural and dredged material salt marshes in Texas with an emphasis on geomorphological variables. Wetlands Ecology and Management, 8(5), 353-366.
Wetland habitat	Muzzi Marsh	CA	1980s	silt, sand	north of Tiburon, San Francisco Bay, Marin County	(None)
Wetland habitat	Potters Marsh	IL	1996	(N/I)	Pool 13 Upper Mississippi River	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C. Cammen, L. M., Seneca, E. D., & Copeland, B. J. (1976). Animal Colonizaion of Man-Initiated Salt Marshes on Dredge Spoil. COASTAL ENGINEERING RESEARCH CENTER FORT BELVOIR VA.

BU	Project	State	Event	Sediment	Location	References
Wetland habitat	St. Johns River	FL	1980s	silt, sand	along St. Johns River near Jacksonville	(None)
Wetland habitat	Sonoma Baylands	CA	1996-1997	silt	near the mouth of the Petaluma River	(None)
Wetland habitat	Snow's Cut	NC	1970s	coarse sand (0.5-2.0 mm)	Cape Fear River and Snow's Cut	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C. Streever, W. J. (2000). Spartina alternifloramarshes on dredged material: a critical review of the ongoing debate over success. Wetlands Ecology and Management, 8(5), 295-316.
Wetland habitat	San Francisco Bay Salt Pond #3	CA	1970s	silt	near mouth of the Alameda Flood Control Channel	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Wetland habitat	Bayou DuPont	LA	2000	(N/I)	Bayou DuPont, near Barataria Waterway, New Orleans	Powers. (2001). Louisiana completes marsh creation demo projects. International Dredging Review 20: 2, 13-15.
Wetland habitat	Bayou La Branche	LA	1994	sand	adjacent to the Lower Guide Levee of the Bonnet Carre' Floodway	Muncy et al. (1996). National review of Corps environmental restoration projects. IWR Report 96-R-27, 123.
Wetland habitat	Bodkin Island	MD	1986, 1996-1997	sand	near Kent Narrows and Chester River in Queen Annes County	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997.

BU	Project	State	Event	Sediment	Location	References
Wetland habitat	Bolivar Sandbag Marsh	TX	1976-1977	sand	Galveston Bay	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997. USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Wetland habitat	Bolivar Peninsula	TX	1960s-1980s	fine grained sand	Goat Island, Bolivar Peninsula, Galveston Bay	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997., USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Wetland habitat	Brown Lake	LA	(N/I)	(N/I)	(N/I)	(None)
Wetland habitat	Buttermilk Sound	GA	1960s-1970s	sand	near mouth of Altamaha River north of Brunswick	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997. USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Wetland habitat	Clear Creek	TX	1997-1998	(N/I)	Clear Creek in Galveston Bay	(None)
Wetland habitat	Coffee Island	AL	1985	sand	Mississippi Sound near Bayou le Batre	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997.
Wetland habitat	Commencement Bay	WA	1980s-1990s	(N/I)	near mouth of Puyallup River in Puget Sound	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.

BU	Project	State	Event	Sediment	Location	References
Wetland habitat	Donlin Island	CA	1983	silt, sand	San Joaquin River near Stockton	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997. USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Wetland habitat	Eastern Neck National Wildlife Refuge	MD	1993	sand	near Kent Narrows in Chesapeake Bay	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997. Davis, J. E., & Landin, M. C. (1997). Proceedings of the national workshop on geotextile tube applications. US Army Engineer Waterways Experiment Station.
Wetland habitat	Fina la Terre	LA	1980s	silt, sand	Terrebonne Parish	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997.
Wetland habitat	Goglihite	WA	1987-1988	sand	Seattle	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997.
Wetland habitat	Queen Bess Island	LA	1980s	silt, sand	Gulf Intracoastal Waterway	(None)
Wetland habitat	San Leandro	CA	(N/I)	(N/I)	upland disposal site in the city of San Leandro	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Wetland habitat	Sabine National Wildlife Refuge	LA	1996	(N/I)	along west side of Calcasieu Ship Channel	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.

BU	Project	State	Event	Sediment	Location	References
Wetland habitat	Southwest Pass	LA	1970s	silt, sand	below Head of Passes on the western side of Southwest Pass	USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Wetland habitat	Warm Springs	CA	1980s	silt	adjacent to south San Francisco Bay north of San Jose	(None)
Wetland habitat	Windmill Point	VA	1970s	silt, sand	at Windmill Point east of Hopewell along James River	(None)
Wetland habitat	Winyah Bay	SC	1970s	silt	off Middle Ground Island in Winyah Bay near Georgetown	Alphin and Posey. (2000). Long-term trends in vegetation dominance and infaunal community composition in created marshes. Wetlands Ecology and Management 8:317-325. LaSalle, M. W., Landin, M. C., & Sims, J. G. (1991). Evaluation of the flora and fauna of aSpartina alterniflora marsh established on dredged material in Winyah Bay, South Carolina. Wetlands, 11(2), 191-208.
Wetland habitat	Weaver Bottoms	MN	1988	sand	Upper Mississippi River National Fish and Wildlife Refuge	(None)
Wetland habitat	Texas City Dike	TX	1978-1979	silt, sand	northeast side of Texas City Dike, Galveston Bay	(None)
Wetland habitat	Times Beach CDF	NY	(N/I)	silt, sand	Lake Ontario near Buffalo	(None)

BU	Project	State	Event	Sediment	Location	References
Wetland habitat	Atchafalaya River Delta	LA	1970s-1980s	silt	Mouth of the Atchafalaya River	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997. USACE. (1987). Beneficial Uses of dredged material. Engineer Manual 1110-2-5026, USACE, Office of the Chief of Engineers, Washington, D.C.
Wetland habitat	Atkinson Island	TX	1993	silt, sand	upper reaches of Houston Ship Channel	Landin. (1997). Proceedings, International Workshop on Dredged Material Beneficial Uses. Baltimore, MD July 28-August 1, 1997.
Wetland habitat	Vintondale-wetlands	PA	2001	sand	AMD & ART Park	Lee, C. R., Brandon, D. L., & Price, R. A. (2007). Manufactured soil field demonstration for constructing wetlands to treat acid mine drainage on abandoned minelands. ENGINEER RESEARCH AND DEVELOPMENT CENTER VICKSBURG MS ENVIRONMENTAL LAB.

APPENDIX B: REGULATORY BACKGROUND AND AGENCY JURISDICTION

The United States Army Corps of Engineers (USACE) and the United States Environmental Protection Agency (USEPA) develop federal policy and regulations that must also be observed on a state and local level. USACE requirements primarily relate to locations where dredged material could potentially be placed within the waterway and/or the floodplain. The primary responsibilities for USEPA relate to potential human health or ecological impacts associated with dredging and disposal practices, and protection of surface water and groundwater resources.

The USACE regulates construction, dredging and fill placement in waters of the United States under permits issued under Section 404 of the Clean Water Act (CWA, 2002). Sediment and soil dredged or excavated as part of a river crossing project, cannot be used or disposed within the floodplain, and must be placed in an upland, non-wetland area, unless specifically authorized by USACE, USEPA, or a state agency with delegated authority. USACE regulations are primarily concerned with placement of fill within the floodplain. USACE permits for river crossings do not define “clean” and/or “contaminated” soil or sediment and do not regulate management of dredged spoils.

The Illinois Department of Natural Resources and units of local government (through floodplain development ordinances required for participation in the Flood Insurance Program) also have jurisdiction over placement of fill in the floodplain.

Under the Illinois Environmental Protection Act (Illinois EPA Act) (Environmental Protection Act), the Illinois Pollution Control Board (IPCB) adopts environmental regulations and adjudicates complaints for non-compliance. The Illinois EPA is responsible for permitting, compliance, and enforcement; the Illinois EPA also has focused rule-making authority. IPCB has adopted regulations that define clean, or uncontaminated soil under Section 742 of Part 35 of the Illinois Administrative Code (Illinois Administrative Code), also known as the Tiered Approach to Corrective Action Objectives (TACO) (TACO, 1997). In practical terms, the TACO Residential Criteria (TACO, 1997) define clean, or uncontaminated soil. Under these rules, clean soil that meets Residential Criteria as listed in 35 IAC 742 Subpart E (Illinois Administrative Code), can be used off-site as unrestricted clean fill. IPCB has developed rules for the management of Clean Construction and Demolition Debris (CCDD) and Uncontaminated Soil Fill Operations (USFO) which rely on Maximum Allowable Contaminant (MAC) concentrations which are based on the TACO Residential Criteria (TACO, 1997).

IPCB remediation standards relevant to the use and disposal of potentially contaminated soil, including dredged spoils from river projects, are incorporated into Article 669.05 of the IDOT *Standard Specifications for Road and Bridge Construction.* These specifications stipulate conditions for use of potentially contaminated soil within IDOT right-of-way (ROW). Specific conditions for individual IDOT construction projects are incorporated as Special Provisions.

IPCB regulations allow for placement of impacted soils, including sediments, that do <u>not</u> meet TACO Residential Criteria (TACO, 1997), but the fill placement site must be subject to enforceable environmental land use controls (ELUC) recorded with the deed. Conditions specified in the ELUC would depend on characteristics of the impacted material, and could include limitation to commercial/industrial uses only, prohibitions on groundwater use, the construction and maintenance of an engineered barrier to prevent access, construction worker protections, etc. Impacted material may be used beneficially as: fill or cover at a commercial or industrial facility, an agricultural amendment, for daily or intermediate cover at a landfill, cover material at a reclaimed strip mine, environmental remediation site, etc. Future requirements for managing the site, including maintenance of engineered barriers, groundwater monitoring, etc. would be addressed in the ELUC.

Illinois EPA has established a permitting process through the Division of Land Pollution Control to request a Beneficial Use Determination (BUD) for material that would otherwise be considered a waste. The permit application requires detailed information about the material to be managed and the location where it would be used, including information on soil and groundwater characteristics (see Appendix I). Where possible, IDOT would beneficially use the dredged material to reclaim former borrow areas. The application would likely be prepared by the District design team with support from the Illinois Department of Transportation Bureau of Design and Environment (BDE). The necessary timing to accomplish the permitting process is long, often measured in years, and compared to the transportation project design timetable often makes the permitting process impractical.

IPCB has also established rules for soil that can be managed through a Clean Construction or Demolition Debris (CCDD) Fill Operations and/or Uncontaminated Soil Fill Operations (USFO) (35 IAC 1100) (Illinois Administrative Code). Commercial CCDD and USFO operations are often inactive quarries and former borrow sites. Acceptance criteria for materials that can be managed at CCDD/USFO are based on, but are more stringent than, TACO Residential Criteria (TACO, 1997).

Impacted soil and dredged material can potentially be land-applied to agricultural fields, subject to requirements specified by USEPA, the Illinois Department of Agriculture (IDOA) and the Illinois EPA. In Illinois, soil that has been impacted by spills of agricultural chemicals (pesticides, herbicides, etc.), particularly at agrichemical facilities, are often managed in this manner. Application rates for soil or sediment would be required to be less than or equal to product label or agronomic application rates for the specific chemicals. Land-application rates for both clean and contaminated soil and sediments would also be restricted by maximum loadings for nutrients (nitrogen, phosphorous, etc.) and metals (lead, manganese, zinc, etc.) that may be present in the sediments. These limits are designed to prevent groundwater contamination, minimize surface water impacts from erosion and storm water runoff, limit accumulations in a growing crop, and prevent crop damage. Hazardous compounds listed in 35 IAC Section 721 (Illinois Administrative Code) would not be suitable for land application. A permit would be required from the Illinois EPA Bureau of Water for land application of impacted soil or sediments on agricultural land. The permit application would be prepared by the IDOT District Engineer with support from BDE.

- There are three (3) categories for classifying and regulating dredged material disposal used by the Illinois Environmental Protection Agency (IEPA). According to section 3.160 of the Illinois Environmental Protection Act (Environmental Protection Act), dredged material is categorized as part of construction or demolition debris, and therefore, if falls into these three categories

(Thomas Hubbard email dated 27 July 2020 in Figure 44 (Hubbard, 2020). Therefore, dredged material falls into the following three (3) categories for classifying and regulating dredged material disposal:

i. **Clean Construction and Demolition Debris (CCDD) and Uncontaminated Soil (UC)** – dredged material is classified as a subset of construction and demolition debris by the IEPA. If the contaminates in the dredged material do not exceed the Maximum Allowable Concentrations (MAC) (IEPA, 2012) under 3.160(b and c) of the Illinois Environmental Protection Act (IEPA Act) (Environmental Protection Act) and 35 Ill. Admin. Code 1100 Subpart F (Illinois Administrative Code), the dredged material is not considered to be a "waste". Therefore, if the material is not a waste, it is not subject to the above-referenced requirements applicable to special waste and hazardous waste. If the dredged material meets the MAC criteria, it can be re-used as clean soil and it can also be managed at an Illinois permitted CCDD or USFO facilities.

   The testing to determine whether the dredged material qualifies to be CCDD material is performed by the generator, e.g., IDOT and not by the user (i.e., contractor), and is based on U.S. EPA SW-846 or 35 IAC Section 1100.610(c) (Illinois Administrative Code). The generator could potentially certify that certain contaminates are unlikely to be present based on environmental due diligence regarding chemical spills and releases in proximity to the dredging location. If the material is managed at a CCDD or USFO facility, certification and waiver of testing requirements will be subject to review and approval by the facility.

ii. **Special Waste –** dredged material is classified as a special waste if one or more of the contaminants exceed the values in the table of Maximum Allowable Concentrations (MAC) (35 Ill. Admin. Code 1100, Subpart F) (Illinois Administrative Code). If the dredged material meets the criteria for industrial and commercial land use under the Illinois Tiered Approach to Corrective Action Objectives (35 Ill. Admin. Code 742) (Illinois Administrative Code), it may be able to be re-used as fill subject to Environmental Land Use Controls (ELUC) or could potentially be used subject to a Beneficial Use Determination (BUD). The IEPA manages BUD in accordance with section 22.54 of the Illinois Environmental Protection Act (Environmental Protection Act) and it doesn't mention any need for tracking of the material through the life of its presence, and it doesn't mention restrictions with regards to future operational activities (see Appendix I). If the dredged material is not re-used on industrial/commercial property, or through beneficial use, or does not meet these criteria, it must be disposed in a permitted landfill as hazardous or non-hazardous waste.

iii. **Hazardous Waste –** A waste, or combination of wastes, that because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible, illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed, and has been identified by characteristics or listing, as hazardous pursuant to Section 3001 of the Resource Conservation and Recovery Act of 1976 (415 ILCS 5/22.4) (Environmental Protection Act) or pursuant to the Pollution Control Board regulations. Potentially infectious medical waste is not a hazardous waste, except for those potentially infectious medical wastes identified by characteristics or listing as hazardous under Section 3001 of the Resource Conservation and Recovery Act of 1976 (415 ILCS 5/22.4) (Environmental Protection Act) or pursuant to Board regulations. (415 ILCS 5/3.220) (Environmental Protection Act).

Hazardous Wastes are defined by listing in 35 Ill. Admin. Code 721, Subpart D (Illinois Administrative Code), and by characteristics of ignitability, corrosivity, reactivity, and toxicity as listed and defined in 35 Ill. Admin. Code 721, Subpart C (Illinois Administrative Code).

Dredged Material Questions

HT

Hubbard, Thomas <Thomas.Hubbard@Illinois.gov
>

Mon 7/27/2020 7:55 AM

To: Stark, Timothy D

Cc: Idries, Abedalqader

Tim,

The Agency has determined, per Section 3.160 of the Illinois Environmental Protection Act, that dredged material is part of construction or demolition debris. Therefore it falls into three catagories, based on its contaminate level:

1. If the dredged material testing is all below the MAC table values, the material is considered clean soil and can be used without any permitting or restrictions, including disposal at a CCDD or USFO site;
2. If the dredged material testing exceeds any MAC table value, but is non-hazardous, it's a special waste but could still be used in certain circumstances (cover/fill for a remediation project or with a BUD for a specific use) and;
3. If the dredged material is determined to be a hazardous waste, the hazardous waste regulations would apply.

Tom

...

Figure 44. Screenshot. Thomas Hubbard (IEPA) email regarding IEPA classification of dredged material (Hubbard, 2020).

- **Beneficial Use Determination –** If the dredged material is classified as a special waste, the generator (e.g., IDOT) can prepare a Beneficial Use Determination (BUD) for review and approval by the IEPA (see Appendix I). If approved, this BUD would allow the dredged material to be used in only the approved site-specific application. As a result, each site and use would require a BUD evaluation by the IEPA.
- **Characterizing Illinois Dredged Materials –** There is evidence that the chemical characteristics of most of the Illinois dredged material are between CCDD eligible and Hazardous Waste criteria, i.e., contamination levels exceed the MAC Table but do not exceed the hazardous waste characteristic concentrations. Therefore, most sediments (and other IDOT wastes) fall under the category of "non-special waste". However, some sediments that are closer to shore are fine grained and organic rich materials that fall in between a special waste and hazardous waste.
- **Dredged Material Contaminants –** The contaminant criteria used for dredged material (CCDD, special waste, hazardous waste, etc.) is defined by the Illinois Pollution Control Board (IPCB) which develops environmental regulations for implementation of the Illinois EPA Act.

Beneficial Use Determination – If the dredged material is classified as a special waste, the generator (e.g., IDOT) can prepare a Beneficial Use Determination (BUD) for review and approval by the IEPA. If approved, this BUD would allow the dredged material to be used in only the approved site-specific application. As a result, each site and use would require a BUD evaluation by the IEPA.

Table 17. Chemical Testing Parameters (after Oswald et al. 2002)

Test Description	Test Method
TCLP	EPA Method 1311
SPLP	EPA Method 1312
TAL Metals	EPA Method 6010B/7471
TCL Pesticides	EPA Method 8081A
TCL PCBs[1]	EPA Method 8082
TCL BNAs (Semi-volatile Organic Chemicals)	EPA Method 8270C
Total Petroleum Hydrocarbons[2]	Modified EPA 8015
Cyanide	EPA Method 9010

TAL= Target Analyte List.
TCL= Target Compound List.
[1]= Analysis Performed on Pedricktown material only.
[2]= Analysis Performed on Fort Mifflin material only.

Minnesota DOT Allowable Contamination Standards

For comparison purposes, this section reviews the specifications for beneficial use of dredged material on Minnesota Department of Transportation projects (Minnesota DOT). Minnesota standards are presented in this report because it is a midwestern state and adjacent to the state of Illinois and they have been actively trying to identify beneficial uses for dredged material. The comparison is not meant to apply Minnesota standards to Illinois. Minnesota DOT has been more active in trying to increase beneficial uses of dredged material than other neighboring states so Minnesota is a focus in this section. According to the Minnesota Pollution Control Agency (MPCA), no permit is required for the management of dredged material when (Stollenwerk et al. 2014):

- The size of the removed dredged material without surface water discharge is less than 3,000 yd^3.
- The material has greater than or equal to 93% of sand based on the No. 200 sieve.
- The dredged material has contaminant values that do not exceed that Soil Reference Values (SRVs) values for a disposal option.
- When the landfill or site of disposal of dredged material already has a managing dredged material MPCA permit.
- When the dredged material is dredged from places other than Mississippi River downstream of River Mile 857.6, Minnesota River downstream of River Mile 27, St. Croix River downstream of River Mile 26, St. Louis River downstream of the State Highway 23 crossing, St. Louis Bay or Duluth/Superior Harbor, and out of state projects.

Before starting dredging activities, sediment characterization must be completed for the dredge site. If the material has more than or equal to 93% sand, it is unlikely to be contaminated, according to the MPCA. Otherwise, the material requires testing for baseline sediment analysis, which is testing for contamination levels for different parameters, such as, Arsenic, Cadmium, Copper, …, etc. (Stollenwerk et al. 2014). If the dredged material is likely contaminated due to the likelihood of pollutants or historical land uses, it must be subjected to additional sediment analysis.

After testing for contaminants, the concentrations of different substances must be compared to Tier 1 and 2 SRVs levels to determine the category of dredged material management level that applies. There are the following three (3) management levels: level 1, level 2, and level 3. Levels 1 and 2 are suitable for transportation facilities. For the dredged material to be classified into level 1, the dredged material must have a concentration level at or below Tier 1 SRVs for all concentrations. Under level 1, the dredged material is suitable for use or reuse in residential or recreational properties. If at least one (1) concentration is higher than Tier 1 SRVs and all concentrations are at or below Tier 2 SRVs, the material is classified as level 2 dredged material. Under level 2, the material is suitable for use on industrial properties. If the material has at least one (1) concentration higher than Tier 2 SRVs levels, the material is classified as level 3 dredged material, which is not suitable for reuse in any property. Table 18 shows the minimum number of samples that are needed for chemical characterization and evaluation of sediments.

Table 18. Minimum Number of Samples Required for Minnesota Characterization and Evaluation (Stollenwerk et al. 2014)

Volume planned for removal, ydP^3	Number of core sample sites	Number of sieve analysis sites
</=1,000	1	3
1,000-30,000	3	6
30,000-100,000	5	10
100,000-500,000	6	12
500,000-1,000,000	8	16
>1,000,000	>8	>16

Great Lakes Commission (2004) Contamination Standards

This section summarizes the contamination standards requirements used in surrounding Midwest states including Illinois state for classifying dredged material for use and disposal purposes. The tables in this section summarize the surrounding contamination standards compiled by the Great lakes Commission (Great Lakes Dredging Team, 2004) for different scenarios and are based on gathered information from the Great Lakes states representatives, mainly the Upland Testing and Evaluation Project Management Team. This comparison provides the reader with the resulting differences in criteria adopted by Midwest States. However, an appeal to the Illinois Pollution Control Board is required to modify or update the TACO remedial objectives. Even though the values in the following tables for the proposed scenarios are based on state responses of how their states would handle the proposed beneficial uses scenarios, it is not considered how the states will deal with a particular scenario. Instead, these summary tables present an example of how these state agencies might respond to the scenario presented. Only Illinois' contaminant criteria for all different scenarios are provided in this section. However, other states' criteria are available in the "Testing and Evaluating Dredged Material for Upland Beneficial Uses: A Regional Framework for the Great Lakes" report (see Great Lakes Dredging Team, 2004). In addition, Table 19 to Table 30 contain TACO regulatory requirements with recent proposed changes incorporated in MAC table.

i) Geotechnical and Chemical Parameters:

The chemical contaminants considered in the Great lakes Commission (Great Lakes Dredging Team, 2004) study include: polychlorinated biphenyls (PCBs), volatiles, semi-volatiles, diesel range organics, metals, pesticides, cyanide, polycyclic aromatic hydrocarbons (PAHs), and total petroleum hydrocarbons (Oswald et al., 2002). Table 17 shows the EPA (SW 846) chemical test methods that should be used to measure the listed contaminants. The geotechnical characterization of the sediments includes: Atterberg limits, USCS classification (ASTM D2487), particle size analysis, organic content, moisture content, compaction behavior, shear strength, compressibility, swell potential, and hydraulic conductivity.

ii) Dredging Case Scenarios Considered by Surrounding States:

This section describes eight (8) scenarios that neighboring states consider for beneficial use of dredged material. All of these scenarios pertain to non-hazardous dredged material. It should be noted that agencies may apply site-specific criteria that may be more or less stringent that the criteria listed below.

Scenario 1: Daily Cover at Licensed Municipal Solid Waste Landfill:

Municipal solid waste (MSW) landfill needs a daily cover of the placed waste. This daily cover typically consists of a 6 in. thick layer of soil to prevent escaping of litter, birds and animals from entering the waste, leachate generation, and release of gases and odors. A dewatered dredged material can serve as a daily cover for MSW landfills at a low cost. For daily landfill cover, some of the factors to consider when selecting a dredged material for daily waste cover are: volatilization, leachate constituents, surface water runoff, and fugitive dust. Table 19 shows the maximum contaminant concentrations of primary contaminants for use a daily cover at an MSW landfill in the states of Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin (Great Lakes Dredging Team, 2004). For the state of Illinois, contaminants criteria would need to be made on a case-by-case basis following the risk-based procedures outlined in 35 Illinois Administrative Code, subtitle C (Illinois Administrative Code). As guidance, the TACO Tier 1 industrial contaminant criteria could be referred to (TACO, 1997).

Scenario 2: Beach Nourishment:

The contamination criteria for using dredged material for beach nourishment is strict because of wildlife and human exposure, and high potential for leaching of contaminants into nearshore waters. Fine-grained soils are usually more contaminated than coarse-grained soils, i.e., sandy soils, so they are less preferred. Therefore, for materials that have a sand percentage of more than 80% or even 95%, some state regulations waive the required contamination testing. For beach nourishment, human - dermal, human – ingestion, human – inhalation, biota (land) - ingestion, and biota (land) – bioaccumulation are the minimum pathways that must be considered. The maximum contamination criteria for beach nourishment for the eight Great Lakes states is shown in Table 20. For the state of Illinois, the water quality standards under 35 IAC (Illinois Administrative Code) must be met during beach nourishment operations. The Illinois EPA's dredge and fill rules under 35 IAC Part 395-204(a) (Illinois Administrative Code), provide that sediment testing of the material prior to placement must confirm that the material is less than 20% passing a #230 U.S. sieve. In Illinois, additional testing for asbestos may be required prior to beach nourishment.

Table 19. Maximum Contamination Criteria for Scenario 1 Daily Cover at Licensed Municipal Solid Waste Landfill (Great Lakes Dredging Team, 2004)

Contaminant	IL	IN	MI	MN	NY	OH	PA	WI
Arsenic	13	20	5.8	25	41	12	–	–
Lead	23–282*	230	3,333	700	4	600	–	–
Zinc	1,000–23,000*	10000	466667	70000	–	360	–	–
PCBs	1	5.3	16	8	–	33	50	50
Benzo(a)pyrene	0.8	1.5	–	4	–	0.7	–	–
Benzene	0.03	0.67	0.102	4	–	5	–	–
Criteria source	Cleanup Industrial	Cleanup Industrial	Use specific regulations	Cleanup Industrial	Reuse Specific	Soil Quality Industrial	Non TSCA**	Non TSCA**

All units are in milligrams per kilogram (mg/Kg) of material

* Values are pH-specific and are contained in 35 Ill. Admin. Code 742 (Illinois Administrative Code); soil component to groundwater ingestion criteria

**TSCA stands for Toxic Substance Control Act.

Table 20. Maximum Contamination Criteria for Scenario 2 Beach Nourishment (Great Lakes Dredging Team, 2004)

<table>
<tr><th>Contaminant</th><th>IL</th><th>IN</th><th>MI</th><th>MN</th><th>NY</th><th>OH</th><th>PA</th><th>WI</th></tr>
<tr><td>Arsenic</td><td>13</td><td>3.9</td><td rowspan="6">Must be >95% sand</td><td>12</td><td>7.5</td><td>–</td><td>–</td><td rowspan="6">Grain size and color requirements</td></tr>
<tr><td>Lead</td><td>23–282*</td><td>81</td><td>400</td><td>Background</td><td>–</td><td>–</td></tr>
<tr><td>Zinc</td><td>1,000–23,000*</td><td>10000</td><td>1,242**</td><td>20</td><td>–</td><td>–</td></tr>
<tr><td>PCBs</td><td>1</td><td>1.8</td><td>1.2**</td><td>1</td><td>–</td><td>–</td></tr>
<tr><td>Benzo(a)pyrene</td><td>0.09</td><td>0.5</td><td>1.0**</td><td>0.061</td><td>–</td><td>–</td></tr>
<tr><td>Benzene</td><td>0.03</td><td>0.034</td><td></td><td></td><td>–</td><td>–</td></tr>
<tr><td>Criteria Source</td><td>Cleanup Residential</td><td>Cleanup Residential</td><td>Use-specific regulations</td><td>Cleanup recreational</td><td>Cleanup general</td><td></td><td></td><td>Use-specific regulations</td></tr>
</table>

All units are in milligrams per kilogram (mg/Kg) of material

* Values are pH-specific and are contained in 35 Ill. Admin. Code 742 (Illinois Administrative Code); soil component to groundwater ingestion criteria

Minnesota criteria are based on SRV Tier 2 chronic residential standards (Risk-Based Guidance for the Soil, 1998), except for **, which are from SLV Tier 1 standards (Risk-Based Guidance for Evaluating the Soil Leaching Pathway, 1998).

Scenario 3: Compost and Topsoil Manufacture:

Mixing dredged material with other components can lead to a source of compost or topsoil with good quality for city and state projects. Assessing the best soil and its additional components for topsoil manufacture needs soil and plant testing. Evaluating plant growth and seed germination can be achieved by conducting greenhouse tests on the resulting soil mixture. Furthermore, the removal of organic contaminants like PCBs and PAHs can be achieved by adding carbon sources to the dredged material. The minimum exposure routes and pathways that must be considered for topsoil manufacture include: runoff, volatilization, leachate generation, plant and animal uptake, biota exposure routes, i.e., direct contact, ingestion, and bioaccumulation, and human exposure routes, i.e., direct contact, ingestion, and inhalation. For this scenario, there are three (3) different scenarios depending on the use of restrictions. These sub scenarios are unrestricted use, bagged use, and restricted use (bulk use). The maximum contamination criteria for these three (3) scenarios are presented in Scenarios 3a, 3b, and 3c and the accompanying tables.

Scenario 3(a): Unrestricted Use - Compost and Topsoil Manufacture:

When the dredged material falls under the unrestricted use category, the material is suitable for a range of applications without a permit. Therefore, stricter contamination criteria are required, i.e., lower values of maximum contaminant concentration, due to the large number of exposure routes and pathways, as shown in Table 21. For the state of Illinois, 35 IAC 830 Subpart E: "Quality of End Use Compost" (Illinois Administrative Code), could be used as guidance for use in developing compost mixture specifications for scenarios 3(a), 3(b), and 3(c).

Table 21. Maximum Contamination Criteria for Scenario 3(a) Unrestricted Use—Compost and Topsoil Manufacture (Great Lakes Dredging Team, 2004)

Contaminant	IL	IN	MI	MN	NY	OH	PA	WI
Arsenic	13	3.9	7.6	10	7.5	41	---	0.042
Lead	23 – 282*	81	400	400	Backg-round	300	---	50
Zinc	1,000 – 23,000*	10,000	65	1,242**	Backg-round	2,800	---	4,700
PCBs	1	1.8	1.2	1.2	1	--	---	--
Benzo(a)pyr-ene	0.09	0.5	2	1.0**	0.061	--	---	0.0088
Benzene	0.03	0.034	0.1	0.034**	0.06	--	---	--
Criteria Source	Cleanup Resident-ial	Cleanup Reside-ntial	Use-specific regulations	Cleanup Reside-ntial	Specific reuse and general cleanup	Sludge rules		Reuse General

All units are in milligrams per kilogram (mg/Kg) of material.* Values are pH-specific and are contained in 35 Ill. Admin. Code 742 (Illinois Administrative Code); soil component to groundwater ingestion criteria.

Minnesota criteria are based on SRV Tier 2 chronic residential standards (Risk-Based Guidance for the Soil, 1998), except for **, which are from SLV Tier 1 standards (Risk-Based Guidance for Evaluating the Soil Leaching Pathway, 1998).

Scenario 3(b): Bagged Use – Compost and Topsoil Manufacture:

When the material meets the Bagged Use criteria, the material is suitable for a fewer number of applications, such as, residential gardens. Also, ingestion is the main concern in this case because of a potential for human contact, i.e., farmers, labors, etc. Table 22 shows the maximum contamination criteria for this case.

Table 22. Maximum Contamination Criteria for Scenario 3(b) Bagged Use—Compost and Topsoil Manufacture (Great Lakes Dredging Team, 2004)

Contaminant	IL	IN	MI	MN	NY	OH	PA	WI
Arsenic	13	3.9	7.6	10	7.5	41	--	0.042
Lead	23 – 282*	81	400	400	Backgr-ound	300	--	50
Zinc	1,000 – 23,000*	10,000	170,000	1,242**	Backgr-ound	2,800	--	4,700
PCBs	1	1.8	1.2	1.2	1	--	--	--
Benzo(a)pyr-ene	0.09	0.5	2	1.0**	0.061	--	--	0.0088
Benzene	0.03	0.034	180	0.034**	0.06	--	--	--
Criteria Source	Cleanup Residential	Cleanup Residential	Use-specific regulat-ions	Cleanup Recrea-tional	Specific reuse and general cleanup	Sludge rules		General Reuse

All units are in milligrams per kilogram (mg/Kg) of material

* Values are pH-specific and are contained in 35 Ill. Admin. Code 742 (Illinois Administrative Code); soil component to groundwater ingestion criteria

Minnesota criteria are based on SRV Tier 2 chronic residential standards (Risk-Based Guidance for the Soil, 1998), except for **, which are from SLV Tier 1 standards (Risk-Based Guidance for Evaluating the Soil Leaching Pathway, 1998).

Scenario 3(c): Restricted Use (or bulk use) – Compost and Topsoil Manufacture:

Under the Restricted Use category, the dredged material can be used in a limited number of applications, if approved first. If the use of this type of material is intended for industrial use with on-site exposure controls, the maximum contamination criteria might be less restrictive than shown in Table 23. Table 23 shows the maximum contamination criteria for this type of material.

Table 23. Maximum Contamination Criteria for Scenario 3(c) Restricted Use (or bulk use) – Compost and Topsoil Manufacture (Great Lakes Dredging Team, 2004)

Contaminant	IL	IN	MI	MN	NY	OH	PA	WI
Arsenic	13	3.9	7.6	25	7.5	41	--	0.042
Lead	23 –282*	81	400	700	Background	300	--	50
Zinc	1,000 – 23,000*	10,000	227	70,000	Background	2,800	--	4,700
PCBs	1	1.8	1.2	8	1	--	--	--
Benzo(a)pyr-ene	0.09	0.5	2	4	0.061	--	--	0.0088
Benzene	0.03	0.034	1.0	4	0.06	--	--	--
Criteria Source	Cleanup Reside-ntial	Cleanup Reside-ntial	Use-specific regulations	Cleanup Industrial	Specific reuse and general cleanup	Sludge rules		General Reuse

All units are in milligrams per kilogram (mg/Kg) of material

* Values are pH-specific and are contained in 35 Ill. Admin. Code 742 (Illinois Administrative Code); soil component to groundwater ingestion criteria

Scenario 4: Final Cover System at a Municipal Solid Waste Landfill:

Using dredged material as the final cover system for an MSW landfill is also an attractive option. However, the contamination criteria for the dredged material depends on the intended use of the landfill surface after closure, e.g., a park or golf course. The final cover is usually a thick cover of soil with low hydraulic conductivity that creates a barrier between the ground surface and underlying waste. For general post-closure applications leaching to groundwater, volatilization, ingestion, surface runoff, and fugitive particle release are typical considerations. Figure 24 shows the maximum contamination criteria for this scenario. For the state of Illinois, the criteria determination would be similar to the criteria for unrestricted fill (i.e. uncontaminated).

Scenario 5: Soil Cover at a Superfund or Brownfield Site:

This is a similar application as a final cover system at an MSW landfill described above. In this scenario, the intended use of the site after soil cover placement at the contaminated site is the prime factor for the exposure routes and pathways. Even though this is for a Superfund or Brownfield Site, contamination criteria are similar to that use for topsoil because of uncertainties in subsequent usage and exposure. Table 25, Table 26, and Table 27 below show the maximum contamination criteria for the material needed for this scenario for residential, industrial, and commercial post-closure uses, respectively. For the state of Illinois, contaminant criteria would need to be determined on a case-by-case basis following the risk-based procedures outlined in 35 IAC 742 (Illinois Administrative Code).

Although they were not developed for use with dredged material, the TACO standards (TACO, 1997) might be applied in these situations.

Table 24. Maximum Contamination Criteria for Scenario 4 Final Cover System at a Municipal Solid Waste Landfill (Great Lakes Dredging Team, 2004)

Contaminant	IL	IN	MI	MN	NY	OH	PA	WI
Arsenic	13	20	--	25	Varies	41	--	21
Lead	23 – 282*	230	--	700		300	--	--
Zinc	1,000 – 23,000*	10000	--	70000		2,800	--	--
PCBs	1	5.3	--	8		--	--	--
Benzo(a)pyrene	0.8	1.5	--	4		--	--	4.4
Benzene	0.03	0.67	--	4		--	--	--
Criteria Source	Cleanup Residential	Cleanup Residential	Use-specific regulations	Cleanup Industrial	Specific reuse and general cleanup	Sludge rules		General Reuse

All units are in milligrams per kilogram (mg/Kg) of material

* Values are pH-specific and are contained in 35 Ill. Admin. Code 742 (Illinois Administrative Code); soil component to groundwater ingestion criteria

Table 25. Maximum Contamination Criteria for Scenario 5a Soil Cover at a Superfund or Brownfield Site (Residential Use) (Great Lakes Dredging Team, 2004)

Contaminant	IL	IN	MI	MN	NY	OH	PA	WI
Arsenic	13	3.9	--	10	Use Prohibited	12	--	0.042
Lead	23 – 282*	81	--	400		140	--	50
Zinc	1,000 – 23,000*	10000	--	1,242**		200	--	4,700
PCBs	1	1.8	--	1.2		1.3	--	--
Benzo(a)pyrene	0.09	0.5	--	1.0**		0.7	--	0.0088
Benzene	0.03	0.034	--	0.034**			--	
Criteria Source	Cleanup Residential	Cleanup Residential		Cleanup Industrial and general	Use-specific regulations	Soil quality residential		General Reuse

All units are in milligrams per kilogram (mg/Kg) of material.

* Values are pH-specific and are contained in 35 Ill. Admin. Code 742 (Illinois Administrative Code); soil component to groundwater ingestion criteria

Minnesota criteria are based on SRV Tier 2 chronic residential standards (Risk-Based Guidance for the Soil, 1998), except for **, which are from SLV Tier 1 standards (Risk-Based Guidance for Evaluating the Soil Leaching Pathway, 1998).

Table 26. Maximum Contamination Criteria for Scenario 5b Soil Cover at a Superfund or Brownfield Site (Industrial Use) (Great Lakes Dredging Team, 2004)

Contaminant	IL	IN	MI	MN	NY	OH	PA	WI
Arsenic	13	20	--	25	14.5	41	--	0.042
Lead	23 – 282*	230	--	700	150	300	--	50
Zinc	1,000 – 23,000*	10000	--	70000	2,480	2,800	--	4,700
PCBs	1	5.3	--	8	10	--	--	--
Benzo(a)pyrene	0.8	1.5	--	4	0.061	--	--	0.0088
Benzene	0.03	0.67	--	4	0.06	--	--	--
Criteria Source	Cleanup Industrial	Cleanup Industrial		Cleanup Industrial	Reuse Specific	Sludge rules		General Reuse

All units are in milligrams per kilogram (mg/Kg) of material.

* Values are pH-specific and are contained in 35 Ill. Admin. Code 742 (Illinois Administrative Code); soil component to groundwater ingestion criteria

Table 27. Maximum Contamination Criteria for Scenario 5c Soil Cover at a Superfund or Brownfield Site (Commercial Use) (Great Lakes Dredging Team, 2004)

Contaminant	IL	IN	MI	MN	NY	OH	PA	WI
Arsenic	13	20	--	25	14.5	41	--	0.042
Lead	23 – 282*	230	--	700	150	300	--	50
Zinc	1,000 – 23,000*	10000	--	70000	2480	2800	--	4700
PCBs	1	5.3	--	8	10	--	--	--
Benzo(a)pyrene	0.8	1.5	--	4	0.061	--	--	0.0088
Benzene	0.03	0.67	--	4	0.06	--	--	--
Criteria Source	Cleanup Industrial	Cleanup Industrial		Cleanup Industrial	Reuse Specific	Sludge rules		General Reuse

All units are in milligrams per kilogram (mg/Kg) of material.

* Values are pH-specific and are contained in 35 Ill. Admin. Code 742 (Illinois Administrative Code); soil component to groundwater ingestion criteria

Scenario 6: Unrestricted Structural Fill:

The evaluations of dredged material as structural fill, e.g., highway embankments, is similar to topsoil mixtures discussed above. However, the criterion used for evaluation of structural fill material is applied to the dredged material, while for the case of topsoil, the criteria are applied to the mixture. Because the structural fill is generally unrestricted, all exposure routes and pathways must be considered. However, conservative assumptions can be made in this scenario. Table 28 shows the maximum contamination criteria for use of dredged material as unrestricted structural fill. For the state of Illinois, Contaminant criteria would need to be determined on a case-by-case basis following the risk-based procedures outlined in 35 IAC 742 (Illinois Administrative Code).

Table 28. Criteria for Scenario 6 Unrestricted Structural Fill (Great Lakes Dredging Team, 2004)

Contaminant	IL	IN	MI	MN	NY	OH	PA
Arsenic	13	3.9	5.8	10	7.5	12	41
Lead	23 – 282*	81	400	400	Background	70	450
Zinc	1,000 – 23,000*	10000	65	1,242**	Background	200	12,000
PCBs	1	1.8	1	1.2	1	0.5	Various
Benzo(a)pyr-ene	0.09	0.5	0.33	1.0**	0.061	0.1	2.5
Benzene	0.03	0.034	1	0.034**	0.06	0.05	0.13
Criteria Source	Cleanup Residential	Cleanup Residential	Cleanup	Cleanup general	Use-specific regulations	Soil quality	Use-specific regulation

All units are in milligrams per kilogram (mg/Kg) of material

* Values are pH-specific and are contained in 35 Ill. Admin. Code 742 (Illinois Administrative Code); soil component to groundwater ingestion criteria

Minnesota criteria are based on SRV Tier 2 chronic residential standards (Risk-Based Guidance for the Soil, 1998), except for **, which are from SLV Tier 1 standards (Risk-Based Guidance for Evaluating the Soil Leaching Pathway, 1998).

Scenario 7: Restricted Structural Fill

In this scenario, the intended uses play a significant role in assessing the exposure routes and pathways for the structural fill. Also, exposure controls and restrictions can reduce other routes and pathways. For instance, if the material was approved for use as structural fill under roadways, the fugitive dust pathway can be dismissed after placement of the roadway pavement. Table 29 shows the maximum contamination criteria for use of dredged material as restricted structural fill. For the state of Illinois, Contaminant criteria would need to be determined on a case-by-case basis following the risk-based procedures outlined in 35 IAC 742 (Illinois Administrative Code).

Table 29. Criteria for Scenario 7 Restricted Structural Fill (Great Lakes Dredging Team, 2004)

Contaminant	IL	IN	MI	MN	NY	OH	PA	WI
Arsenic	13	20	--	25	Case by case determ-ination	41	53	21
Lead	23 -282*	230	--	700		300	450	--
Zinc	1,000 – 23,000*	10000	--	70000		2,800	12,000	--
PCBs	1	5.3	--	8		--	various	--
Benzo(a)pyr-ene	0.8	1.5	--	4		--	11	4.4
Benzene	0.03	0.67	--	4		--	--	--
Criteria Source	Cleanup Industrial	Cleanup Industrial		Cleanup Industrial	Reuse General	Sludge rules	Use-Specific regulation	General Reuse

All units are in milligrams per kilogram (mg/Kg) of material. * Values are pH-specific and are contained in 35 Ill. Admin. Code 742 (Illinois Administrative Code); soil component to groundwater ingestion criteria

Scenario 8: Aggregate (i.e., bonded by lime, asphalt, or cement):

One of the best beneficial uses of dredged material is creating concrete or asphalt by binding dredged material with cement, asphalt, or lime. This is because, it gives an advantage of beneficially using a waste material (dredged material) in a large market size (i.e., aggregate production). Inhalation, ingestion, dermal contact might be the expected routes and pathways as well as testing for leaching. Table 30 shows the contamination criteria for this scenario. For the state of Illinois, contaminant criteria would need to be made on a case-by-case basis following the risk-based procedures outlined in 35 IAC 742 (Illinois Administrative Code).

Table 30. Criteria for Scenario 8 Aggregate (i.e., bonded by lime, asphalt, or cement) (Great Lakes Dredging Team, 2004)

Contaminant	IL	IN	MI	MN	NY	OH	PA	WI
Arsenic	13	20	--	25	41	--	41	--
Lead	23 – 282*	230	--	700	4	--	200	--
Zinc	1,000 – 23,000*	10,000	--	70,000	--	--	1,000	--
PCBs	1	5.3	--	8	--	--	5	--
Benzo(a)pyr-ene	0.8	1.5	--	4	--	--	0.6	--
Benzene	0.03	0.67	--	4	--	--	0.8	--
Criteria Source	Cleanup Industrial	Cleanup Industrial		Cleanup Industrial	Reuse specific		Use-Specific regulation	Non Hazardous waste

All units are in milligrams per kilogram (mg/Kg) of material * Values are pH-specific and are contained in 35 Ill. Admin. Code 742 (Illinois Administrative Code); soil component to groundwater ingestion criteria

STATUTORY AND REGULATORY DEFINITIONS

- **<u>Special Waste</u>**. Special waste means any of the following:
  - potentially infectious medical waste;
  - hazardous waste, as determined in conformance with RCRA hazardous waste determination requirements set forth in 35 Ill. Admin. Code 722.111 (Illinois Administrative Code), including residue from burning or processing hazardous waste in a boiler or industrial furnace unless the residue has been tested in accordance with 35 Ill. Admin. Code 726.212 (Illinois Administrative Code) and proven to be nonhazardous;
  - industrial process waste or pollution control waste, except:
    - any such waste certified by its generator, pursuant to Section 22.48 of the *Illinois Environmental Protection Act* (Environmental Protection Act), not to be any of the following:
      - a liquid, as determined using the paint filter test set forth in subdivision (3)(A) of subsection (m) of 35 Ill. Admin. Code 811.107 (Illinois Administrative Code);
      - regulated asbestos-containing waste materials, as defined in 40 CFR 61.141 (Protection of Environment), under the National Emission Standards for Hazardous Air Pollutants;
      - polychlorinated biphenyls regulated pursuant to 40 CFR 761 (Protection of Environment);
      - an industrial process waste or pollution control waste subject to the waste analysis and recordkeeping requirements of 35 Ill. Admin. Code 728.107 (Illinois Administrative Code) under the land disposal restrictions of 35 Ill. Admin. Code 728 (Illinois Administrative Code); and
      - a waste material generated by processing recyclable metals by shredding and required to be managed as a special waste under Section 22.29 of the *Illinois Environmental Protection Act (Environmental Protection Act)*.
  - any empty portable device or container, including but not limited to a drum where a special waste has been stored, transported, treated, disposed of, or otherwise handled, provided that the generator has certified that the device or container is empty and does not contain a liquid, as determined using the paint filter test set forth in subdivision (3)(A) of subsection (m) of 35 Ill. Admin. Code 811.107 (Illinois Administrative Code). For purposes of this definition, "empty portable device or container" means a device or container where removal of special waste, except for a residue not to exceed 1 in. (25 mm) in thickness, has been accomplished by a practice commonly employed to remove materials of that type. An inner liner used to prevent contact between the special waste and the container shall be removed and managed as a special waste; or
    - as may otherwise be determined under Section 2.9 of the *Illinois Environmental Protection Act* (Environmental Protection Act).

Special waste does not mean fluorescent and high-intensity discharge lamps as defined in subsection (a) of Section 22.23a of the *Illinois Environmental Protection Act* (Environmental Protection Act), waste that is managed in accordance with the universal waste requirements set forth in Title 35 of the *Illinois Administrative Code* (Illinois Administrative Code), Subtitle G, Chapter I, Subchapter c, Part 733, or waste that is subject to rules adopted pursuant to subsection (c)(2) of Section 22.23a of the *Illinois Environmental Protection Act* (415 ILCS 5/3.475) (Environmental Protection Act).

- Non-special waste. Non-special waste means any of the following:
  - An industrial process waste or pollution control waste not within the exception set forth in subdivision (2) of subsection (c) of Section 3.475 of the *Illinois Environmental Protection Act* (Environmental Protection Act) must be managed as special waste unless the generator first certifies in a signed and dated written statement that the waste is outside the scope of the categories listed in subdivision (1) of subsection (c) of Section 3.475 of the *Illinois Environmental Protection Act* (Environmental Protection Act).
  - All information used to determine that the waste is not a special waste shall be attached to the certification. The information shall include but not be limited to:
    - the means by which the generator has determined that the waste is not a hazardous, special or non-hazardous waste;
    - the means by which the generator has determined that the waste is not a liquid;
    - if the waste undergoes testing, the analytic results obtained from testing must be signed and dated by the person responsible for completing the analysis;
    - if the waste does not undergo testing, an explanation as to why no testing is needed;
    - a description of the process generating the waste; and
    - relevant Material Data Safety Sheets.
- **Hazardous Waste**. A waste, or combination of wastes, that because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible, illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed, and has been identified by characteristics or listing, as hazardous pursuant to Section 3001 of the *Resource Conservation and Recovery Act* of 1976 (415 ILCS 5/22.4) (Environmental Protection Act) or pursuant to the Pollution Control Board regulations. Potentially infectious medical waste is not a hazardous waste, except for those potentially infectious medical wastes identified by characteristics or listing as hazardous under Section 3001 of the *Resource Conservation and Recovery Act* of 1976 (415 ILCS 5/22.4) (Environmental Protection Act) or pursuant to Board regulations (415 ILCS 5/3.220) (Environmental Protection Act).

  Hazardous Wastes are defined by listing in 35 Ill. Admin. Code 721, Subpart D (Illinois Administrative Code), and by characteristics of ignitability, corrosivity, reactivity, and toxicity as listed and defined in 35 Ill. Admin. Code 721, Subpart C (Illinois Administrative Code).

- **<u>Nonhazardous Special Waste</u>**. Special waste found not to be hazardous (e.g., industrial process waste, pollution control waste).
- **<u>Regulated Substances</u>**. Any hazardous substances as defined under Section 101(14) of the *Comprehensive, Environmental Response, Compensation, and Liability Act* of 1980 (PL 96-510) and petroleum products including crude oil or any fraction thereof, natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel or mixtures or natural gas and such synthetic gas (415 ILCS 5/58.2) (Environmental Protection Act).
- **<u>Uncontaminated Soil</u>**. Soil is classified as "uncontaminated" and eligible for Clean Construction or Demolition Debris (CCDD)/Uncontaminated Soil Fill Operation (USFO) disposal when:
    - All analytical parameters are below respective MACs (Maximum Allowable Concentration) (Illinois Administrative Code) for a given CCDD/USFO disposal location that is regulated under 35 IAC, Part 1100 (Illinois Administrative Code). Note that when a site is identified as potentially impacted, "sufficient and appropriate" data and analytical testing is required to make this determination.
    - Soil-containing contaminants of concern below applicable MACs and classified as "uncontaminated" may be managed as follows:
        - If eligible for CCDD/USFO—unrestricted use.
        - Ineligible for CCDD/USFO based on pH outside established limits—potentially eligible for non-CCDD/USFO reuse based on the cause of the pH value.
        - Ineligible for CCDD/USFO based on elevated (Photoionization Detector) PID readings—potentially eligible for non-CCDD/USFO reuse based on the cause of the PID values.
    - Note: "Uncontaminated" has a specific definition relative to CCDD/USFO and is characterized in 35 IAC Part 1100, Subpart F (Illinois Administrative Code); "uncontaminated" does not mean "unregulated" or "unrestricted."
- **<u>Contamination</u>**. The presence of any regulated substance on the land or in the waters of the State in quantities that are, or may be, harmful or injurious to human health or welfare, or animal or plant life.
- Regulations Applied to Regulated Substances
    - 415 ILCS 5/ Illinois Environmental Protection Act
    - 35 IAC 620 Groundwater quality
    - 35 IAC 734 IEPA UST
    - 35 IAC 740 IEPA SRP
    - 35 IAC 742 IEPA TACO

- 35 IAC 808 — Special waste classifications
- 35 IAC 1100 — IEPA CCDD/USFO
- 41 IAC 174-176 — OSFM UST
- 77 IAC 920 — IDPH Water Wells
- 29 CFR 1910.120 — OSHA HAZWOPER
- 40 CFR 239-280 — U.S.EPA RCRA
- 40 CFR 307 — U.S.EPA CERCLA

ACRONYMS FOR REGULATORY CITATIONS

CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CCDD	Clean Construction and Demolition Debris
CFR	Code of Federal Regulations
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDOT	Illinois Department of Transportation
IDPH	Illinois Department of Public Health
IEPA	Illinois Environmental Protection Agency
ILCS	Illinois Administrative Code
MAC	Maximum allowable Concentratio
OSFM	Office of State Fire Marshal
OSHA	Occupational Safety and Health Act (Agency)
PID	Photo-Ionization Detector
RCRA	Resource Conservation and Recovery Act
TACO	Tiered Approach to Corrective Action Objectives
USEPA	United States Environmental Protection Agency
USFO	Uncontaminated Soil Fill Operation
UST	Underground Storage Tank

APPENDIX C: AVAILABLE SANDY DREDGED MATERIAL FOR PUBLIC USE

Figure 45, Figure 46, Figure 47, Figure 48, Figure 49, Figure 50, and Figure 51 show the locations of eight sites (Beardstown Sites, Kingston Mines & Mackinaw River sites, Senate Island, Duck Island & Copperas Creek sites, Starved Rock Lock sites, Buzzard Island, Keithsburg, and Northeast Missouri Power, respectively) along the Illinois Waterway and the Upper Mississippi River where dredged materials consist of mainly uncontaminated sand are available to public for free.

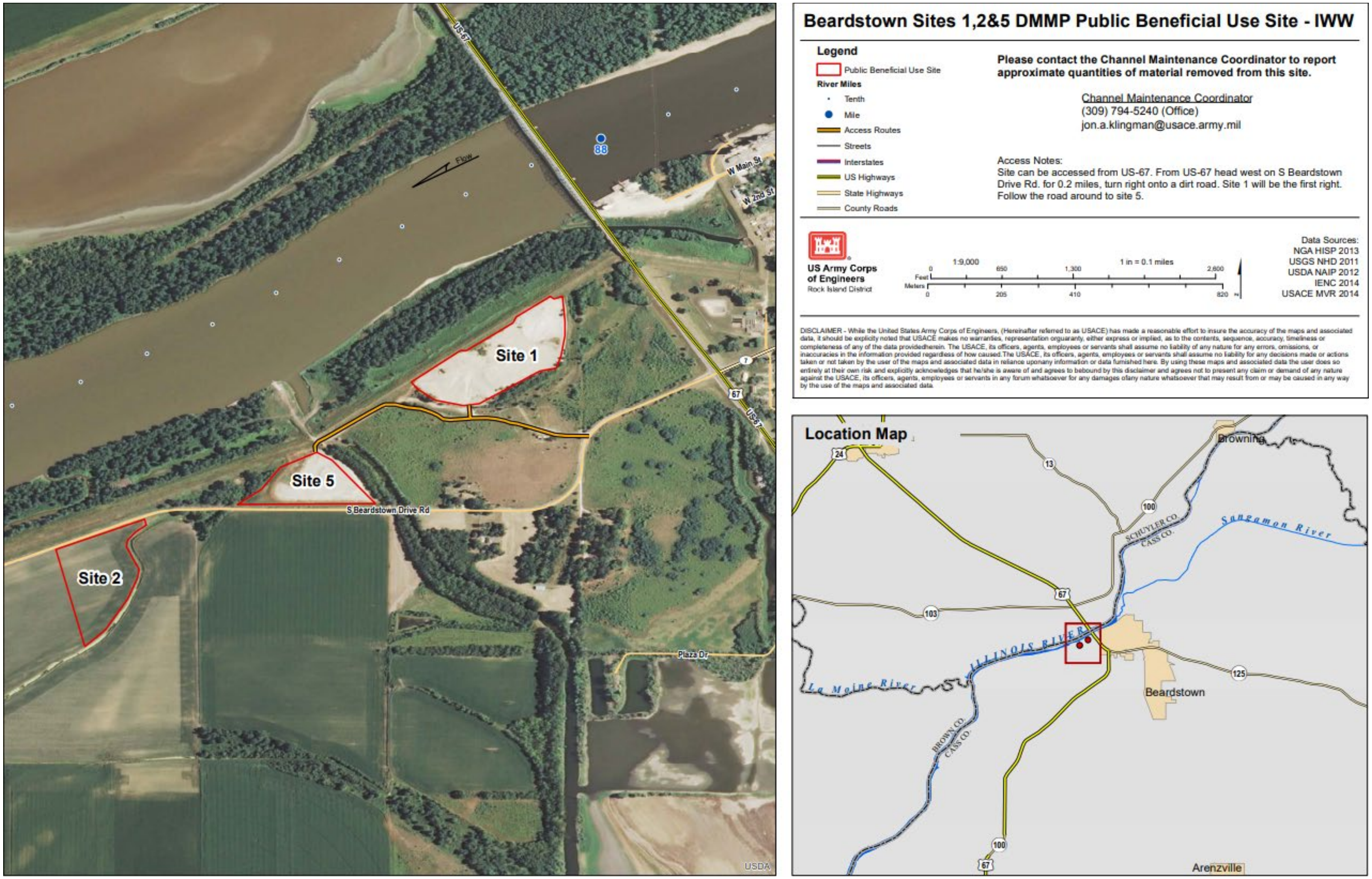

Figure 45. Arial Photo. Beardstown Sites 1, 2 & 5 DMMP Public Beneficial Use Site (USACE, n.d.).

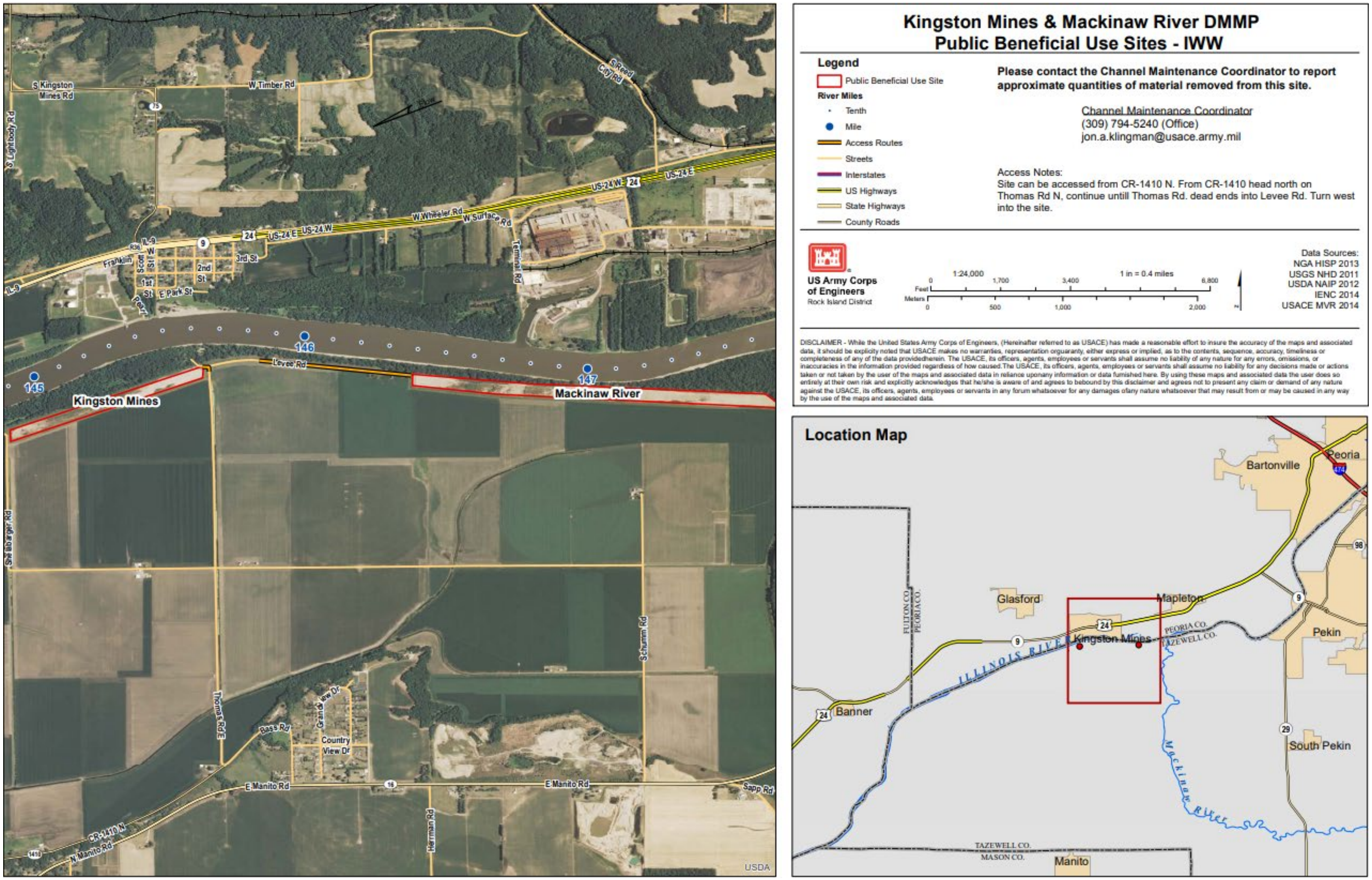

Figure 46. Arial Photo. Kingston Mines & Mackinaw River DMMP Public Beneficial Use Sites (USACE, n.d.).

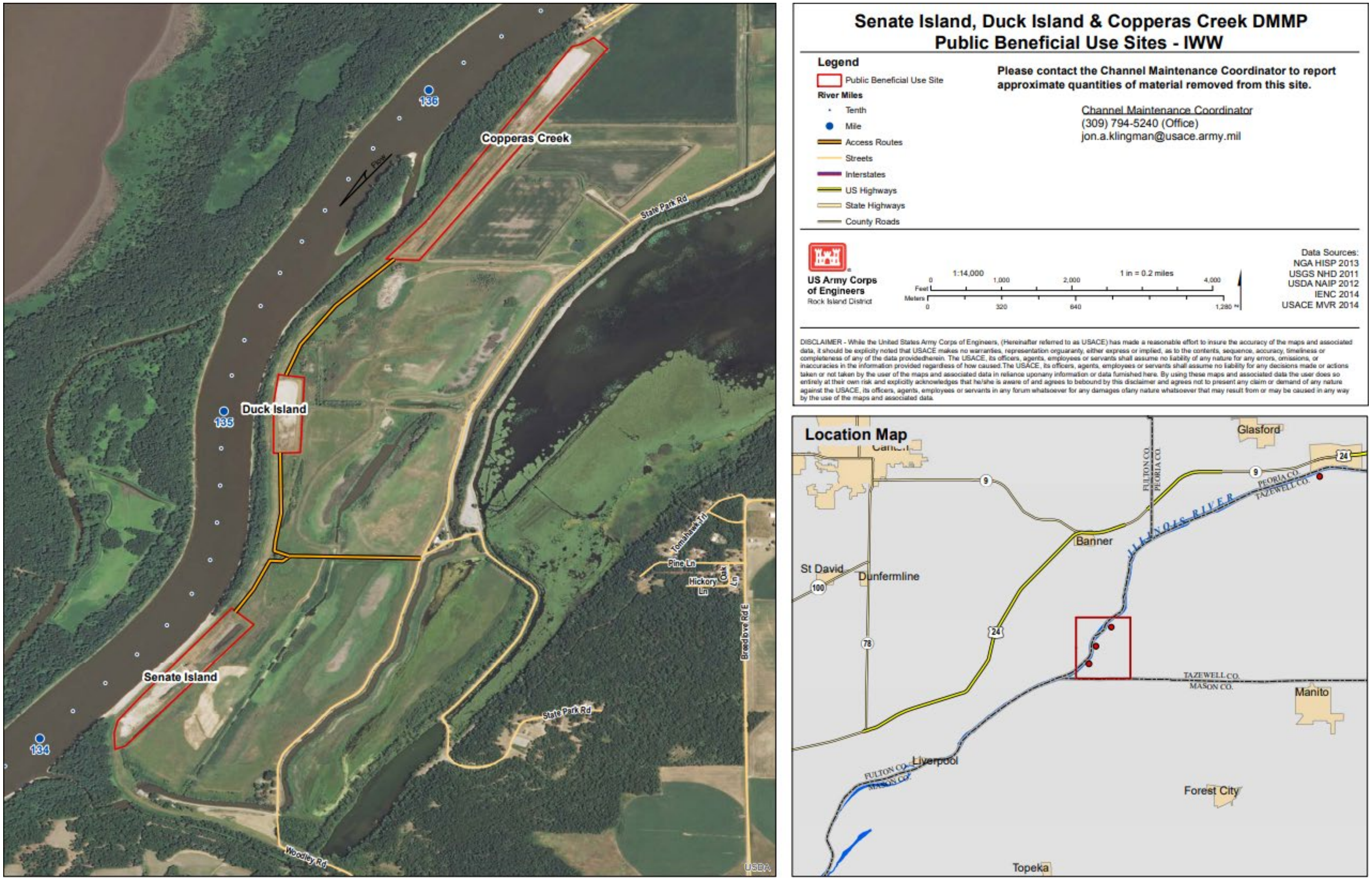

Figure 47. Arial Photo. Senate Island, Duck Island & Copperas Creek DMMP Public Beneficial Use Sites (USACE, n.d.).

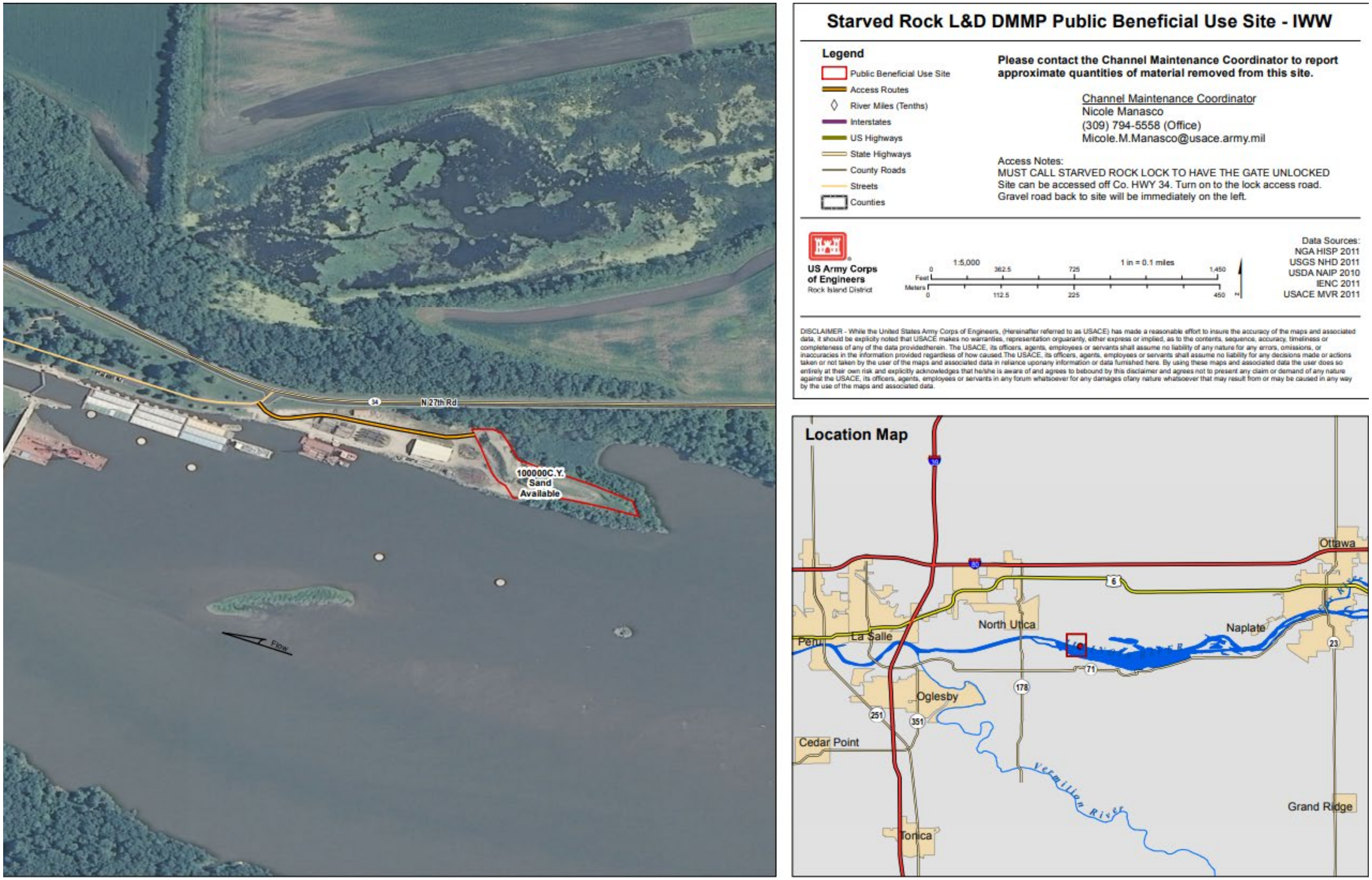

Figure 48. Arial Photo. Starved Rock L&D DMMP Public Beneficial Use Site (USACE, n.d.).

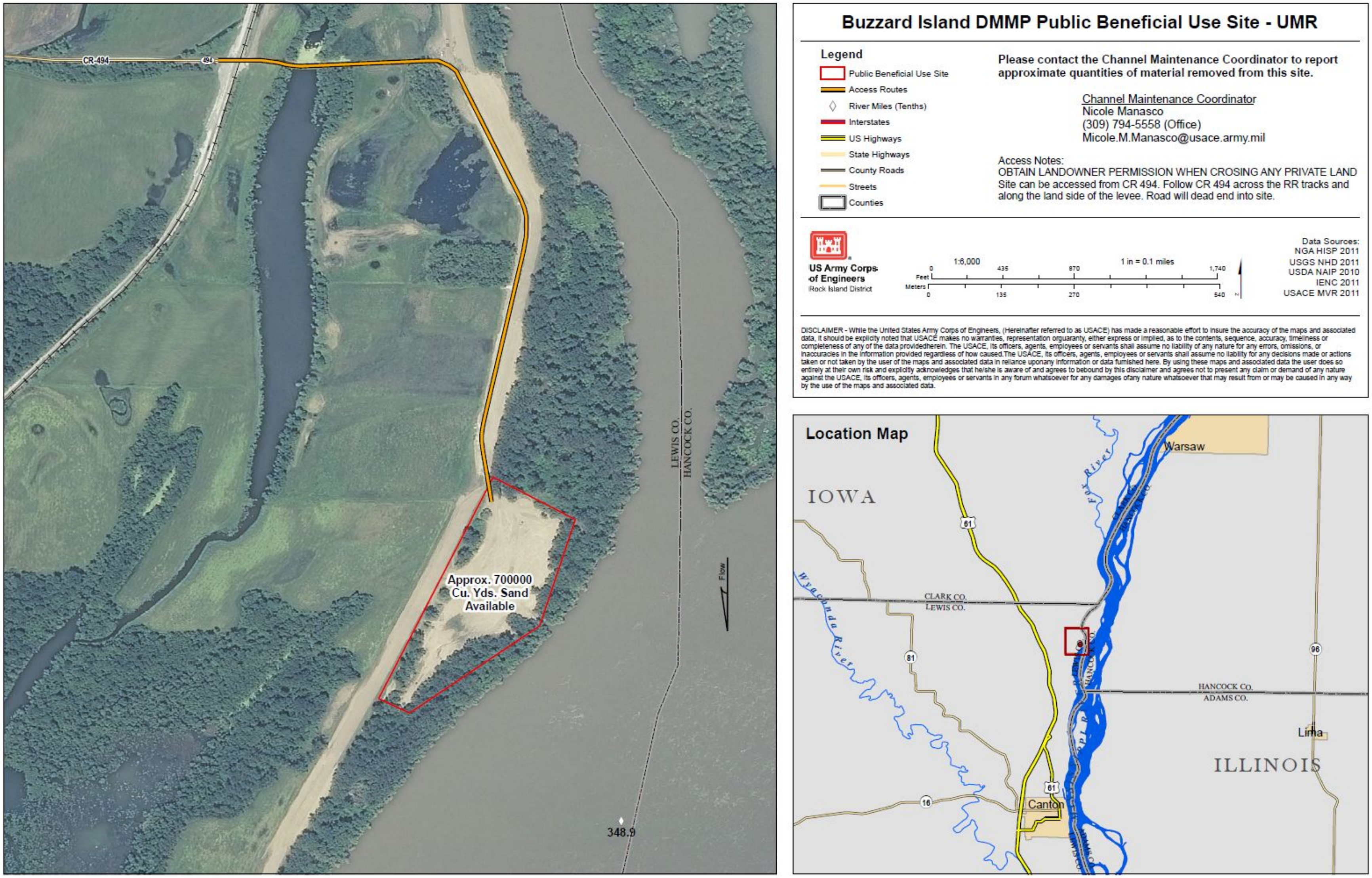

Figure 49. Arial Photo. Buzzard Island DMMP Public Beneficial Use Site (USACE, n.d.).

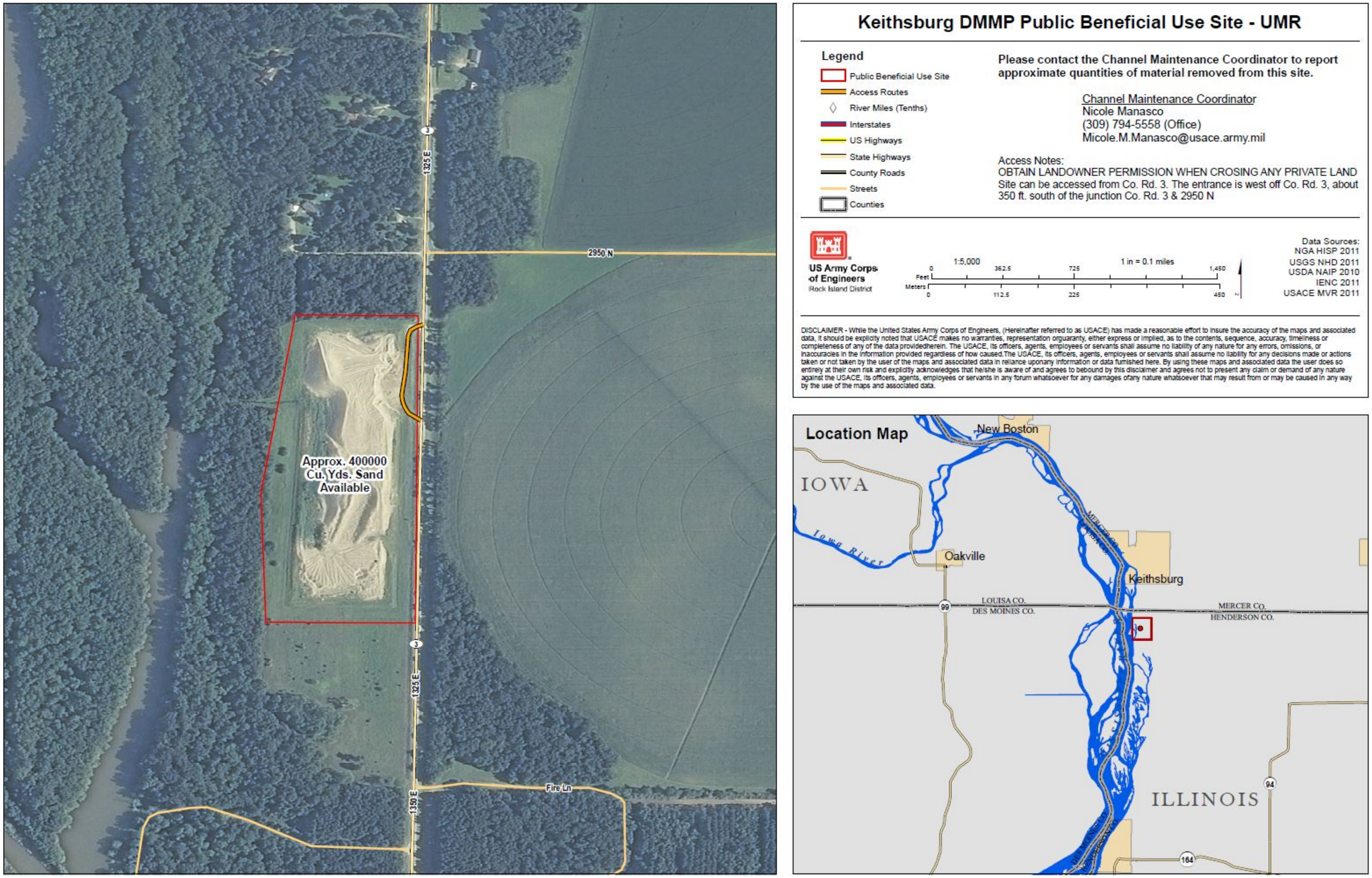

Figure 50. Arial Photo. Keithsburg DMMP Public Beneficial Use Site (USACE, n.d.).

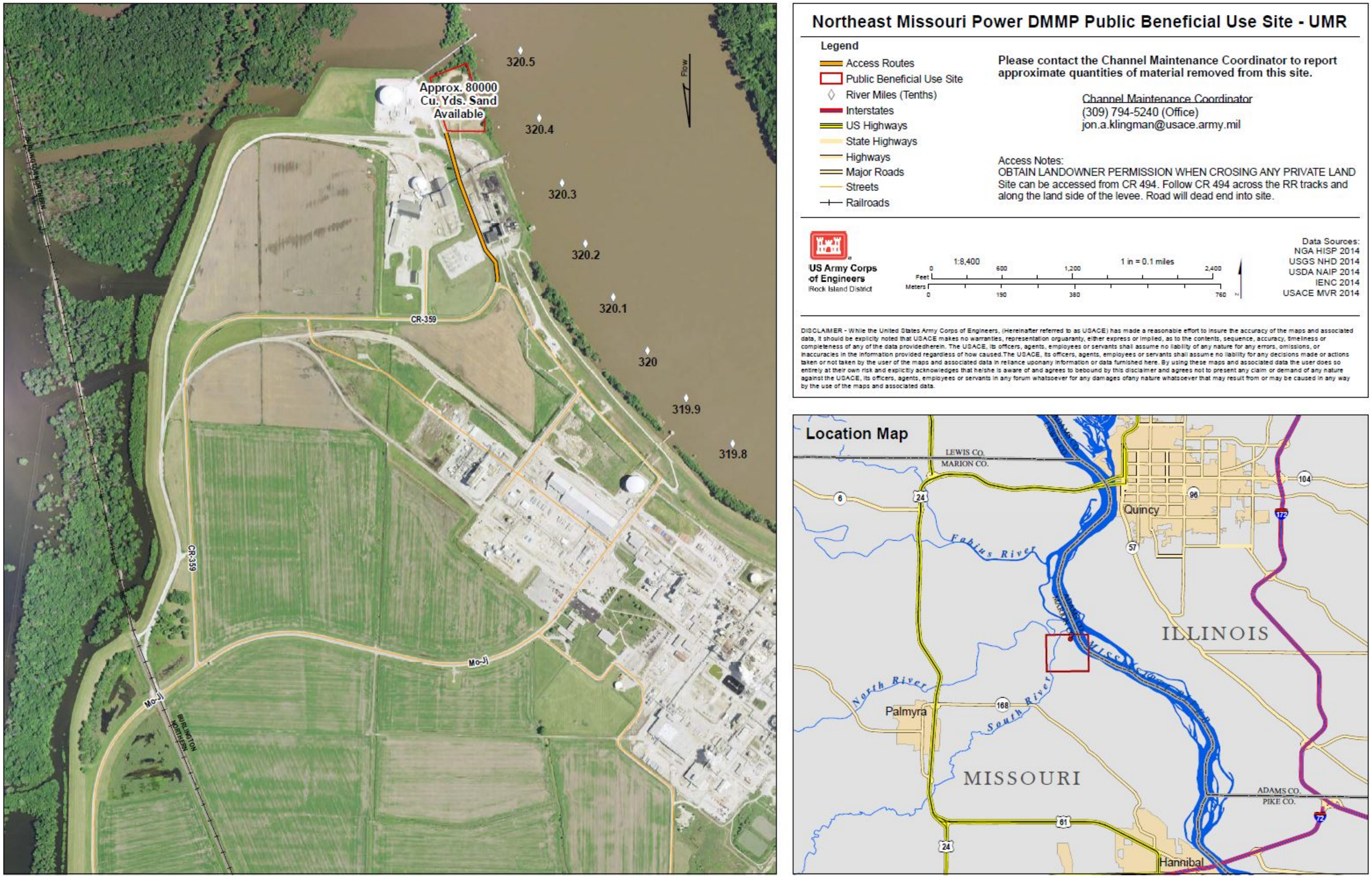

Figure 51. Arial Photo. Northeast Missouri Power DMMP Public Beneficial Use Site (USACE, n.d.)

APPENDIX D: BEARDSTOWN, ILLINOIS SUPPLEMENTS

This appendix presents supplements of grain size analyses with figures and tables that are not included in Chapter 5. Table 3 and Table 4 from Chapter 5 are graphically presented herein. Figure 52 through Figure 63 summarize the results for Site 1. Figure 64 through Figure 75 summarize the results for Site 5. Each figure contains four curves. Following the order of the legend, the first curve (see red line with diamond symbols) represents the gradation from the site, i.e., Site 1 or Site 5. The next two curves represent the upper and lower boundaries for IDOT gradations, i.e., FA1, FA2, FA3, FA4, FA5, or FA6. The fourth curve (see green line with triangle symbols) represents the gradation of the mixture resulting from the dredged material and the added material pertaining to sieves between 3/8'' and No. 200.

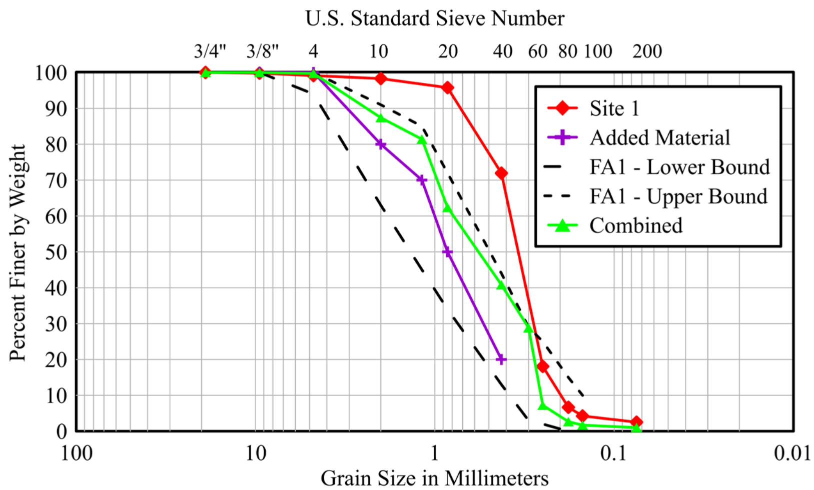

Figure 52. Graph. FA1 with 40% Dredged Material from Site 1 plus Added Material Upper Bound.

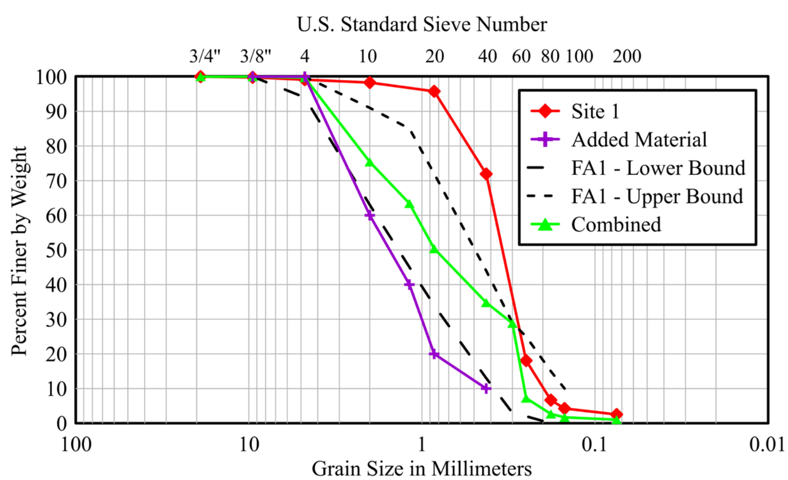

Figure 53. Graph. FA1 with 40% Dredged Material from Site 1 plus Added Material Lower Bound.

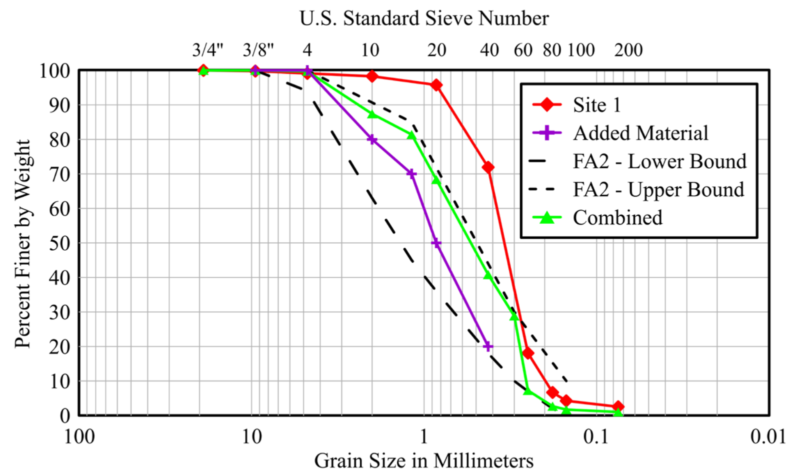

Figure 54. Graph. FA2 with 40% Dredged Material from Site 1 plus Added Material Upper Bound.

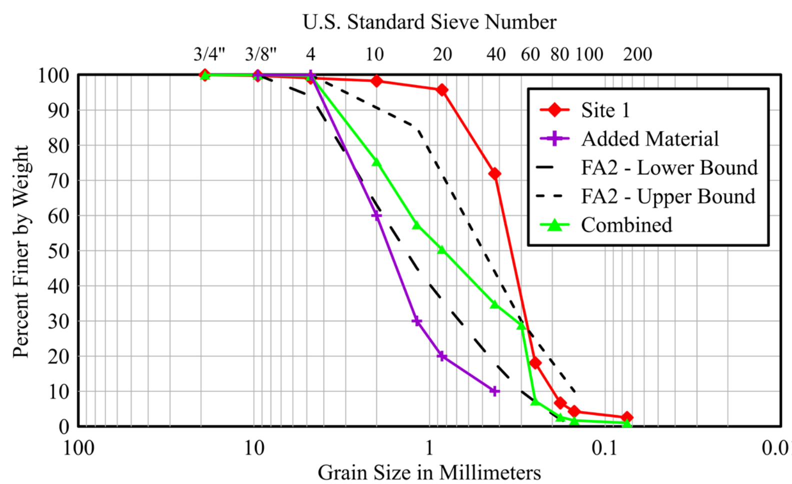

Figure 55. Graph. FA2 with 40% Dredged Material from Site 1 plus Added Material Lower Bound.

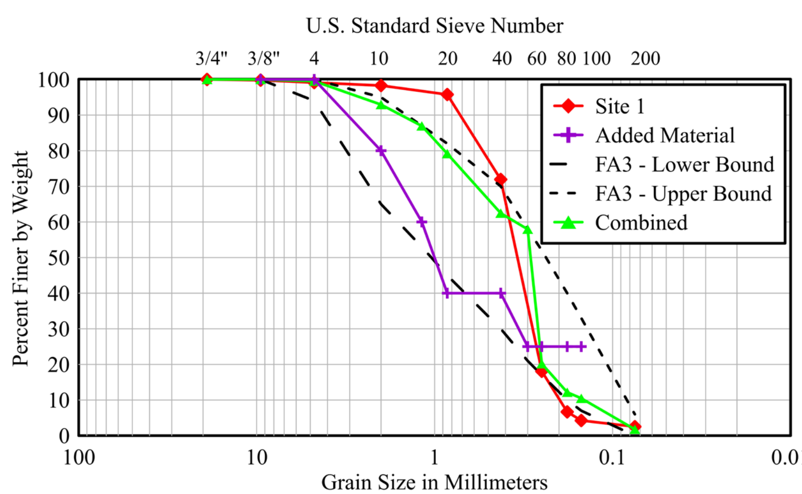

Figure 56. Graph. FA3 with 70% Dredged Material from Site 1 plus Added Material Upper Bound.

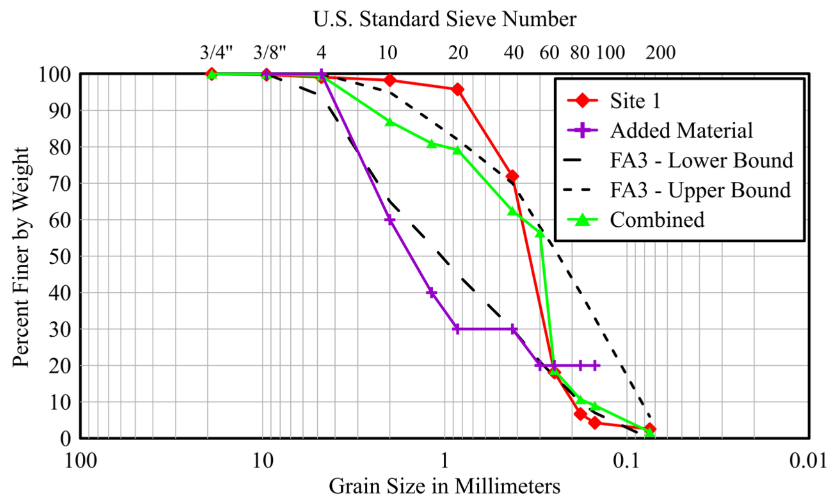

Figure 57. Graph. FA3 with 70% Dredged Material from Site 1 plus Added Material Lower Bound.

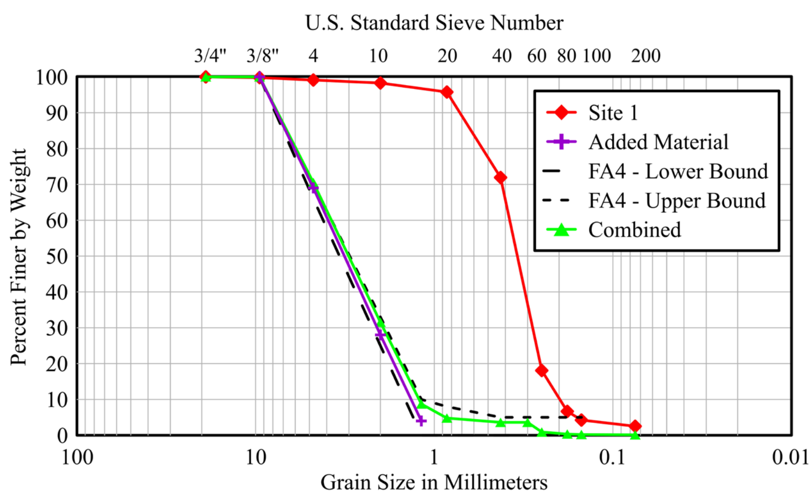

Figure 58. Graph. FA4 with 5% Dredged Material from Site 1 plus Added Material Upper Bound.

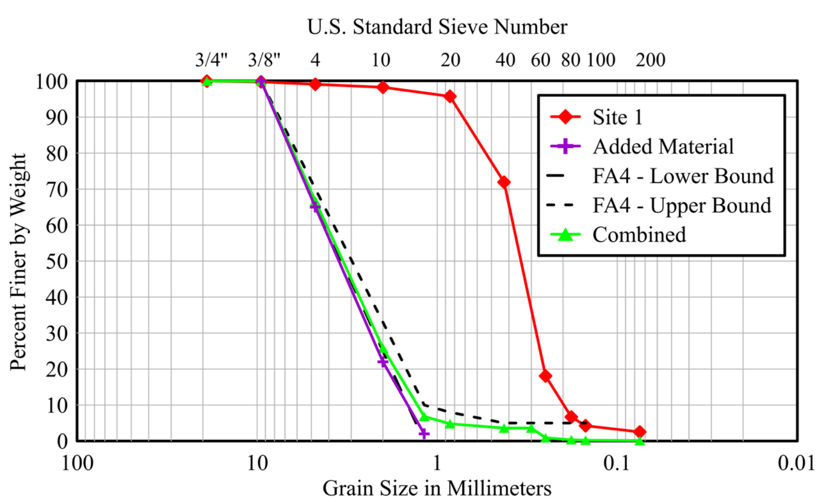

Figure 59. Graph. FA4 with 5% Dredged Material from Site 1 plus Added Material Lower Bound.

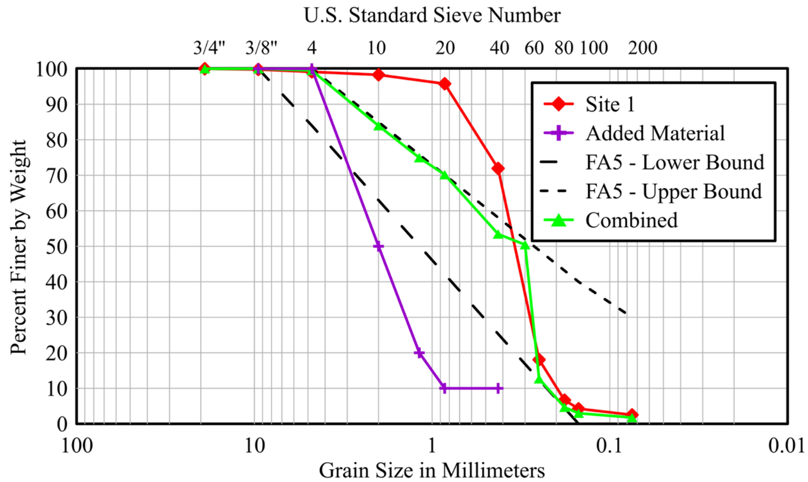

Figure 60. Graph. FA5 with 70% Dredged Material from Site 1 plus Added Material Upper Bound.

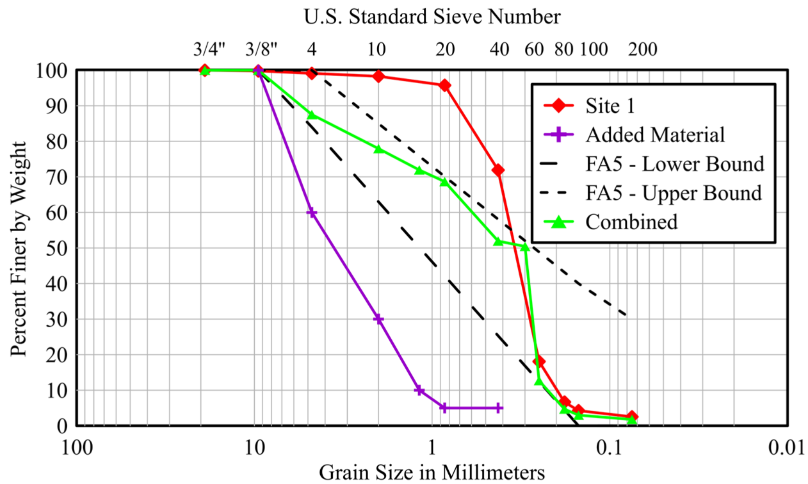

Figure 61. Graph. FA5 with 70% Dredged Material from Site 1 plus Added Material Lower Bound.

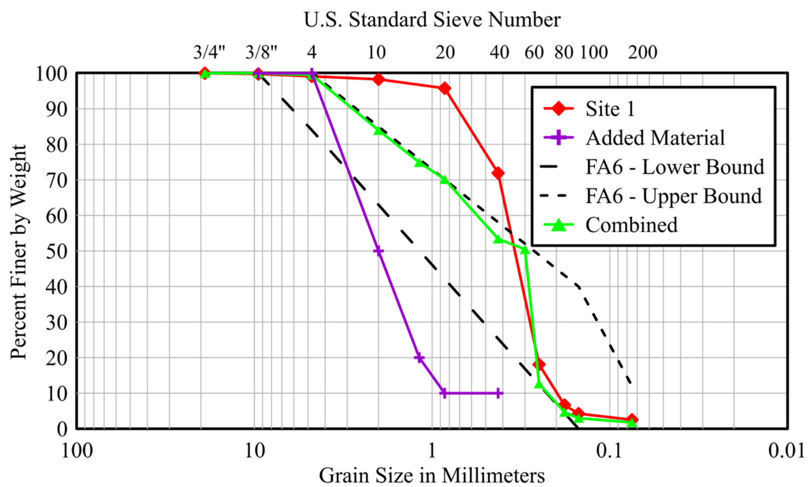

Figure 62. Graph. FA6 with 70% Dredged Material from Site 1 plus Added Material Upper Bound.

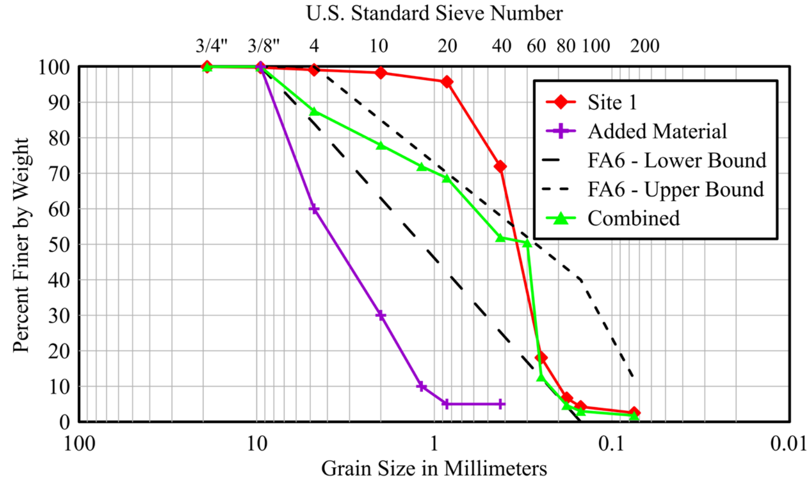

Figure 63. Graph. FA6 with 70% Dredged Material from Site 1 plus Added Material Lower Bound.

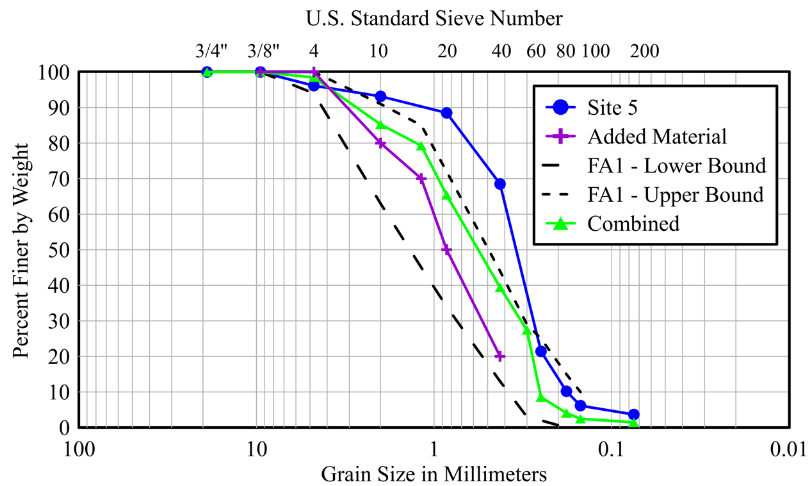

Figure 64. Graph. FA1 with 40% Dredged Material from Site 5 plus Added Material Upper Bound.

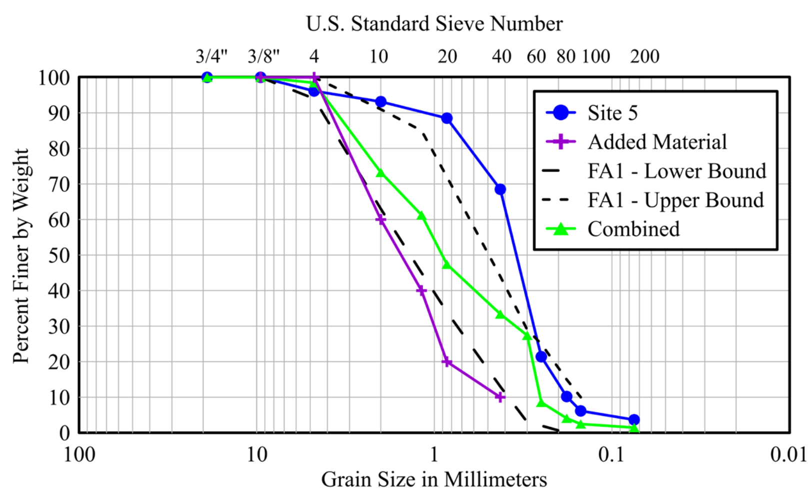

Figure 65. Graph. FA1 with 40% Dredged Material from Site 5 plus Added Material Lower Bound.

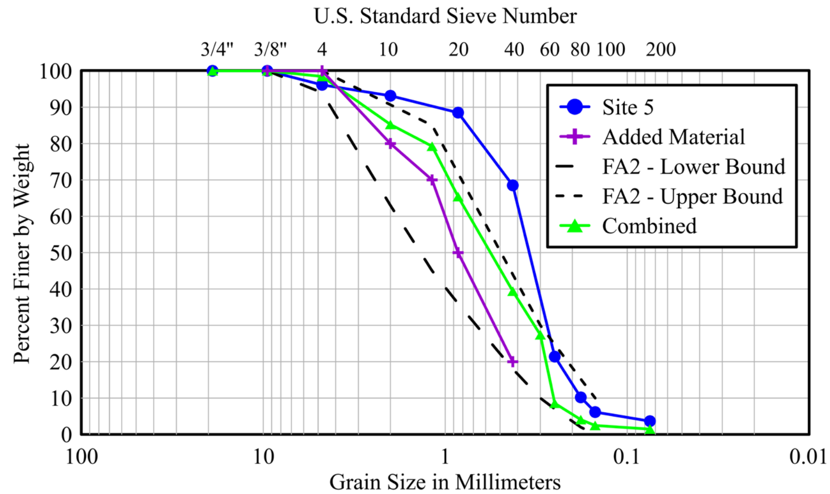

Figure 66. Graph. FA2 with 40% Dredged Material from Site 5 plus Added Material Upper Bound.

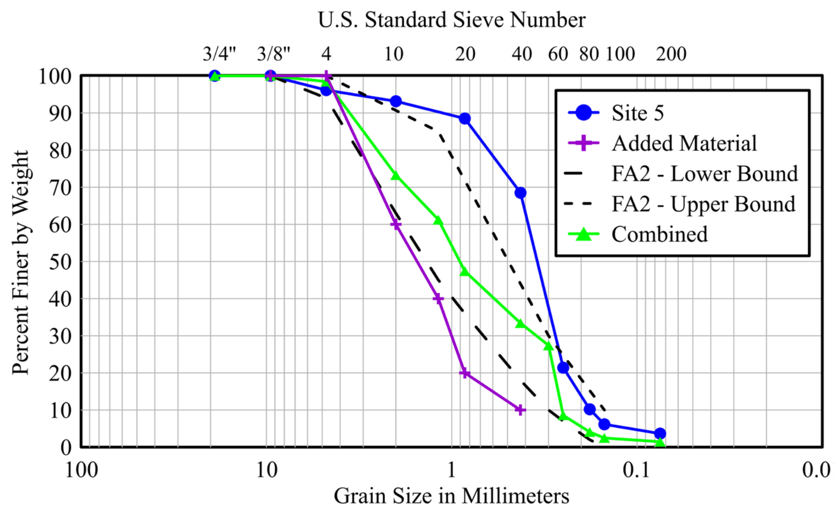

Figure 67. Graph. FA2 with 40% Dredged Material from Site 5 plus Added Material Lower Bound.

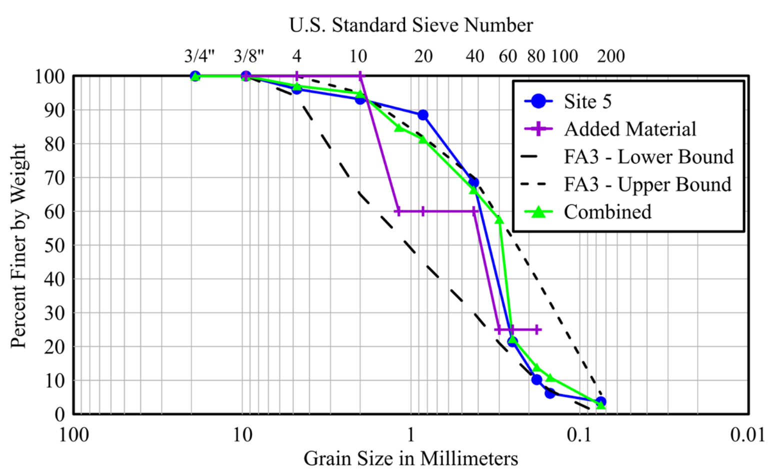

Figure 68. Graph. FA3 with 75% Dredged Material from Site 5 plus Added Material Upper Bound.

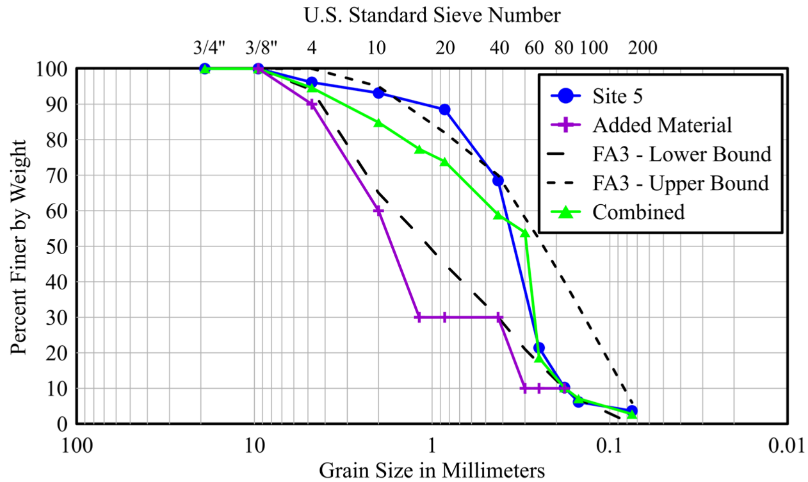

Figure 69. Graph. FA3 with 75% Dredged Material from Site 5 plus Added Material Lower Bound.

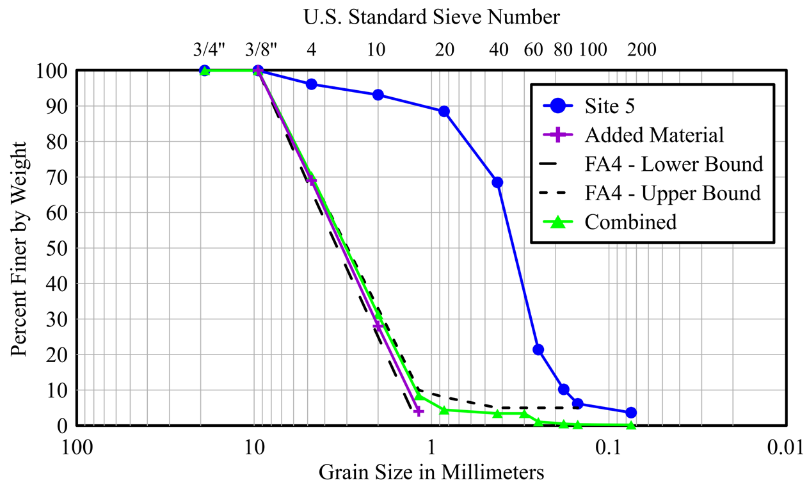

Figure 70. Graph. FA4 with 5% Dredged Material from Site 5 plus Added Material Upper Bound.

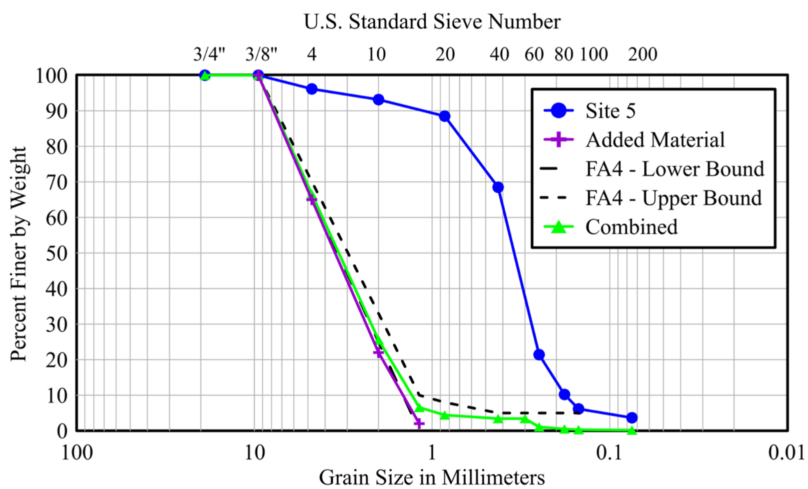

Figure 71. Graph. FA4 with 5% Dredged Material from Site 5 plus Added Material Lower Bound.

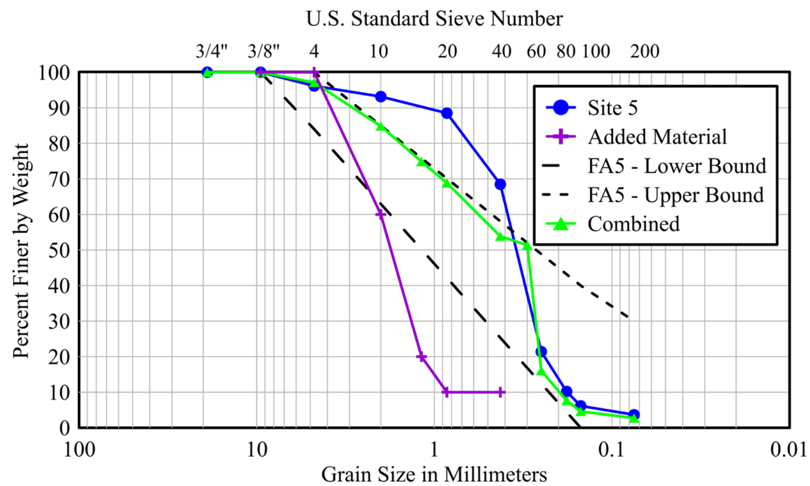

Figure 72. Graph. FA5 with 75% Dredged Material from Site 5 plus Added Material Upper Bound.

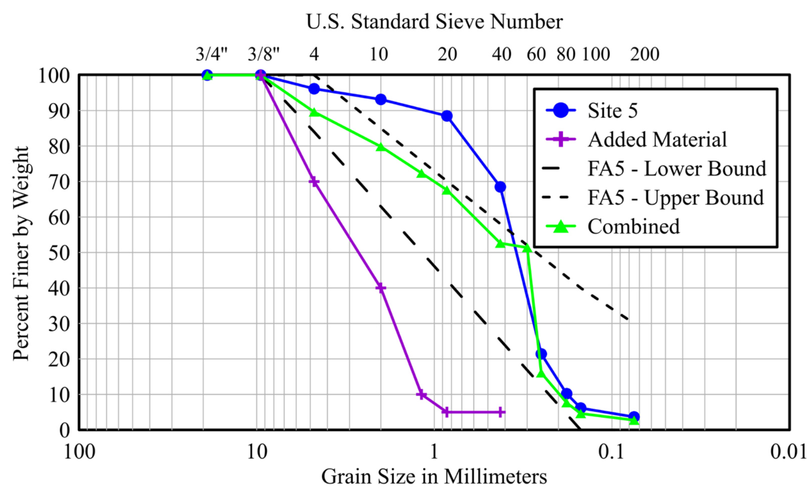

Figure 73. Graph. FA5 with 75% Dredged Material from Site 5 plus Added Material Lower Bound.

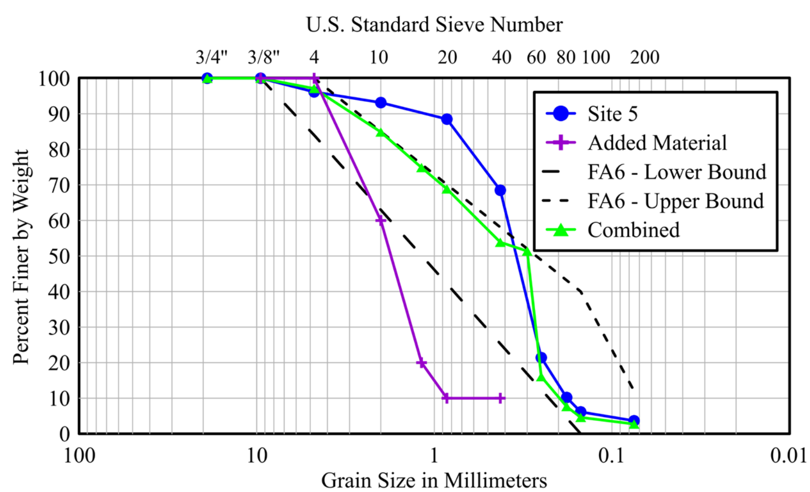

Figure 74. Graph. FA6 with 75% Dredged Material from Site 5 plus Added Material Upper Bound.

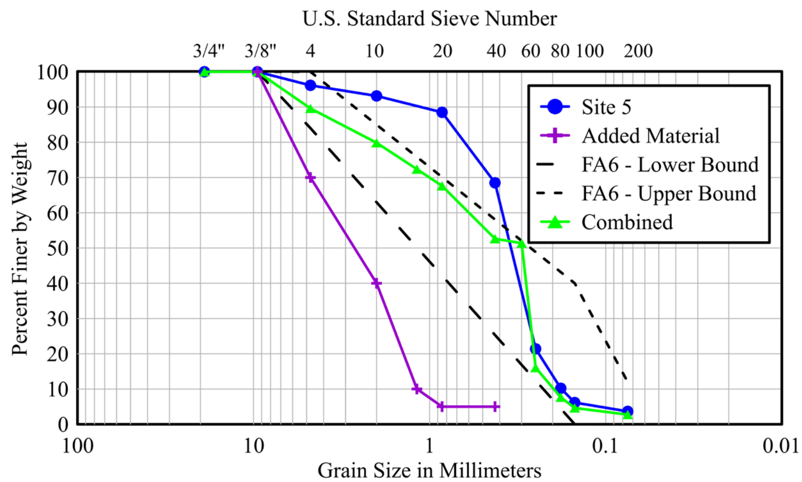

Figure 75. Graph. FA6 with 75% Dredged Material from Site 5 plus Added Material Lower Bound.

Table 31 through Table 42 present the results derived from added material meeting IDOT gradations FA1 through FA6. This appendix also presents Table 31 through Table 42 graphically. Figure 76 through Figure 81 summarize the results for Site 1. Figure 82 through Figure 87 summarize the results for Site 5. Following the order of the legend, the first curve (see red line with diamond symbols) represents the gradation from the site, i.e., Site 1 or Site 5. The next two curves represent the upper and lower boundaries for IDOT gradations, i.e., FA1, FA2, FA3, FA4, FA5, or FA6. From then on curves represent the gradation of the mixture resulting from the dredged material and the added material meeting IDOT gradations FA1 through FA6.

Table 31. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA1—Site 1

Site 1	FA1	FA2	FA3	FA4	FA5	FA6
20	80	0	0	0	0	0
25	65	0	0	10	0	0

Note: Percentages are expressed weight-wise

Table 32. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA2—Site 1

Site 1	FA1	FA2	FA3	FA4	FA5	FA6
25	75	0	0	0	0	0
25	65	0	0	10	0	0
25	70	0	0	5	0	0

Note: Percentages are expressed weight-wise

Table 33. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA3—Site 1

Site 1	FA1	FA2	FA3	FA4	FA5	FA6
55	0	0	0	0	0	45
60	0	0	0	5	0	35
60	0	0	30	10	0	0

Note: Percentages are expressed weight-wise

Table 34. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA4—Site 1

Site 1	FA1	FA2	FA3	FA4	FA5	FA6
5	0	0	0	95	0	0

Note: Percentages are expressed weight-wise

Table 35. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA5—Site 1

Site 1	FA1	FA2	FA3	FA4	FA5	FA6
30	0	0	0	0	0	70
30	0	0	0	0	70	0
30	0	70	0	0	0	0
30	70	0	0	0	0	0
60	0	0	0	30	0	10
60	0	0	0	30	10	0
60	0	0	0	35	0	5
60	0	0	0	35	5	0
60	0	0	5	35	0	0
60	0	0	10	30	0	0
60	0	10	0	30	0	0
60	0	15	0	25	0	0
60	15	0	0	25	0	0

Note: Percentages are expressed weight-wise

Table 36. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA6—Site 1

Site 1	FA1	FA2	FA3	FA4	FA5	FA6
30	0	0	0	0	0	70
30	0	0	0	0	70	0
30	0	70	0	0	0	0
30	70	0	0	0	0	0
60	0	0	0	30	0	10
60	0	0	0	30	10	0
60	0	0	0	35	0	5
60	0	0	0	35	5	0
60	0	0	5	35	0	0
60	0	0	10	30	0	0
60	0	10	0	30	0	0
60	0	15	0	25	0	0
60	15	0	0	25	0	0

Note: Percentages are expressed weight-wise

Table 37. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA1—Site 5

Site 5	FA1	FA2	FA3	FA4	FA5	FA6
20	80	0	0	0	0	0
25	70	0	0	5	0	0

Note: Percentages are expressed weight-wise

Table 38. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA2—Site 5

Site 5	FA1	FA2	FA3	FA4	FA5	FA6
25	75	0	0	0	0	0
25	55	20	0	0	0	0
25	60	15	0	0	0	0
25	65	10	0	0	0	0
25	70	0	0	0	0	5
25	70	0	0	0	5	0
25	70	0	0	5	0	0
25	70	5	0	0	0	0

Note: Percentages are expressed weight-wise

Table 39. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA3—Site 5

Site 5	FA1	FA2	FA3	FA4	FA5	FA6
65	0	0	0	0	0	35
70	15	0	0	0	0	15
70	15	0	0	0	15	0

Note: Percentages are expressed weight-wise

Table 40. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA4—Site 5

Site 5	FA1	FA2	FA3	FA4	FA5	FA6
5	0	0	0	95	0	0

Note: Percentages are expressed weight-wise

Table 41. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA5—Site 5

Site 5	FA1	FA2	FA3	FA4	FA5	FA6
70	0	0	0	30	0	0
70	0	5	0	25	0	0
70	5	0	0	25	0	0

Note: Percentages are expressed weight-wise

Table 42. Material Type/Gradation and Blending Percentages to Meet IDOT Gradation FA6—Site 5

Site 5	FA1	FA2	FA3	FA4	FA5	FA6
70	0	0	0	30	0	0
70	0	5	0	25	0	0
70	5	0	0	25	0	0

Note: Percentages are expressed weight-wise

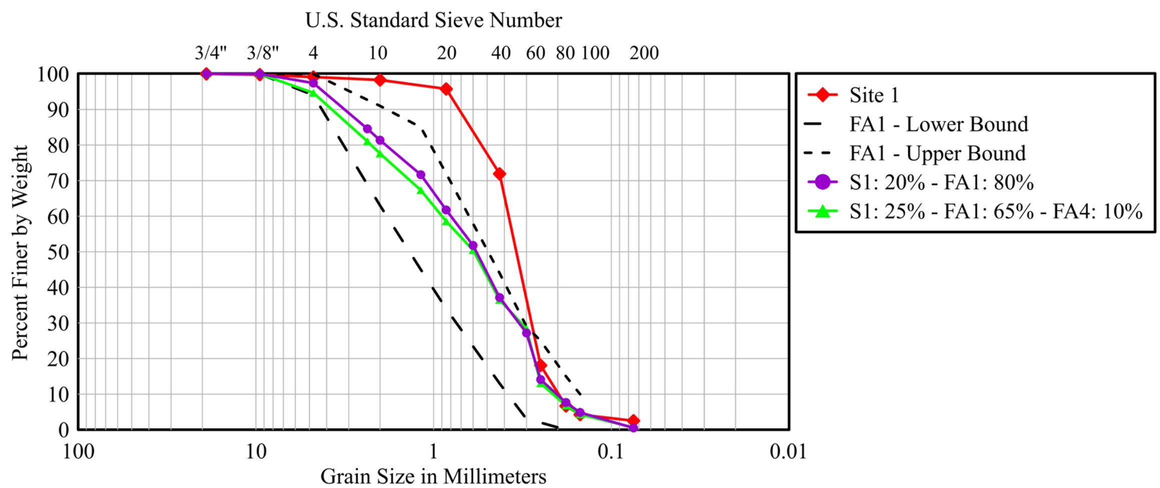

Figure 76. Graph. FA1 with Dredged Material from Site 1 plus Added Material from IDOT Gradations FA1-6.

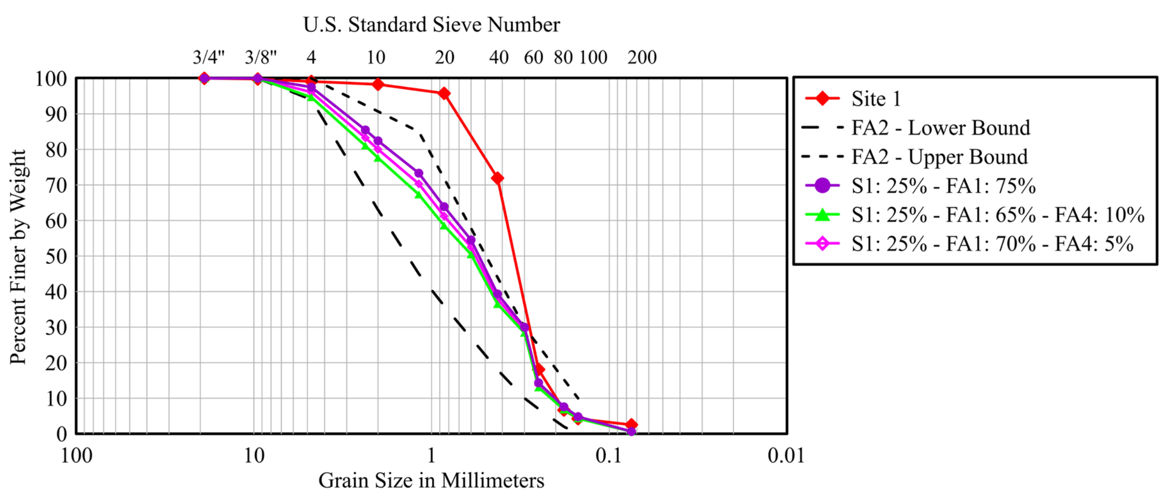

Figure 77. Graph. FA2 with Dredged Material from Site 1 plus Added Material from IDOT Gradations FA1-6.

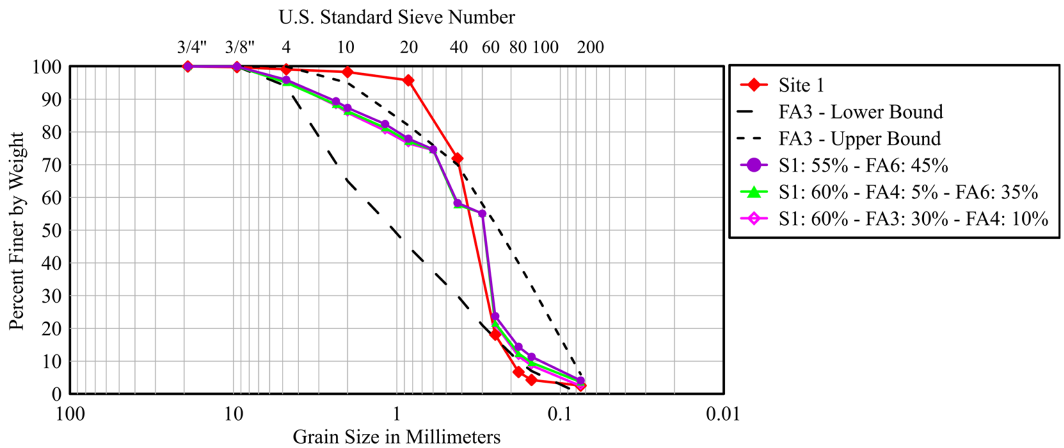

Figure 78. Graph. FA3 with Dredged Material from Site 1 plus Added Material from IDOT Gradations FA1-6.

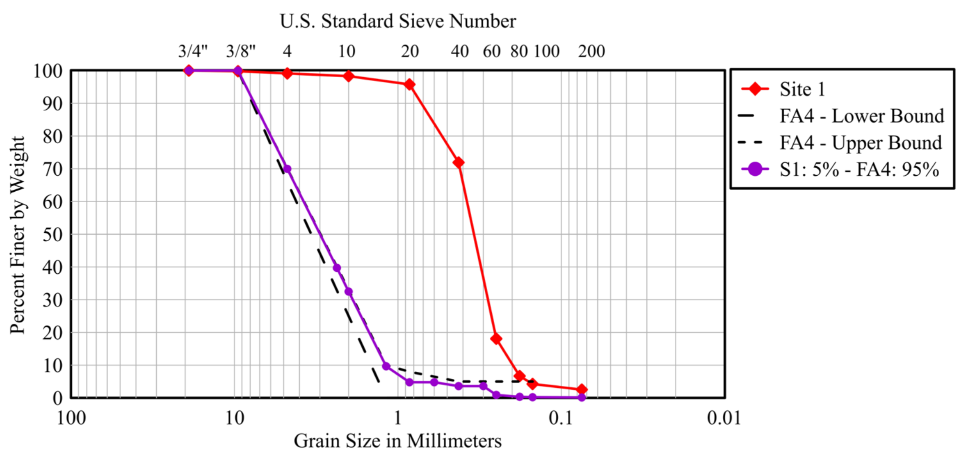

Figure 79. Graph. FA4 with Dredged Material from Site 1 plus Added Material from IDOT Gradations FA1-6.

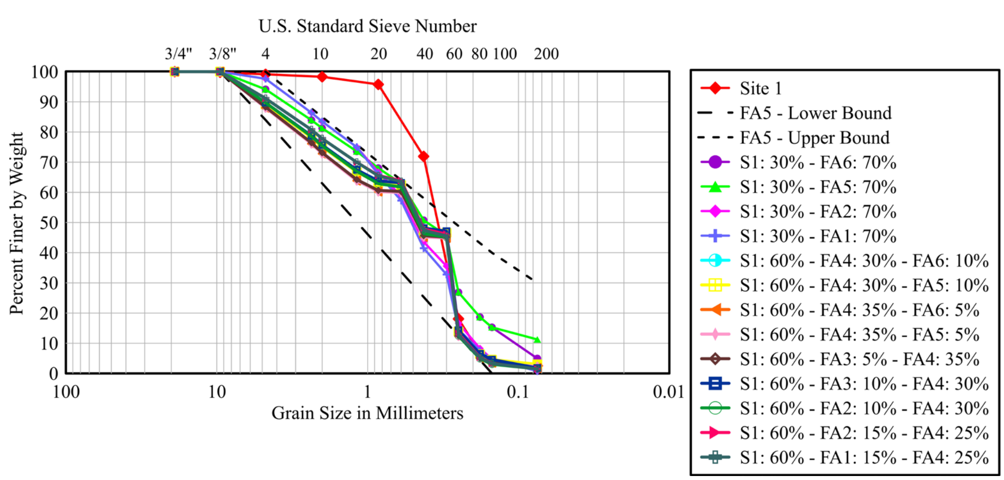

Figure 80. Graph. FA5 with Dredged Material from Site 1 plus Added Material from IDOT Gradations FA1-6.

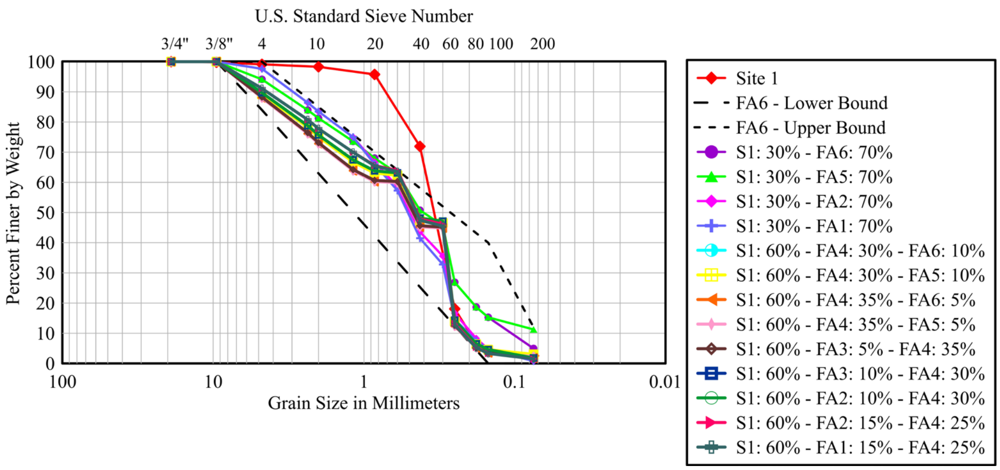

Figure 81. Graph. FA6 with Dredged Material from Site 1 plus Added Material from IDOT Gradations FA1-6.

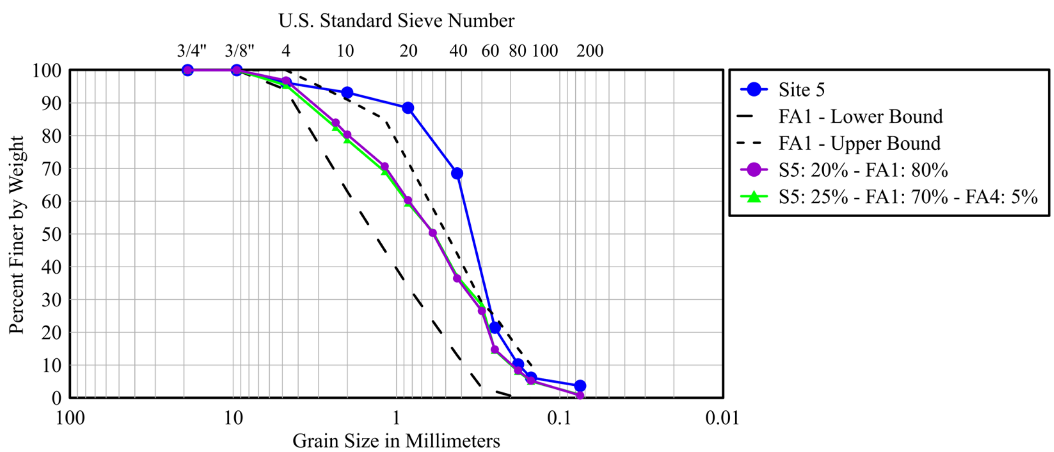

Figure 82. Graph. FA1 with Dredged Material from Site 5 plus Added Material from IDOT Gradations FA1-6.

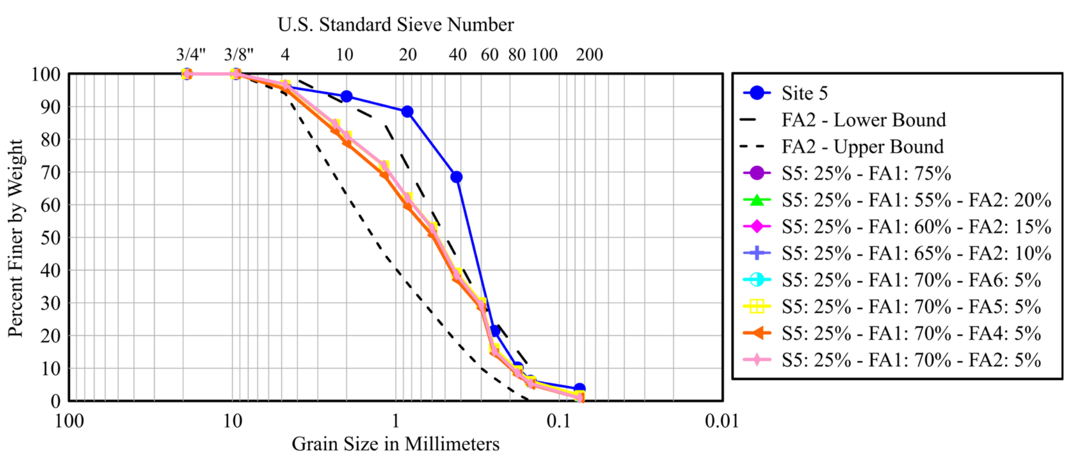

Figure 83. Graph. FA2 with Dredged Material from Site 5 plus Added Material from IDOT Gradations FA1-6.

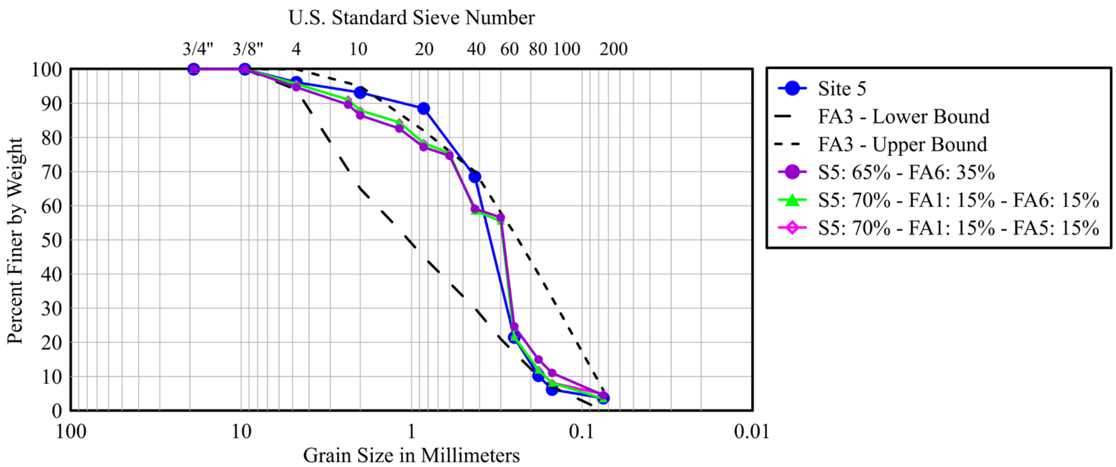

Figure 84. Graph. FA3 with Dredged Material from Site 5 plus Added Material from IDOT Gradations FA1-6.

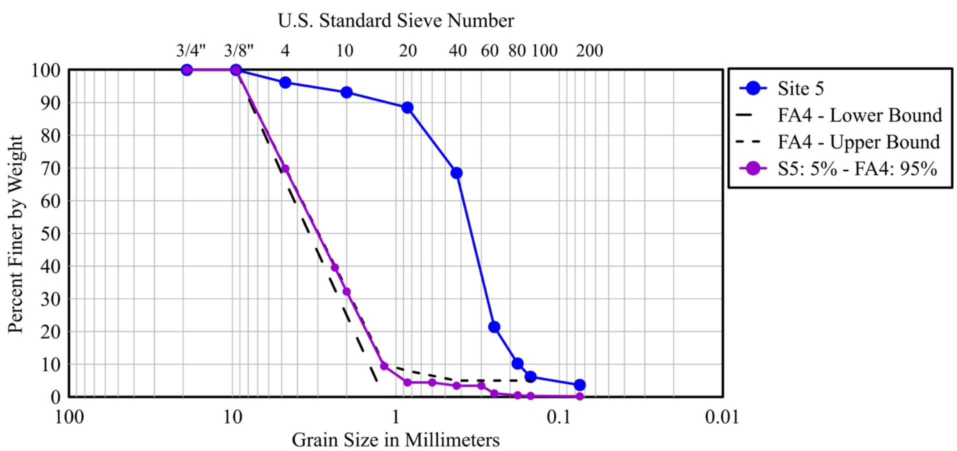

Figure 85. Graph. FA4 with Dredged Material from Site 5 plus Added Material from IDOT Gradations FA1-6.

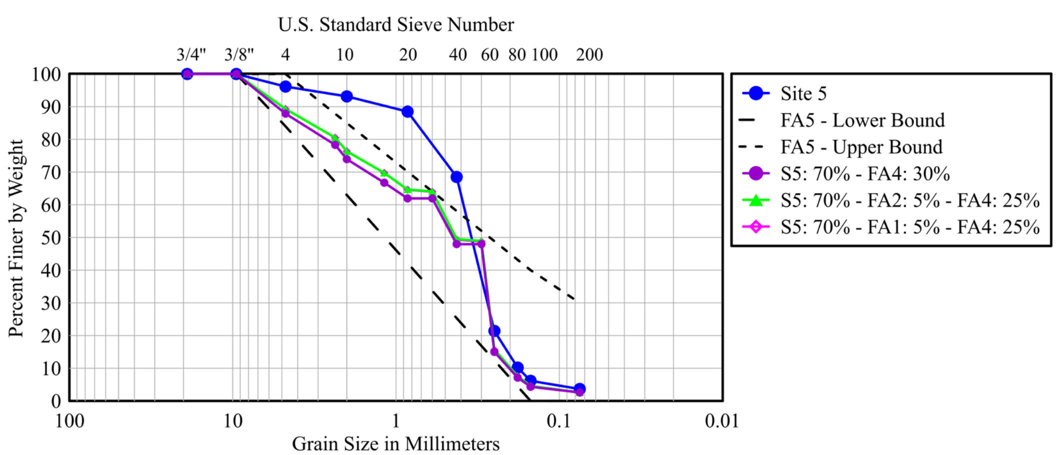

Figure 86. Graph. FA5 with Dredged Material from Site 5 plus Added Material from IDOT Gradations FA1-6.

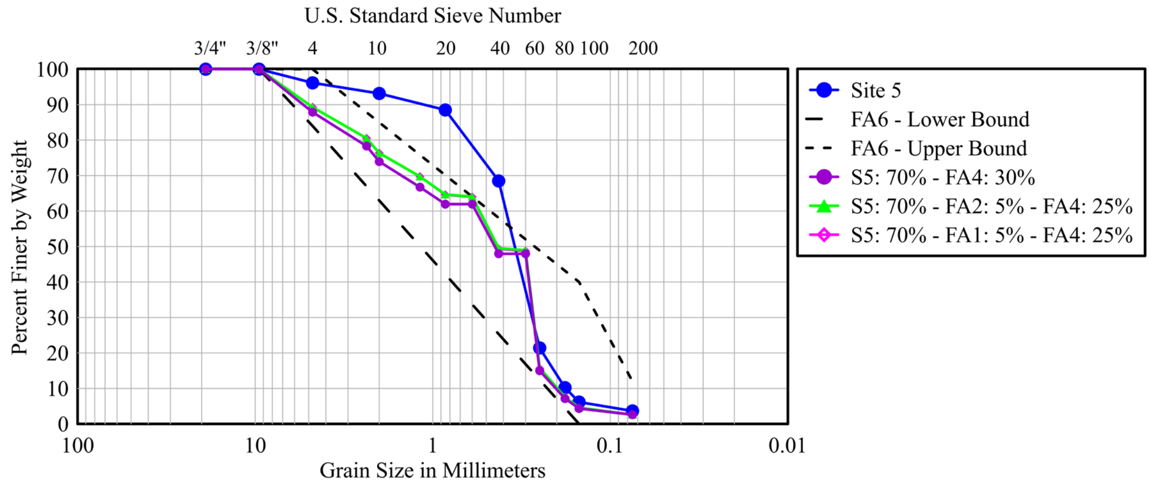

Figure 87. Graph. FA6 with Dredged Material from Site 5 plus Added Material from IDOT Gradations FA1-6.

Soil boring logs for the sixteen soil borings in site #1, S1-1 through S1-16 are shown in Figure 88 through Figure 103, respectively, while soil boring logs for the eight soil borings in site #5, S5-1 through S5-8 are shown in Figure 104 through Figure 111, respectively. Figure 12 provides a comparison of analytical results for soil with applicable regulatory criteria.

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BORING NUMBER S1-1
PAGE 1 OF 1

CLIENT IDOT
PROJECT NAME W.O. 39
PROJECT NUMBER 3160150049.39
PROJECT LOCATION BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20
GROUND SURFACE ELEVATION **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe
AT TIME OF DRILLING ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S1 1-4	30	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.5					NO RECOVERY	
4.0					Bottom of Boring	

AMECFWTEMPLATE BEARDSTOWN.GPJ GINT STD US.GDT 12/14/20

Figure 88. Illustration. Soil boring log for sample S1-1 (WOOD, 2020-b).

wood.

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BORING NUMBER S1-2

PAGE 1 OF 1

CLIENT IDOT

PROJECT NAME W.O. 39

PROJECT NUMBER 3160150049.39

PROJECT LOCATION BEARDSTOWN, IL

DATE STARTED 11/9/20 **COMPLETED** 11/9/20

GROUND SURFACE ELEVATION **HOLE SIZE** 2

DRILLING CONTRACTOR Cabeno

GROUND WATER LEVELS:

DRILLING METHOD Geoprobe

AT TIME OF DRILLING ---

LOGGED BY J. Stricklin **CHECKED BY** T. McNally

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S1 1-4	30	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.5					NO RECOVERY	
4.0					Bottom of Boring	

AMECFW TEMPLATE BEARDSTOWN.GPJ GINT STD US.GDT 12/14/20

Figure 89. Illustration. Soil boring log for sample S1-2 (WOOD, 2020-b).

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BORING NUMBER S1-3
PAGE 1 OF 1

CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** ____ **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S1 1-4	28	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.3					NO RECOVERY	
4.0					Bottom of Boring	

AMECFW TEMPLATE BEARDSTOWN.GPJ GINT STD US.GDT 12/14/20

Figure 90. Illustration. Soil boring log for sample S1-3 (WOOD, 2020-b).

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BORING NUMBER S1-4
PAGE 1 OF 1

CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S1 1-4	30	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.5					NO RECOVERY	
4.0					Bottom of Boring	

AMECFW TEMPLATE BEARDSTOWN.GPJ GINT STD US.GDT 12/14/20

Figure 91. Illustration. Soil boring log for sample S1-4 (WOOD, 2020-b).

wood.

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BORING NUMBER S1-5
PAGE 1 OF 1

CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** ____ **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S1 5-8	34	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.8					NO RECOVERY	
4.0					Bottom of Boring	

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Figure 92. Illustration. Soil boring log for sample S1-5 (WOOD, 2020-b).

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BORING NUMBER S1-6
PAGE 1 OF 1

CLIENT IDOT
PROJECT NAME W.O. 39
PROJECT NUMBER 3160150049.39
PROJECT LOCATION BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20
GROUND SURFACE ELEVATION **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe
AT TIME OF DRILLING ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S1 5-8	26	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.2					NO RECOVERY	
4.0					Bottom of Boring	

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Figure 93. Illustration. Soil boring log for sample S1-6 (WOOD, 2020-b).

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BORING NUMBER S1-7
PAGE 1 OF 1

CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S1 5-8	28	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.3					NO RECOVERY	
4.0					Bottom of Boring	

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Figure 94. Illustration. Soil boring log for sample S1-7 (WOOD, 2020-b).

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BORING NUMBER S1-8

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CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S1 5-8	30	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
				2.5	NO RECOVERY	
				4.0	Bottom of Boring	

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Figure 95. Illustration. Soil boring log for sample S1-8 (WOOD, 2020-b).

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BORING NUMBER S1-9
PAGE 1 OF 1

CLIENT IDOT
PROJECT NAME W.O. 39
PROJECT NUMBER 3160150049.39
PROJECT LOCATION BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20
GROUND SURFACE ELEVATION **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe
AT TIME OF DRILLING ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS		MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S1 9-12	31	0.0 0.0 0.0		2.6	BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
					4.0	NO RECOVERY	
						Bottom of Boring	

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Figure 96. Illustration. Soil boring log for sample S1-9 (WOOD, 2020-b).

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BORING NUMBER S1-10

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CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** ____ **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S1 9-12	32	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.7					NO RECOVERY	
4.0					Bottom of Boring	

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Figure 97. Illustration. Soil boring log for sample S1-10 (WOOD, 2020-b).

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BORING NUMBER S1-11

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CLIENT IDOT | **PROJECT NAME** W.O. 39

PROJECT NUMBER 3160150049.39 | **PROJECT LOCATION** BEARDSTOWN, IL

DATE STARTED 11/9/20 **COMPLETED** 11/9/20 | **GROUND SURFACE ELEVATION** **HOLE SIZE** 2

DRILLING CONTRACTOR Cabeno | **GROUND WATER LEVELS:**

DRILLING METHOD Geoprobe | **AT TIME OF DRILLING** ---

LOGGED BY J. Stricklin **CHECKED BY** T. McNally | **AT END OF DRILLING** ---

NOTES | **AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S1 9-12	32	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.7					NO RECOVERY	
4.0					Bottom of Boring	

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Figure 98. Illustration. Soil boring log for sample S1-11 (WOOD, 2020-b).

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BORING NUMBER S1-12
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CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S1 9-12	30	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.5					NO RECOVERY	
4.0					Bottom of Boring	

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Figure 99. Illustration. Soil boring log for sample S1-12 (WOOD, 2020-b).

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BORING NUMBER S1-13

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CLIENT IDOT

PROJECT NAME W.O. 39

PROJECT NUMBER 3160150049.39

PROJECT LOCATION BEARDSTOWN, IL

DATE STARTED 11/9/20 **COMPLETED** 11/9/20

GROUND SURFACE ELEVATION **HOLE SIZE** 2

DRILLING CONTRACTOR Cabeno

GROUND WATER LEVELS:

DRILLING METHOD Geoprobe

AT TIME OF DRILLING ---

LOGGED BY J. Stricklin **CHECKED BY** T. McNally

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S1 13-16	25	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.1					NO RECOVERY	
4.0					Bottom of Boring	

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Figure 100. Illustration. Soil boring log for sample S1-13 (WOOD, 2020-b).

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BORING NUMBER S1-14

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CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS		MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S1 13-16	29	0.0 0.0 0.0		2.4	BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
					4.0	NO RECOVERY	
						Bottom of Boring	

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Figure 101. Illustration. Soil boring log for sample S1-14 (WOOD, 2020-b).

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BORING NUMBER S1-15

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CLIENT IDOT

PROJECT NAME W.O. 39

PROJECT NUMBER 3160150049.39

PROJECT LOCATION BEARDSTOWN, IL

DATE STARTED 11/9/20 **COMPLETED** 11/9/20

GROUND SURFACE ELEVATION **HOLE SIZE** 2

DRILLING CONTRACTOR Cabeno

GROUND WATER LEVELS:

DRILLING METHOD Geoprobe

AT TIME OF DRILLING ---

LOGGED BY J. Stricklin **CHECKED BY** T. McNally

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S1 13-16	30	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.5					NO RECOVERY	
4.0					Bottom of Boring	

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Figure 102. Illustration. Soil boring log for sample S1-15 (WOOD, 2020-b).

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BORING NUMBER S1-16
PAGE 1 OF 1

CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S1 13-16	30	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.5					NO RECOVERY	
4.0					Bottom of Boring	

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Figure 103. Illustration. Soil boring log for sample S1-16 (WOOD, 2020-b).

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BORING NUMBER S5-1

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CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S5 1-4	34	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.8					NO RECOVERY	
4.0					Bottom of Boring	

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Figure 104. Illustration. Soil boring log for sample S5-1 (WOOD, 2020-b).

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BORING NUMBER S5-2

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CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S5 1-4	32	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.7					NO RECOVERY	
4.0					Bottom of Boring	

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Figure 105. Illustration. Soil boring log for sample S5-2 (WOOD, 2020-b).

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BORING NUMBER S5-3
PAGE 1 OF 1

CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S5 1-4	32	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.7					NO RECOVERY	
4.0					Bottom of Boring	

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Figure 106. Illustration. Soil boring log for sample S5-3 (WOOD, 2020-b).

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BORING NUMBER S5-4

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CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** ____ **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS		MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S5 1-4	34	0.0 0.0 0.0		2.8	BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
					4.0	NO RECOVERY	
						Bottom of Boring	

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Figure 107. Illustration. Soil boring log for sample S5-4 (WOOD, 2020-b).

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BORING NUMBER S5-5
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CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS		MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S5 5-8	29	0.0 0.0 0.0		2.4	BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
					4.0	NO RECOVERY	
						Bottom of Boring	

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Figure 108. Illustration. Soil boring log for sample S5-5 (WOOD, 2020-b).

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BORING NUMBER S5-6
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CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS		MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S5 5-8	31	0.0 0.0 0.0		2.6	BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
					4.0	NO RECOVERY	
						Bottom of Boring	

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Figure 109. Illustration. Soil boring log for sample S5-6 (WOOD, 2020-b).

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BORING NUMBER S5-7
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CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S5 5-8	29	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.4					NO RECOVERY	
4.0					Bottom of Boring	

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Figure 110. Illustration. Soil boring log for sample S5-7 (WOOD, 2020-b).

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BORING NUMBER S5-8

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CLIENT IDOT	**PROJECT NAME** W.O. 39
PROJECT NUMBER 3160150049.39	**PROJECT LOCATION** BEARDSTOWN, IL
DATE STARTED 11/9/20 **COMPLETED** 11/9/20	**GROUND SURFACE ELEVATION** ____ **HOLE SIZE** 2
DRILLING CONTRACTOR Cabeno	**GROUND WATER LEVELS:**
DRILLING METHOD Geoprobe	**AT TIME OF DRILLING** ---
LOGGED BY J. Stricklin **CHECKED BY** T. McNally	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S5 5-8	35	0.0 0.0 0.0		BROWN-TAN MEDIUM GRAINED SAND, WELL SORTED, BITS OF SHELLS PRESENT, MOIST, NO ODOR	
2.9					NO RECOVERY	
4.0					Bottom of Boring	

AMECFW TEMPLATE BEARDSTOWN.GPJ GINT STD US.GDT 12/14/20

Figure 111. Illustration. Soil boring log for sample S5-8 (WOOD, 2020-b).

Sample ID	S1 (1-4 Comp.)		S1 (5-8 Comp.)		S1 (9-12 Comp.)		S1 (13-16 Comp.)		S5 (1-4 Comp.)		S5 (5-8 Comp.)		Maximum Allowable Concentrations							TACO Remediation Objectives	
Sample Depth (ft.)	0-4		0-4		0-4		0-4		0-4		0-4		Most Stringent Maximum Allowable Concentration [1]	Within Chicago Corporate Limits [2]	Within a Populated Area in a MSA (excluding Chicago) [3]	Within a MSA County [4]	Within a Populated Area in a non-MSA County [5]	Outside a Populated Area [6]	Within a non-MSA County [7]	Most Stringent TACO Tier 1 Construction Worker Exposure Objective [8]	Most Stringent TACO Tier 1 Residential Objective [9] and Groundwater Protection (TCLP/SPLP) [10]
Sample Date	11/9/2020		11/9/2020		11/9/2020		11/9/2020		11/9/2020		11/9/2020										
PID	0.0		0.0		0.0		0.0		0.0		0.0										
Sample pH	8.9		9.1		9.1		8.8		9		8.8										
Matrix	Sand		Sand		Sand		Sand		Sand		Sand										
IDOT 669 Designation	Unrestricted		(b)(1)		(b)(1)		Unrestricted		Unrestricted		Unrestricted										
VOCs (mg/kg)																					
Carbon disulfide	<0.0055		<0.0047		<0.0048		<0.0060		0.0015	J	<0.0052		9	NA	NA	NA	NA	NA	NA	9	720
SVOCs (mg/kg)																					
Benzo[a]anthracene	0.032	J	<0.034		<0.034		0.0057	J	<0.034		<0.039		0.9	1.1	1.8	NA	0.9	0.9	NA	170	0.9
Benzo[a]pyrene	0.032	J	<0.034		<0.034		<0.039		<0.034		<0.039		0.09	1.3	2.1	NA	0.98	0.09	NA	17	0.09
Benzo[b]fluoranthene	0.042		<0.034		<0.034		<0.039		<0.034		<0.039		0.9	1.5	2.1	NA	0.9	0.9	NA	170	0.9
Benzo[g,h,i]perylene	0.024	J	<0.034		<0.034		<0.039		<0.034		<0.039		NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[k]fluoranthene	0.015	J	<0.034		<0.034		<0.039		<0.034		<0.039		9	NA	NA	NA	NA	NA	NA	1,700	9
Chrysene	0.037	J	<0.034		<0.034		<0.039		<0.034		<0.039		88	NA	NA	NA	NA	NA	NA	17,000	88
Fluoranthene	0.046		<0.034		<0.034		<0.039		<0.034		<0.039		3,100	NA	NA	NA	NA	NA	NA	82,000	3,100
Indeno(1,2,3-cd)pyrene	0.02	J	<0.034		<0.034		<0.039		<0.034		<0.039		0.9	0.9	1.6	NA	0.9	0.9	NA	170	0.9
Phenanthrene	0.012	J	0.0053	J	<0.034		<0.039		<0.034		<0.039		0.99	1.3	2.5	NA	2.5	0.99	NA	NA	NA
Pesticides (mg/kg)																					
Dieldrin	0.00059	J	<0.0018		<0.0018		<0.0020		0.00055	J	<0.0020		0.603	NA	NA	NA	NA	NA	NA	0.4	0.04
Herbicides (mg/kg)																					
None detected	NA		NA		NA		NA		NA		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs (mg/kg)																					
None detected	NA		NA		NA		NA		NA		NA		1	NA	NA	NA	NA	NA	NA	1	1
Microbiological (CFU/g)																					
Fecal Coliform Bacteria	<9.0		<9.0		<9.0		<9.0		<9.0		<9.0		NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics (mg/kg)																					
Antimony	<1.1		<1.0		<0.95		<1.1		<0.98		<1.1		5	NA	NA	NA	NA	NA	NA	82	31
Arsenic	1.5		1.4		1.6		1.8		1.3		2		11.3	NA	NA	13.0	NA	NA	11.3	61	750
Barium	12		11		11		14		12		15		1,500	NA	NA	NA	NA	NA	NA	14,000	5,500
Beryllium	0.1	J	0.11	J	0.1	J	0.12	J	0.11	J	0.13	J	22	NA	NA	NA	NA	NA	NA	410	160
Cadmium	<0.11		0.023	J B	<0.095		<0.11		0.025	J B	<0.11		5.2	NA	NA	NA	NA	NA	NA	200	78
Chromium	2.9		2.8		2.8		3.3		2.9		3		21	NA	NA	NA	NA	NA	NA	690	230
Cobalt	2.3		2.3		2.5		2.7		2.3		2.7		20	NA	NA	NA	NA	NA	NA	12,000	4,700
Copper	0.89		0.92		0.86		1.1		1.2		0.93		2,900	NA	NA	NA	NA	NA	NA	8,200	2,900
Iron	3400		3500		3500		4300		3300		4000		15,000	NA	NA	15,900	NA	NA	15,000	NA	NA
Lead	2.8		2.6		2.5		2.7		3.5		4		107	NA	NA	NA	NA	NA	NA	700	400
Manganese	140	B	130	B	130	B	180	B	140	B	150	B	630	NA	NA	636	NA	NA	630	4,100	1,600
Mercury	0.013	J	0.0073	J	0.0091	J	0.0077	J	0.013	J	0.0078	J	0.89	NA	NA	NA	NA	NA	NA	0.1	10
Nickel	4.1		3.9		4.3		5.1		4.1		4.3		100	NA	NA	NA	NA	NA	NA	4,100	1,600
Selenium	<0.57		<0.51		<0.47		<0.56		<0.49		<0.56		1.3	NA	NA	NA	NA	NA	NA	1,000	390
Silver	<0.29		<0.25		<0.24		<0.28		<0.25		<0.28		4.4	NA	NA	NA	NA	NA	NA	1,000	390
Thallium	<0.57		<0.51		<0.47		<0.56		<0.49		<0.56		2.6	NA	NA	NA	NA	NA	NA	160	6.3
Vanadium	4.6		4.2		4.1		4.4		4.5		4.6		550	NA	NA	NA	NA	NA	NA	1,400	550
Zinc	13		14		12		13		18		12		5,100	NA	NA	NA	NA	NA	NA	61,000	23,000
TCLP Metals (mg/L)																					
Antimony	<0.0060		<0.0060		<0.0060		<0.0060		<0.0060		<0.0060		--	--	--	--	--	--	--	--	0.006
Arsenic	<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		--	--	--	--	--	--	--	--	0.05
Barium	0.16	J	0.18	J	0.18	J	0.19	J	0.32	J	0.26	J	--	--	--	--	--	--	--	--	2
Beryllium	<0.0040		<0.0040		<0.0040		<0.0040		<0.0040		<0.0040		--	--	--	--	--	--	--	--	0.004
Cadmium	<0.0050		<0.0050		<0.0050		<0.0050		<0.0050		<0.0050		--	--	--	--	--	--	--	--	0.005
Chromium	<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		--	--	--	--	--	--	--	--	0.1
Cobalt	<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		--	--	--	--	--	--	--	--	1
Copper	<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		--	--	--	--	--	--	--	--	0.65
Lead	<0.0075		<0.0075		<0.0075		<0.0075		<0.0075		<0.0075		--	--	--	--	--	--	--	--	0.0075
Mercury	<0.00020		<0.00020		<0.00020		<0.00020		<0.00020		<0.00020		--	--	--	--	--	--	--	--	0.002
Nickel	<0.025		<0.025		<0.025		<0.025		0.011	J	<0.025		--	--	--	--	--	--	--	--	0.1
Selenium	<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		--	--	--	--	--	--	--	--	0.05
Silver	<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		--	--	--	--	--	--	--	--	0.05
Thallium	<0.0020		<0.0020		<0.0020		<0.0020		<0.0020		<0.0020		--	--	--	--	--	--	--	--	0.002
Vanadium	<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		--	--	--	--	--	--	--	--	0.049
Zinc	0.033	J	0.035	J	0.034	J	0.028	J	0.096	J	<0.50		--	--	--	--	--	--	--	--	5

Notes:

NA= Not available
ND= Not detected above laboratory reporting limit
NT= Not tested
mg/kg= Milligrams per kilogram
mg/L= Milligrams per liter
TCLP= Toxicity Characteristic Leaching Procedure
SPLP= Synthetic Precipitation Leaching Procedure
MAC= Maximum Allowable Concentrations of Chemical Constituents in Uncontaminated Soil Used as Fill Material at Regulated Fill Operations (35 Ill. Adm. Code 110. Subpart F).
TACO = Tiered Approach to Corrective Action Objectives

*= Laboratory Control Sample (LCS) or Laboratory Control Sample Duplicate (LCSD) is outside acceptance limits.
^= Instrument related QC is outside acceptance limits.
B= Compound was found in the blank and sample.
J= Result is less than the reporting limit but greater than or equal to the method detection limit, concentration reported as an approximate value.
F1= Matrix spike or matrix spike duplicate recovery is outside acceptance limits.
F2= Matrix spike or matrix spike duplicate relative percent difference exceeds control limits.
CCDD = Clean Construction Demolition Debris

Applicable Screening Criteria

[1] Exceeds the most stringent MAC value (35 IAC (1100.605(e))
[2] Exceeds the Chicago Corporate Limits MAC values
[3] Exceeds the Within a Populated Area in a MSA (excluding Chicago) MAC value
[4] Exceeds the Within a MSA County MAC value
[5] Exceeds the Within a Populated Area in a non-MSA County MAC value
[6] Exceeds the Outside a Populated Area MAC value
[7] Exceeds the Within a non-MSA County MAC value
[8] Exceeds the Most Stringent TACO Tier 1 Construction Worker Exposure Objective
[9] Exceeds the Most Stringent TACO Tier 1 Residential Objective
[10] Exceeds the TACO Tier 1 Soil to Groundwater TCLP/SPLP Objective

Unrestrictive- metals exceed Totals but not TCLP and SPLP; or metals exceed TCLP or SPLP but not both
CCDD Eligible- metals exceed TCLP and SPLP but not Totals
CCDD Eligible- VOCs or SVOCs exceedances; limited CCDD disposal availability
Greater than TACO Construction Worker Exposure Objectives
Non-special Waste- Greater than all MACs, Greater than most stringent TACO Tier 1 Criteria; Metals exceed Totals, TCLP, and SPLP; Metals exceed TACO Residential and not considered background
PID above background or pH outside of the acceptable range (6.25 to 9.0)

Figure 112. Table. Comparison of analytical data to screening levels (WOOD, 2020-b).

APPENDIX E: MCCLUGGAGE BRIDGE SUPPLEMENTS

Soil boring logs for the six soil cores for Peoria 1 through Peoria 6 are shown in Figure 113 through Figure 118, respectively.

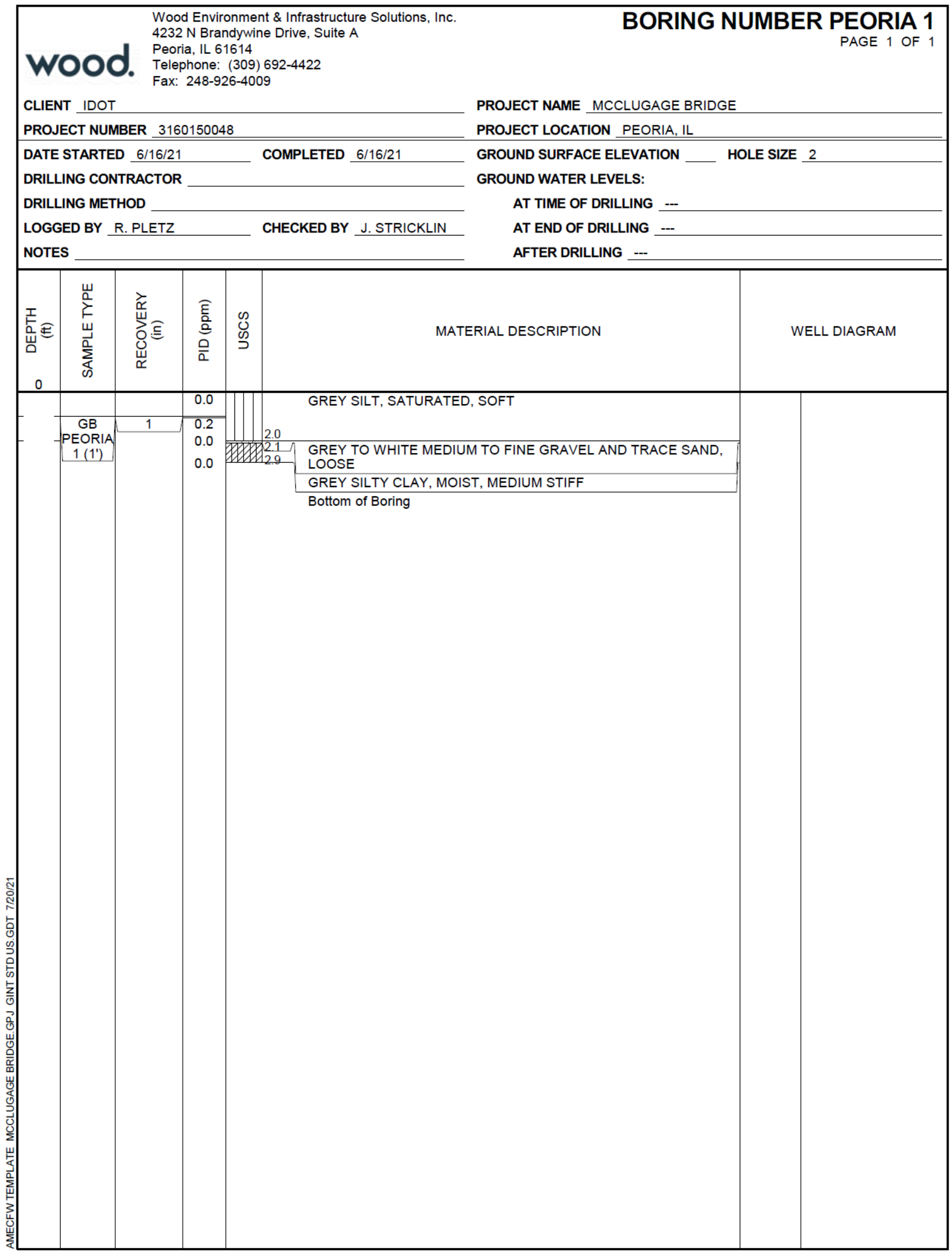

Figure 113. Illustration. Soil boring log for Peoria 1 (WOOD, 2022).

wood.

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BORING NUMBER PEORIA 2

PAGE 1 OF 1

CLIENT IDOT	**PROJECT NAME** MCCLUGAGE BRIDGE
PROJECT NUMBER 3160150048	**PROJECT LOCATION** PEORIA, IL
DATE STARTED 6/16/21 **COMPLETED** 6/16/21	**GROUND SURFACE ELEVATION** ____ **HOLE SIZE** 2
DRILLING CONTRACTOR	**GROUND WATER LEVELS:**
DRILLING METHOD	**AT TIME OF DRILLING** ---
LOGGED BY R. PLETZ **CHECKED BY** J. STRICKLIN	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft)	SAMPLE TYPE	RECOVERY (in)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0			0.0		GREY CLAYEY SILT, TRACE COARSE SAND AND FINE GRAVEL, MOIST TO WET	
	GB PEORIA 2 (1')	1	0.0			
			0.0			
5			0.0			
	GB PEORIA 2 (7')	1	0.0			
9.1					Bottom of Boring	

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Figure 114. Illustration. Soil boring log for Peoria 2 (WOOD, 2022).

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BORING NUMBER PEORIA 3
PAGE 1 OF 1

CLIENT IDOT
PROJECT NAME MCCLUGAGE BRIDGE
PROJECT NUMBER 3160150048
PROJECT LOCATION PEORIA, IL
DATE STARTED 6/16/21 **COMPLETED** 6/16/21
GROUND SURFACE ELEVATION **HOLE SIZE** 2
DRILLING CONTRACTOR
GROUND WATER LEVELS:
DRILLING METHOD
AT TIME OF DRILLING ---
LOGGED BY R. PLETZ **CHECKED BY** J. STRICKLIN
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE	RECOVERY (in)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB PEORIA 3 (0.5')	1	0.0		DARK GREY CLAYEY SILT, TRACE COARSE SAND AND SMALL SHELLS, SAND LAYER PRESENT AT 3.1', MOIST TO WET, SOFT	
			0.0			
			0.0			
5			0.0			
	GB PEORIA 3 (6.5')	1	0.0	8.4		
					Bottom of Boring	

AMECFW TEMPLATE MCCLUGAGE BRIDGE.GPJ GINT STD US.GDT 7/20/21

Figure 115. Illustration. Soil boring log for Peoria 3 (WOOD, 2022).

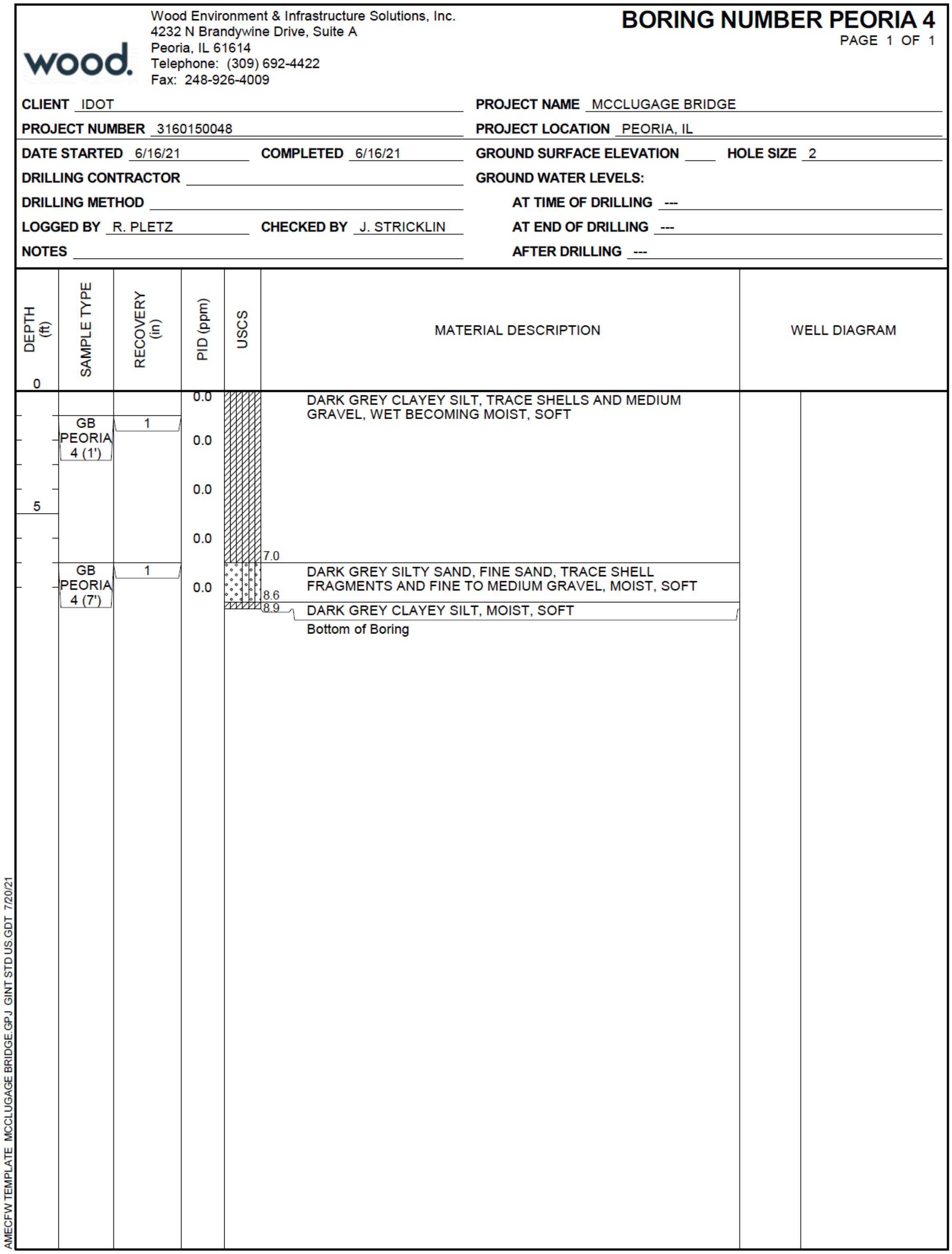

Figure 116. Illustration. Soil boring log for Peoria 4 (WOOD, 2022).

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BORING NUMBER PEORIA 5

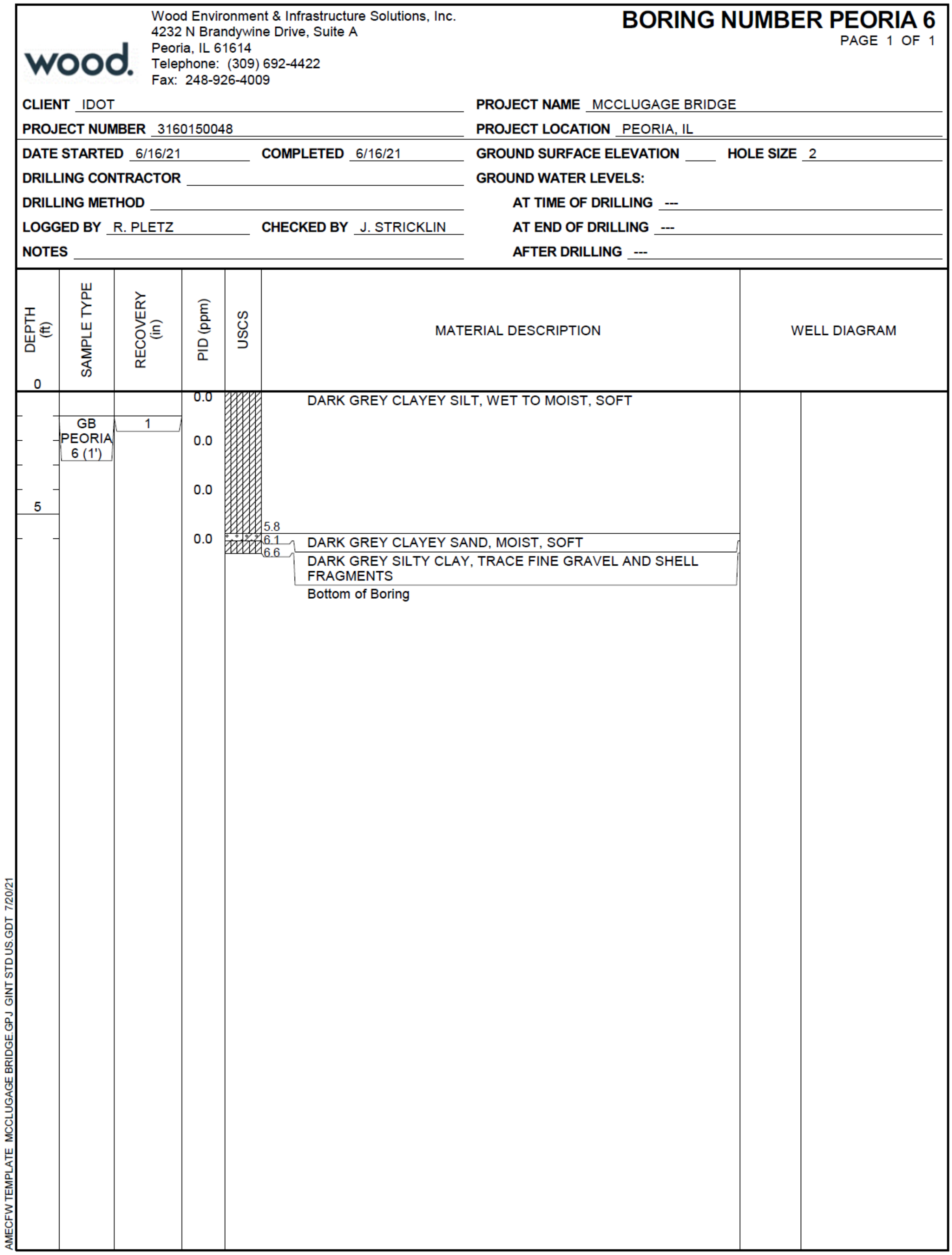
PAGE 1 OF 1

CLIENT IDOT
PROJECT NAME MCCLUGAGE BRIDGE
PROJECT NUMBER 3160150048
PROJECT LOCATION PEORIA, IL
DATE STARTED 6/16/21 **COMPLETED** 6/16/21
GROUND SURFACE ELEVATION **HOLE SIZE** 2
DRILLING CONTRACTOR
GROUND WATER LEVELS:
DRILLING METHOD
AT TIME OF DRILLING ---
LOGGED BY R. PLETZ **CHECKED BY** J. STRICKLIN
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE	RECOVERY (in)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0			0.0		DARK GREY CLAYEY SILT, TRACE FINE GRAVEL AND SHELL FRAGMENTS, WET TO MOIST, SOFT	
	GB PEORIA 5 (0.6')	1	0.0			
5			0.0			
			0.0	6.6		
	GB PEORIA 5 (6.6')	1		6.7	DARK GREY SILTY FINE SAND, MOIST, SOFT	
			0.0	7.8	DARK GREY CLAYEY SILT, MOIST, SOFT	
				8.1	DARK GREY SILTY CLAY, MOIST, SOFT	
					Bottom of Boring	

AMECFW TEMPLATE MCCLUGAGE BRIDGE.GPJ GINT STD US.GDT 7/20/21

Figure 117. Illustration. Soil boring log for Peoria 5 (WOOD, 2022).



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BORING NUMBER PEORIA 6
PAGE 1 OF 1

CLIENT IDOT
PROJECT NAME MCCLUGAGE BRIDGE
PROJECT NUMBER 3160150048
PROJECT LOCATION PEORIA, IL
DATE STARTED 6/16/21 **COMPLETED** 6/16/21
GROUND SURFACE ELEVATION **HOLE SIZE** 2
DRILLING CONTRACTOR
GROUND WATER LEVELS:
DRILLING METHOD
AT TIME OF DRILLING ---
LOGGED BY R. PLETZ **CHECKED BY** J. STRICKLIN
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE	RECOVERY (in)	PID (ppm)	USCS		MATERIAL DESCRIPTION	WELL DIAGRAM
0			0.0			DARK GREY CLAYEY SILT, WET TO MOIST, SOFT	
	GB PEORIA 6 (1')	1	0.0				
			0.0				
5					5.8		
			0.0		6.1	DARK GREY CLAYEY SAND, MOIST, SOFT	
					6.6	DARK GREY SILTY CLAY, TRACE FINE GRAVEL AND SHELL FRAGMENTS	
						Bottom of Boring	

AMECFW TEMPLATE MCCLUGAGE BRIDGE.GPJ GINT STD US.GDT 7/20/21

Figure 118. Illustration. Soil boring log for Peoria 6 (WOOD, 2022).

Photographs of the six split soil cores for Peoria 1 through Peoria 6 are shown in Figure 119 through Figure 124, respectively. Sampling to the maximum depth of 10 ft was not possible on sediment cores numbered Peoria 1, 5 and 6 due to the inability of the vibrocore rig to penetrate the hard clay substrate (WOOD, 2022).

Figure 119. Photos. Photographs of split core obtained from Peoria 1 (WOOD, 2022).

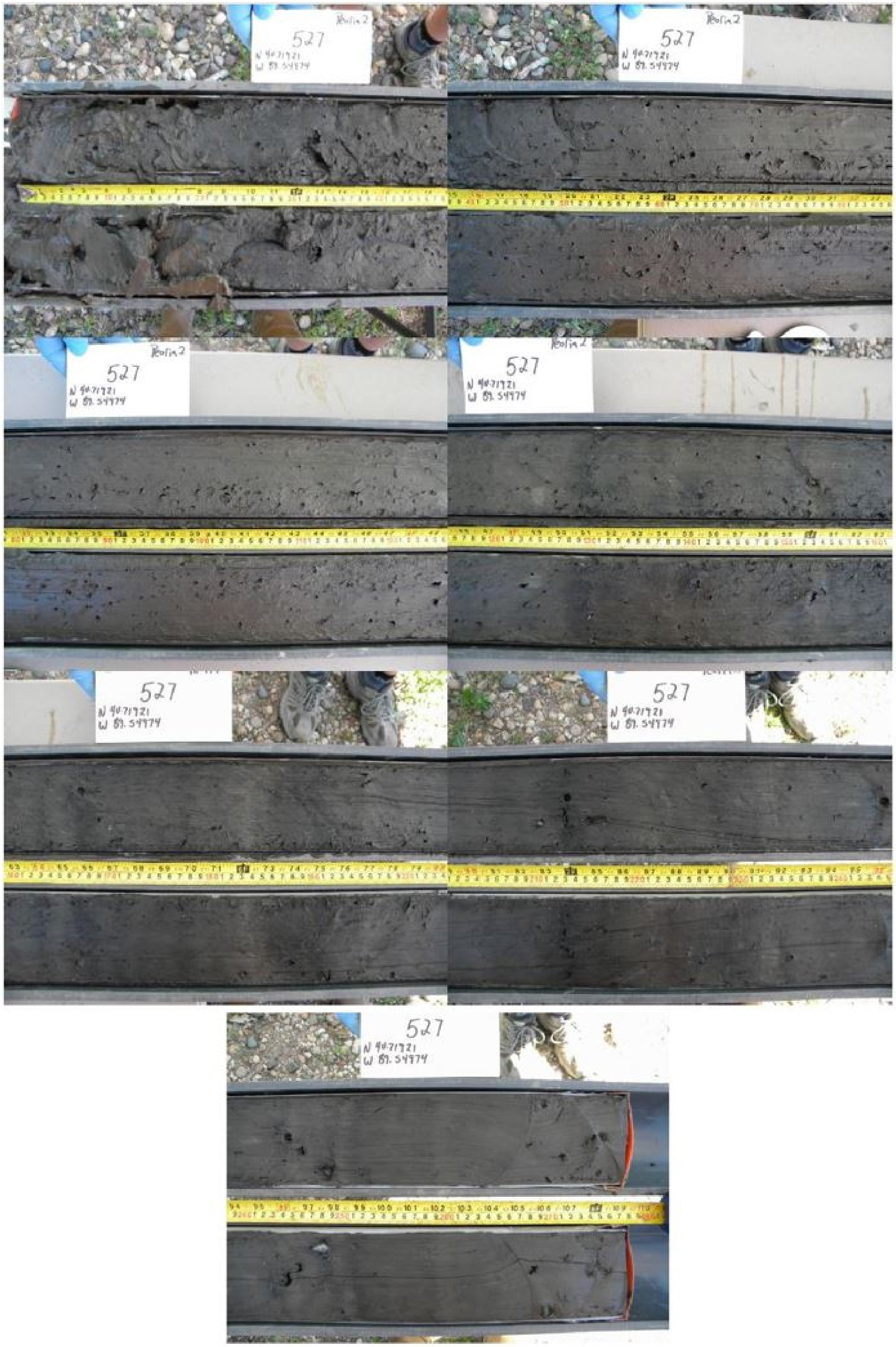


Figure 120. Photos. Photographs of split core obtained from Peoria 2 (WOOD, 2022).

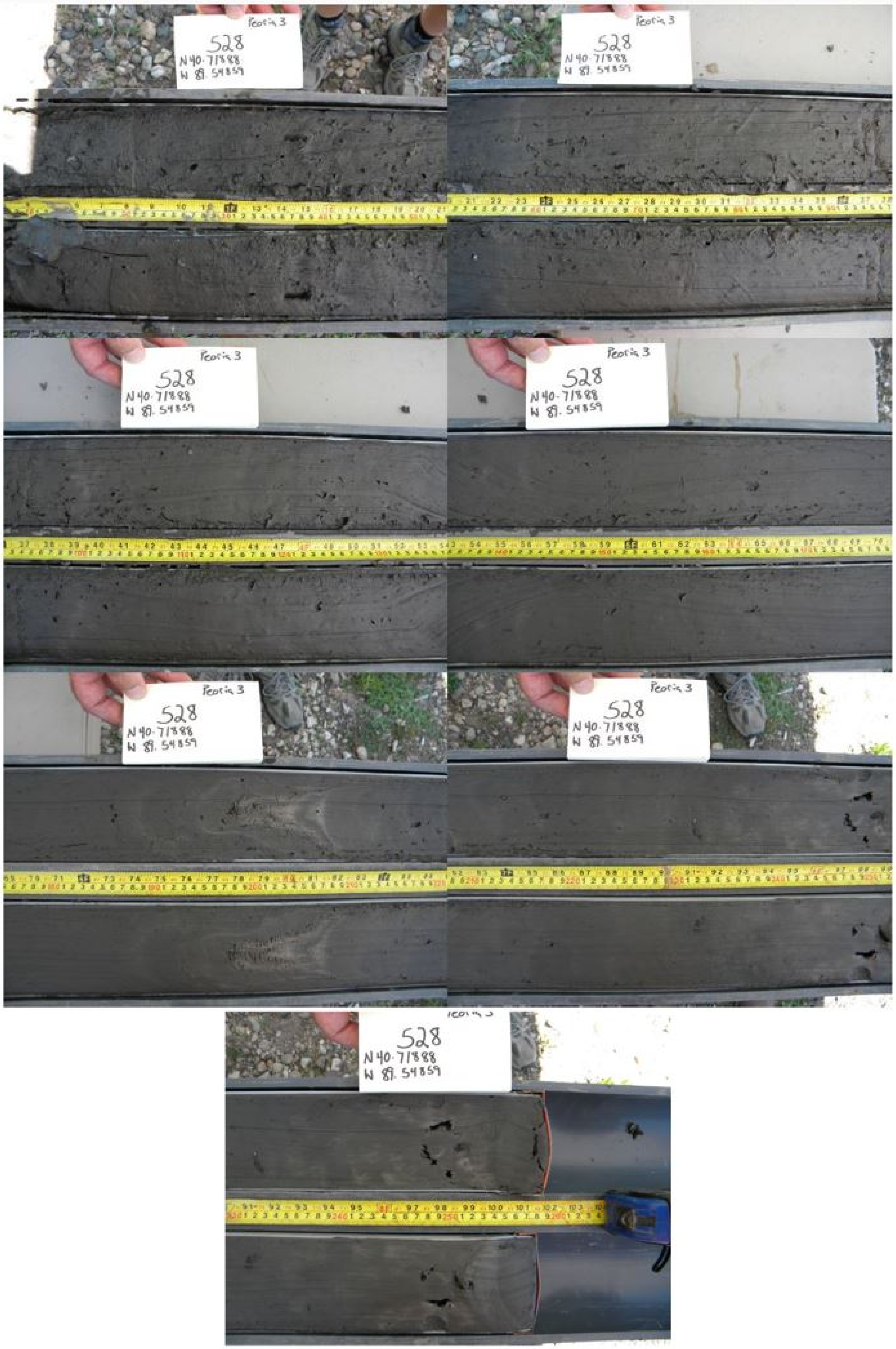


Figure 121. Photos. Photographs of split core obtained from Peoria 3 (WOOD, 2022).

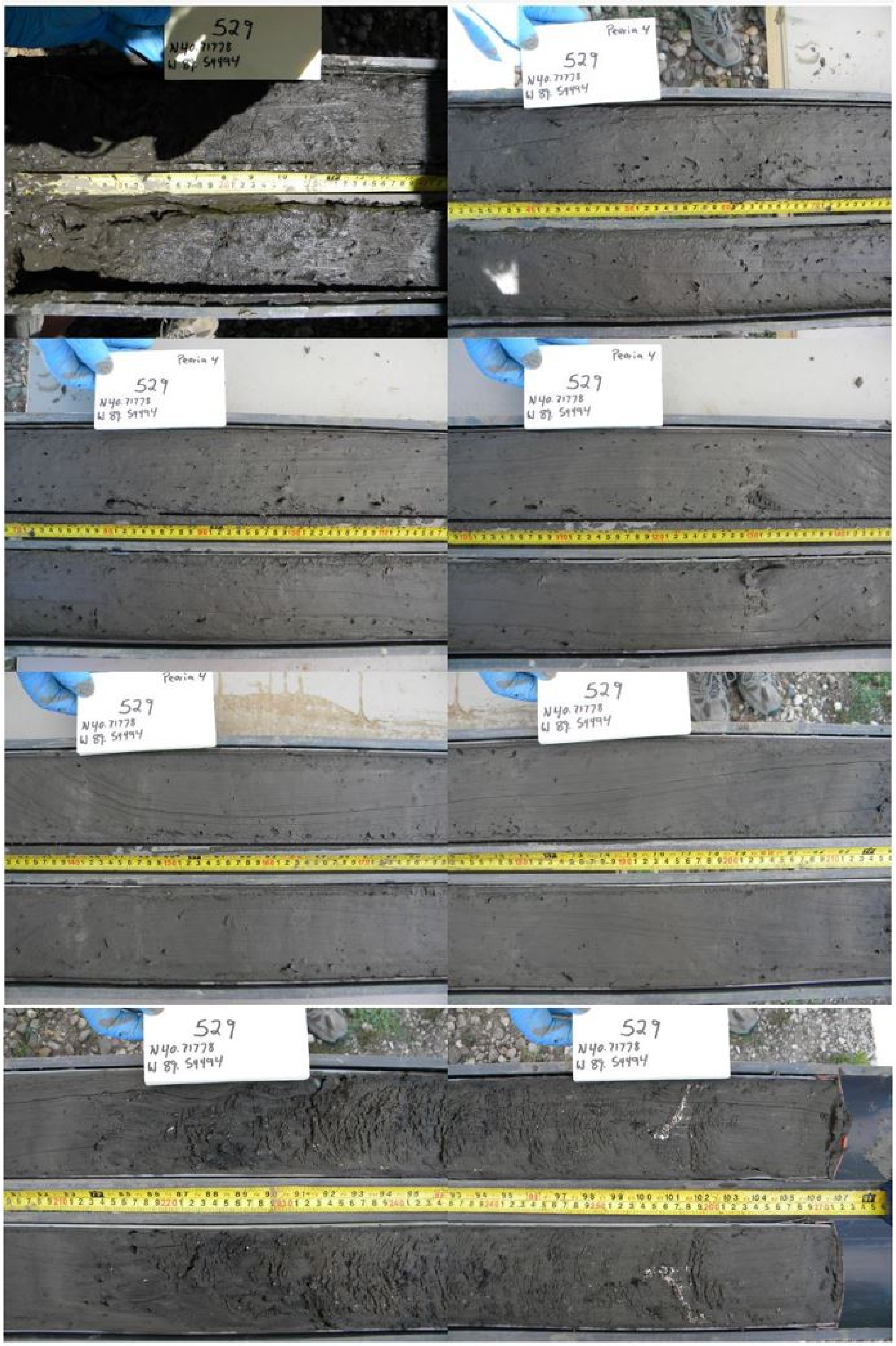


Figure 122. Photos. Photographs of split core obtained from Peoria 4 (WOOD, 2022).

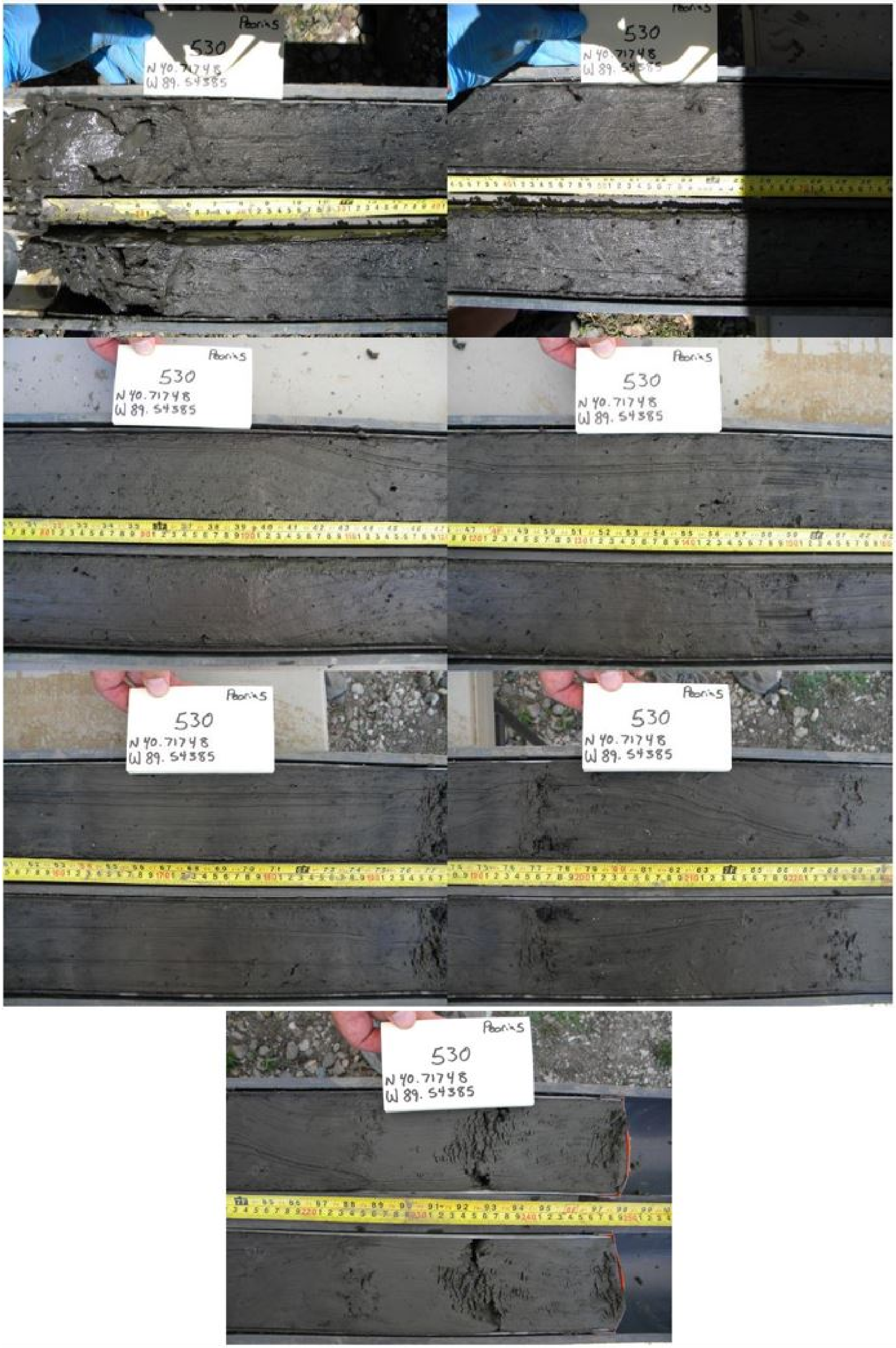


Figure 123. Photos. Photographs of split core obtained from Peoria 5 (WOOD, 2022).

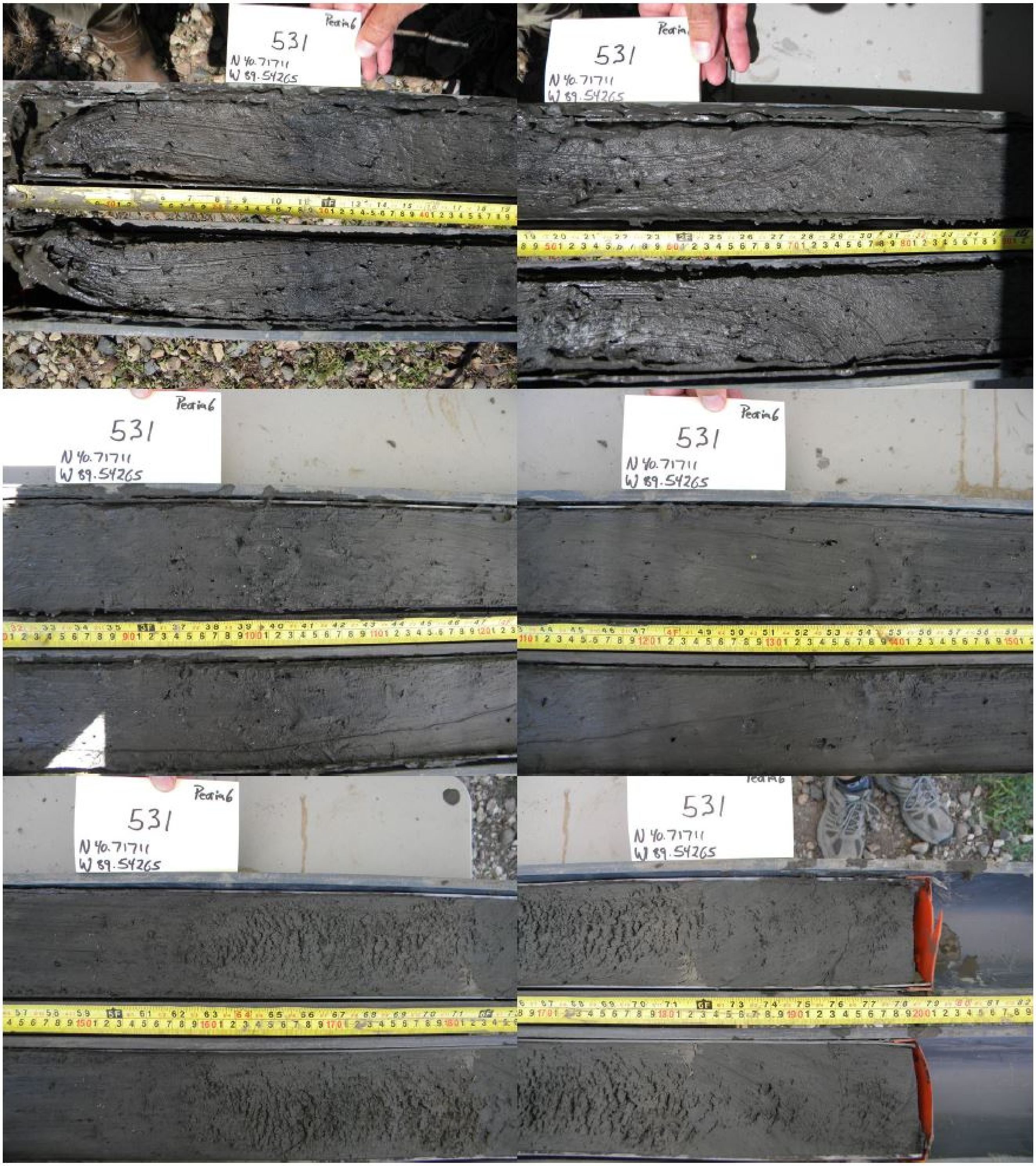


Figure 124. Photos. Photographs of split core obtained from Peoria 6 (WOOD, 2022).

Figure 125 provides a summary of the comparison of analytical results for soil with applicable regulatory criteria. Analytes detected at concentrations above applicable regulatory criteria in project area soil are considered contaminants of concern (COC). In Figure 125, analyte concentrations identified in soil borings were compared to the Maximum Allowable Concentrations (MAC) of Chemical Constituents in Uncontaminated Soil Used as Fill Material at regulated Fill Operations presented in 35 Illinois Administrative Code (IAC) Part 1100, Subpart F. The total concentration of the analyte was completed when a MAC for an inorganic analyte was based on the 35 IAC Tiered Approach to Corrective Action Objectives (TACO) Class I soil component of the groundwater ingestion exposure route (SCGIER) (35 IAC Part 742). Results from the TCLP and SPLP analyses were independently compared with the TACO Class I SCGIER for analytes included in 35 IAC Part 742 (Residential Properties). The analyte was considered to exceed a MAC if the Total results exceed the applicable criteria. Additionally, if the TCLP and SPLP concentrations, for a given constituent, exceeded the TACO Soil Remediation Objective (SRO) for the Soil Component of the Groundwater Ingestion Exposure Route, the constituent was considered a contaminant of concern (WOOD, 2022).

PID headspace screening results were compared to PID background readings. The PID instrument is accurate to 1 part per million (ppm) between 0 and 100 ppm. The PID was calibrated at the beginning of each field day and re-calibrated as necessary based on changing field conditions (i.e., primary wind direction, temperature, precipitation). Background was established at 0 ppm for this site. Soil exhibiting PID readings above background cannot be accepted by a CCDD/USFO (WOOD, 2022).

WOOD's investigation has identified the presence of concentrations of contaminants of concern in river sediment sampled at the US Route 150 (McCluggage Bridge), Peoria, Illinois (WOOD, 2022).

The COCs detected in site soil were compared with TACO Tier 1 ROs for construction worker exposure; analytical results for mercury from samples collected within the project area were above the applicable TACO Tier 1 Remediation Objectives for Construction Worker Exposure. It should be noted that TACO Tier 1 ROs for mercury is based on elemental mercury; the reported mercury concentrations may not be indicative of elemental mercury (WOOD, 2022).

Sample ID	Peoria 1		Peoria 2 (1')		Peoria 2 (7')		Peoria 3 (.5')		Peoria 3 (6.5')		Peoria 4 (1')		Peoria 4 (7')		Peoria 5 (.6')		Peoria 5 (6.6')		Peoria 6 (1')		Maximum Allowable Concentrations							TACO Remediation Objectives	
Sample Depth (ft.)	1		1		7		0.5		6.5		1		7		0.6		6.6		1		Most Stringent Maximum Allowable Concentration [1]	Within Chicago Corporate Limits [2]	Within a Populated Area in a MSA (excluding Chicago) [3]	Within a MSA County [4]	Within a Populated Area in a non-MSA County [5]	Outside a Populated Area [6]	Within a non-MSA County [7]	Most Stringent TACO Tier 1 Construction Worker Exposure Objective [8]	Most Stringent TACO Tier 1 Residential Objective [9] and Groundwater Protection (TCLP/SPLP) [10]
Sample Date	6/16/2021		6/16/2021		6/16/2021		6/16/2021		6/16/2021		6/16/2021		6/16/2021		6/16/2021		6/16/2021		6/16/2021										
PID	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0										
Sample pH	7.8		7.8		7.9		7.6		8.1		7.2		7.9		7.5		7.7		7.7										
Matrix	Silt		Silt		Clay		Silt		Silt		Clay		Fine Sand		Silt		Fine Sand		Silt										
IDOT 669 Designation	(a)(5)		(a)(5)		(a)(5)		(a)(5)		(a)(5)		(a)(5)		(a)(5)		(a)(5)		(a)(5)		(a)(5)										
VOCs (mg/kg)																													
Acetone	0.11		0.14		0.35		0.094		0.085		0.072		0.089		0.046		0.067		0.068		25	NA	NA	NA	NA	NA	NA	100,000	70,000
Benzene	0.0018	J	<0.0042		<0.0044		<0.0045		<0.0031		<0.0033		<0.0026		<0.0035		<0.0033		<0.0036		0.03	NA	NA	NA	NA	NA	NA	2.2	0.8
2-Butanone (MEK)	0.022		0.028		<0.011		<0.011		0.015		0.014		0.019		<0.0088		0.017		0.0099		NA	NA	NA	NA	NA	NA	NA	NA	0.8
Carbon disulfide	0.032		<0.011		0.0025	J	<0.011		0.0016	J	<0.0083		0.0013	J	<0.0088		<0.0083		<0.0089		9	NA	NA	NA	NA	NA	NA	9	720
Toluene	0.0023	J	<0.0042		<0.0044		<0.0045		<0.0031		<0.0033		<0.0026		<0.0035		<0.0033		<0.0036		12	NA	NA	NA	NA	NA	NA	42	650
SVOCs (mg/kg)																													
Acenaphthene	<0.066		<0.064		<0.063		<0.059		0.027	J	<0.055		<0.044		<0.055		<0.059		<0.061		570	NA	NA	NA	NA	NA	NA	120,000	4,700
Acenaphthylene	0.034	J	0.043	J	0.039	J	0.027	J	0.028	J	0.044	J	<0.044		0.036	J	0.025	J	0.038	J	NA	NA	NA	NA	NA	NA	NA	--	--
Anthracene	0.035	J	0.041	J	0.063		0.025	J	0.037	J	0.026	J	0.0082	J	0.034	J	0.049	J	0.033	J	12,000	NA	NA	NA	NA	NA	NA	610,000	23,000
Benzo[a]anthracene	0.16		0.20		0.20		0.14		0.11		0.16		0.024	J	0.14		0.19		0.15		0.9	1.1	1.8	NA	0.9	0.9	NA	170	0.9
Benzo[a]pyrene	0.28	1,6,10	0.33	*3 1,6,10	0.28	*3 1,6,10	0.22	*3 1,6,10	0.19	*3 1,6,10	0.32	*3 1,6,10	0.039	J *3	0.24	*3 1,6,10	0.22	*3 1,6,10	0.25	*3 1,6,10	0.09	1.3	2.1	NA	0.98	0.09	NA	17	0.09
Benzo[b]fluoranthene	0.42		0.50	*3	0.47	*3	0.33	*3	0.31	*3	0.48	*3	0.056	*3	0.41	*3	0.40	*3	0.40	*3	0.9	1.5	2.1	NA	0.9	0.9	NA	170	0.9
Benzo[g,h,i]perylene	0.094		0.088	*3	0.072	*3	0.063	*3	0.052	*3	0.085	*3	<0.044	*3	0.064	*3	0.049	J *3	0.073	*3	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[k]fluoranthene	0.15		0.20	*3	0.13	*3	0.12	*3	0.073	*3	0.17	*3	0.020	J *3	0.13	*3	0.13	*3	0.12	*3	9	NA	NA	NA	NA	NA	NA	1,700	9
Bis(2-ethylhexyl) phthalate	<0.33		<0.33		<0.32		<0.30		<0.26		<0.28		<0.22		0.11	J	<0.30		0.14	J	46	NA	NA	NA	NA	NA	NA	410	46
Chrysene	0.20		0.24		0.31		0.17		0.16		0.19		0.032	J	0.17		0.26		0.19		88	NA	NA	NA	NA	NA	NA	17,000	88
Dibenz(a,h)anthracene	0.042	J	0.045	J *3	0.040	J *3	0.028	J *3	0.023	J *3	0.042	J *3	<0.044	*3	0.042	J *3	0.030	J *3	0.044	J *3	0.09	0.2	0.42	NA	0.15	0.09	NA	17	0.09
Fluoranthene	0.26		0.30		0.45		0.22		0.19		0.16		0.053		0.20		0.53		0.21		3,100	NA	NA	NA	NA	NA	NA	82,000	3,100
Fluorene	0.013	J	0.018	J	0.022	J	0.0088	J	0.026	J	0.012	J	<0.044		0.012	J	0.013	J	0.013	J	560	NA	NA	NA	NA	NA	NA	82,000	3,100
Indeno(1,2,3-cd)pyrene	0.11		0.11	*3	0.088	*3	0.088	*3	0.056	*3	0.10	*3	<0.044	*3	0.080	*3	0.066	*3	0.076	*3	0.9	0.9	1.6	NA	0.9	0.9	NA	170	0.9
2-Methylnapthalene	0.014	J	0.016	J	0.020	J	<0.12		0.015	J	<0.11		<0.089		0.015	J	<0.12		0.017	J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	0.016	J	0.018	J	0.023	J	0.011	J	0.015	J	0.010	J	<0.044		0.016	J	0.012	J	0.016	J	1.8	0.04	0.2	NA	NA	0.17	NA	1.8	170
Phenanthrene	0.086		0.094		0.11		0.068		0.10		0.051	J	0.0082	J	0.071		0.068		0.079		0.99	1.3	2.5	NA	2.5	0.99	NA	NA	NA
Pyrene	0.32		0.42		0.53		0.24		0.29		0.26		0.082		0.39		0.74		0.39		2,300	NA	NA	NA	NA	NA	NA	61,000	2,300
Pesticides (mg/kg)																													
Dieldrin	<0.017		<0.017		<0.016		<0.016		0.0089	J	0.0037	J	<0.011		<0.014		<0.015		<0.015		0.603	NA	NA	NA	NA	NA	NA	0.4	0.04
4,4'-DDD	0.0090	J	0.016	J	<0.016		<0.016		0.0041	J	<0.014		<0.011		<0.014		<0.015		<0.015		3	NA	NA	NA	NA	NA	NA	24	3
4,4'-DDE	0.012	J	0.012	J	0.0033	J	0.0064	J	0.016		0.0056	J	<0.011		0.0054	J	<0.015		0.0063	J	2	NA	NA	NA	NA	NA	NA	17	2
Herbicides (mg/kg)																													
None detected																					NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs (mg/kg)																													
PCB-1254	0.065	J	<0.17		<0.16		<0.15		0.12	J	0.072	J	<0.11		<0.14		<0.14		0.066	J	1	NA	NA	NA	NA	NA	NA	1	1
Microbiological (CFU/g)																													
Fecal Coliform Bacteria	<18		<18		<18		<18		<14		<16		<13		<16		<14		<15		NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics (mg/kg)																													
Antimony	1.4	J F1	1.4	J	1.5	J	1.0	J	1.3	J	1.2	J	<1.3		1.0	J	0.91	J	1.2	J	5	NA	NA	NA	NA	NA	NA	82	31
Arsenic	5.9		5.9		14	1,4,7	4.7		7.7		6.6		3.9		5.4		13	1,4,7	6.7		11.3	NA	NA	13.0	NA	NA	11.3	61	750
Barium	120		120		160		98		120		100		41		90		81		120		1,500	NA	NA	NA	NA	NA	NA	14,000	5,500
Beryllium	0.91		1.0		1.2		0.77		0.97		0.90		0.29		0.73		0.72		0.93		22	NA	NA	NA	NA	NA	NA	410	160
Cadmium	2.1		2.1		3.0		1.3		5.1		2.2		0.25		1.6		0.55		2.7		5.2	NA	NA	NA	NA	NA	NA	200	78
Chromium	35	1	36	1	50	1	23	1	55	1	36	1	6.8		28	1	22	1	40	1	21	NA	NA	NA	NA	NA	NA	690	230
Cobalt	11		11		12		8.6		11		9.8		5.0		8.1		8.9		10		20	NA	NA	NA	NA	NA	NA	12,000	4,700
Copper	38		38		47		28		46		33		4.1		28		21		38		2,900	NA	NA	NA	NA	NA	NA	8,200	2,900
Iron	25000	B 1,4,7	24000	B 1,4,7	27000	B 1,4,7	19000	B 1,4,7	21000	B 1,4,7	21000	B 1,4,7	7800	B	19000	B 1,4,7	17000	B 1,4,7	22000	B 1,4,7	15,000	NA	NA	15,900	NA	NA	15,000	NA	NA
Lead	44		42		91		31		66		43		6.5		32		37		52		107	NA	NA	NA	NA	NA	NA	700	400
Manganese	540		600		430		550		530		480		340		460		420		520		630	NA	NA	636	NA	NA	630	4,100	1,600
Mercury	0.23	9	0.23	9	0.82	9	0.27	9	0.31	9	0.18	9	0.12	9	0.16	9	0.25	9	0.24	9	0.89	NA	NA	NA	NA	NA	NA	0.1	10
Nickel	33		32		41		24		62		40		8.9		28		23		46		100	NA	NA	NA	NA	NA	NA	4,100	1,600
Selenium	<0.96	F1	<0.98		0.76	J	<0.90		<0.77		<0.81		<0.65		<0.82		<0.85		<0.92		1.3	NA	NA	NA	NA	NA	NA	1,000	390
Silver	0.97		0.92		1.2		0.55		1.1		0.83		0.12	J	0.70		0.55		1.0		4.4	NA	NA	NA	NA	NA	NA	1,000	390
Thallium	0.93		0.72	J	0.98		0.76	J	0.86		0.95		0.39	J	0.91		0.78	J	0.95		2.6	NA	NA	NA	NA	NA	NA	160	6.3
Vanadium	26		29		27		17		27		28		9.4		23		24		28		550	NA	NA	NA	NA	NA	NA	1,400	550
Zinc	230		230		340		160		330		210		29		170		130		230		5,100	NA	NA	NA	NA	NA	NA	61,000	23,000
TCLP Metals (mg/L)																													
Antimony	<0.0060		<0.0060		<0.0060		<0.0060		<0.0060		<0.0060		<0.0060		<0.0060		<0.0060		<0.0060		--	--	--	--	--	--	--	--	0.006
Arsenic	0.021	J	0.021	J	0.15	10	0.014	J	0.063	10	0.033	J	0.015	J	0.018	J	0.097	10	0.028	J	--	--	--	--	--	--	--	--	0.05
Barium	0.70		0.63		0.73		0.65		0.35	J	0.58		0.66		0.57		0.80		0.60		--	--	--	--	--	--	--	--	2
Beryllium	<0.0040		<0.0040		<0.0040		<0.0040		<0.0040		<0.0040		<0.0040		<0.0040		<0.0040		<0.0040		--	--	--	--	--	--	--	--	0.004
Cadmium	0.0054	10	0.0032	J	<0.0050		0.0036	J	0.014	10	0.0096	10	<0.0050		<0.0050		<0.0050		<0.0050		--	--	--	--	--	--	--	--	0.005
Chromium	<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		--	--	--	--	--	--	--	--	0.1
Cobalt	0.030		0.024	J	0.042		0.027		0.044		0.039		0.024	J	0.022	J	0.042		0.032		--	--	--	--	--	--	--	--	1
Copper	<0.025		<0.025		<0.025		<0.025		<0.025		0.011	J	<0.025		<0.025		<0.025		<0.025		--	--	--	--	--	--	--	--	0.65
Iron	<0.40		<0.40		76	B 10	0.24	J B	0.27	J B	0.51	B	<0.40		1.3	B	20	B 10	18	B 10	--	--	--	--	--	--	--	--	5
Lead	0.0097	10	<0.0075		0.020	10	<0.0075		<0.0075		0.012	10	<0.0075		<0.0075		0.012	10	<0.0075		--	--	--	--	--	--	--	--	0.0075
Manganese	8.4	10	8.5	10	4.9	10	9.4	10	9.2	10	8.4	10	3.8	10	7.5	10	6.2	10	7.8	10	--	--	--	--	--	--	--	--	0.15
Mercury	<0.00020		<0.00020		<0.00020		<0.00020		<0.00020		<0.00020		<0.00020		<0.00020		<0.00020		<0.00020		--	--	--	--	--	--	--	--	0.002
Nickel	0.070		0.049		0.14	10	0.046		0.37	10	0.16	10	0.040		0.074		0.11	10	0.15	10	--	--	--	--	--	--	--	--	0.1
Selenium	<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		--	--	--	--	--	--	--	--	0.05
Silver	<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		--	--	--	--	--	--	--	--	0.05
Thallium	<0.0020		<0.0020		<0.0020		<0.0020		<0.0020		<0.0020		<0.0020		<0.0020		<0.0020		<0.0020		--	--	--	--	--	--	--	--	0.002
Vanadium	<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		--	--	--	--	--	--	--	--	0.049
Zinc	0.85		0.70		0.84		0.56		1.4		1.2		0.17	J	0.42	J	0.87		0.48	J	--	--	--	--	--	--	--	--	5
TCLP Metals (mg/L)																													
Arsenic	NA		NA		0.011	J	NA		0.011	J	NA		NA		NA		<0.050		NA		--	--	--	--	--	--	--	--	0.05
Cadmium	<0.0050		NA		NA		NA		<0.0050		<0.0050		NA		NA		NA		NA		--	--	--	--	--	--	--	--	0.005
Iron	NA		NA		12	10	NA		NA		NA		NA		NA		7.4	10	16	10	--	--	--	--	--	--	--	--	5
Lead	0.012	10	NA		0.036	10	NA		NA		0.012	10	NA		NA		0.015	10	NA		--	--	--	--	--	--	--	--	0.0075
Manganese	0.067	10	0.056	10	0.19	10	0.046	10	0.28	10	0.071	10	0.16	10	0.056	10	0.078	10	0.11	10	--	--	--	--	--	--	--	--	0.002
Nickel	NA		NA		0.014	J	NA		0.065		0.012	J	NA		NA		<0.025		0.025		--	--	--	--	--	--	--	--	0.1

Notes:

NA= Not available
ND= Not detected above laboratory reporting limit
NT= Not tested
mg/kg= Milligrams per kilogram
mg/L= Milligrams per liter
TCLP= Toxicity Characteristic Leaching Procedure
SPLP= Synthetic Precipitation Leaching Procedure
MAC= Maximum Allowable Concentrations of Chemical Constituents in Uncontaminated Soil Used as Fill Material at Regulated Fill Operations (35 Ill. Adm. Code 110. Subpart F).
TACO = Tiered Approach to Corrective Action Objectives

*= Laboratory Control Sample (LCS) or Laboratory Control Sample Duplicate (LCSD) is outside acceptance limits.
^= Instrument related QC is outside acceptance limits.
B= Compound was found in the blank and sample.
J= Result is less than the reporting limit but greater than or equal to the method detection limit, concentration reported as an approximate value.
F1= Matrix spike or matrix spike duplicate recovery is outside acceptance limits.
F2= Matrix spike or matrix spike duplicate relative percent difference exceeds control limits.
CCDD = Clean Construction Demolition Debris

Applicable Screening Criteria

[1] Exceeds the most stringent MAC value (35 IAC (1100.605(e))
[2] Exceeds the Chicago Corporate Limits MAC values
[3] Exceeds the Within a Populated Area in a MSA (excluding Chicago) MAC value
[4] Exceeds the Within a MSA County MAC value
[5] Exceeds the Within a Populated Area in a non-MSA County MAC value
[6] Exceeds the Outside a Populated Area MAC value
[7] Exceeds the Within a non-MSA County MAC value
[8] Exceeds the Most Stringent TACO Tier 1 Construction Worker Exposure Objective
[9] Exceeds the Most Stringent TACO Tier 1 Residential Objective
[10] Exceeds the TACO Tier 1 Soil to Groundwater TCLP/SPLP Objective

Unrestrictive- metals exceed Totals but not TCLP and SPLP; or metals exceed TCLP or SPLP but not both
CCDD Eligible- metals exceed TCLP and SPLP but not Totals
CCDD Eligible- VOCs or SVOCs exceedances; limited CCDD disposal availability
Greater than TACO Construction Worker Exposure Objectives
PID above background or pH outside of the acceptable range (6.25 to 9.0)

Figure 125. Table. Detected Soil Analytes and Comparison to Applicable Criteria (WOOD, 2022).

APPENDIX F: CENTENNIAL BRIDGE SUPPLEMENTS

In 2016, JACOBS Engineering, Inc. (JACOBS, 2016) performed subsurface investigation to support the scour evaluation for the Centennial Bridge, Rock Island, Illinois. Piers 2, 3, 4, and 5 (numbered from Illinois to Iowa) are located within and adjacent to the Mississippi River navigation channel. At each of these four piers, a boring was advanced through the bridge pier arch, and sampled the pier, footing, and seal concrete, and the underlying bedrock as shown in Figure 126. Additionally, split spoon samples of the Mississippi River bottom were collected within the top 4 ft adjacent to the piers. The distance between the boring through the pier and the boring adjacent to the pier are 40.4 ft, 99.7 ft, 121.7ft, and 89ft between C-2 and C-2-SS, C-3 and C-3-SS, C-4 and C-4-SS, and between C-5 and C-5-SS, respectively. C-2-SS boring didn't yield any sediment sample because the bedrock was exposed to the water. Sediment samples were taken adjacent to each pier using a split spoon sampler. In order to move the drilling rig into place, a 40-ft long by 30-ft wide barge plant composed of 4 sectional spud barges was assembled. Ramps were placed between the barge plant and pier to facilitate the movement of the D-25 drilling rig into place upon the pier arch. Soil samples were tested in Wang's laboratory for moisture content and grain size analysis (JACOBS, 2016).

Borings C-3-SS to C-5-SS sampled from the river bottom were found to be gravelly sand (IDOT Illinois Division of Highways (IDH) Classification). Silty loam was encountered underlying approximately 2 ft of gravelly sand in Boring C-5-SS at Pier 5. Limestone bedrock makes up the river bottom adjacent to Pier 2 (Boring C-2-SS). Within the medium dense brown and gray, gravelly sand, Wang measured SPT N-values of 13 to 20 blows/ft, and moisture content (*w*) values of 11 to 14%, averaging 13%. Within the medium dense, gray silty loam, the SPT N-values range from 11 and 13 blows/ft; the *w* values measured 11 to 13%. A summary of grain size analyses results for the structural sediments is presented in Table 43.

Table 43. Grain Size Analysis Test Results for Structural Sediment Samples (JACOBS, 2016).

Boring ID	Sample No.	Depth (ft)	Classification	Gravel %	Sand %	Silt %	Clay %	D95 (mm)	D90 (mm)	D84 (mm)	D50 (mm)
C-3-SS	1	22	Gravelly Sand	35.5	61.5	1.5	1.4	17.2	12.3	8.57	1.16
C-4-SS	1	12	Gravelly Sand	62.4	33.6	2	2	28.92	23.9	21.32	5.12
C-5-SS	1	14	Gravelly Sand	62.3	35.4	1.2	1.1	38.8	33.4	27.9	6.23
C-5-SS	2	16	Silty Loam	1.1	27.6	52.2	19.1	0.34	0.17	0.125	0.02

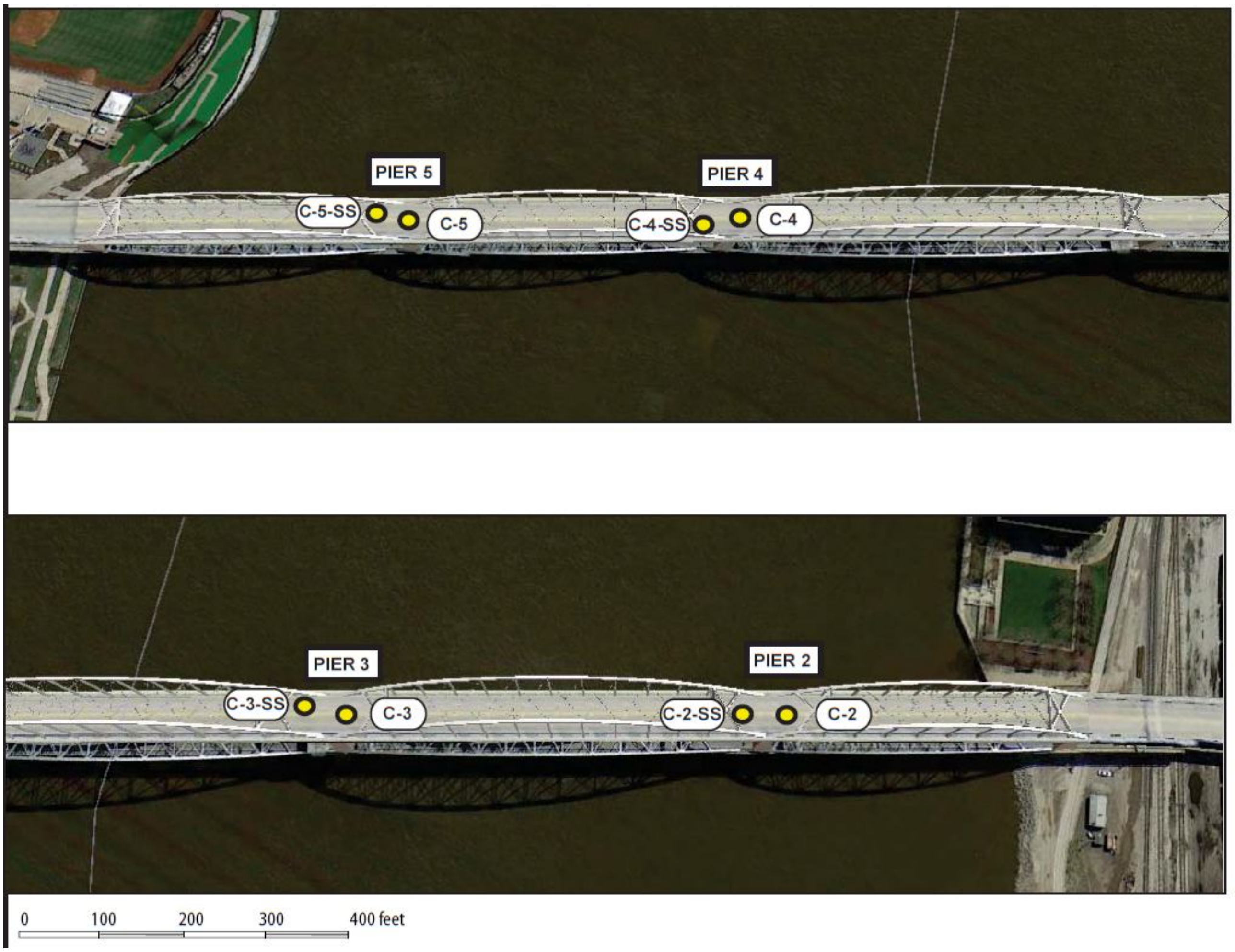
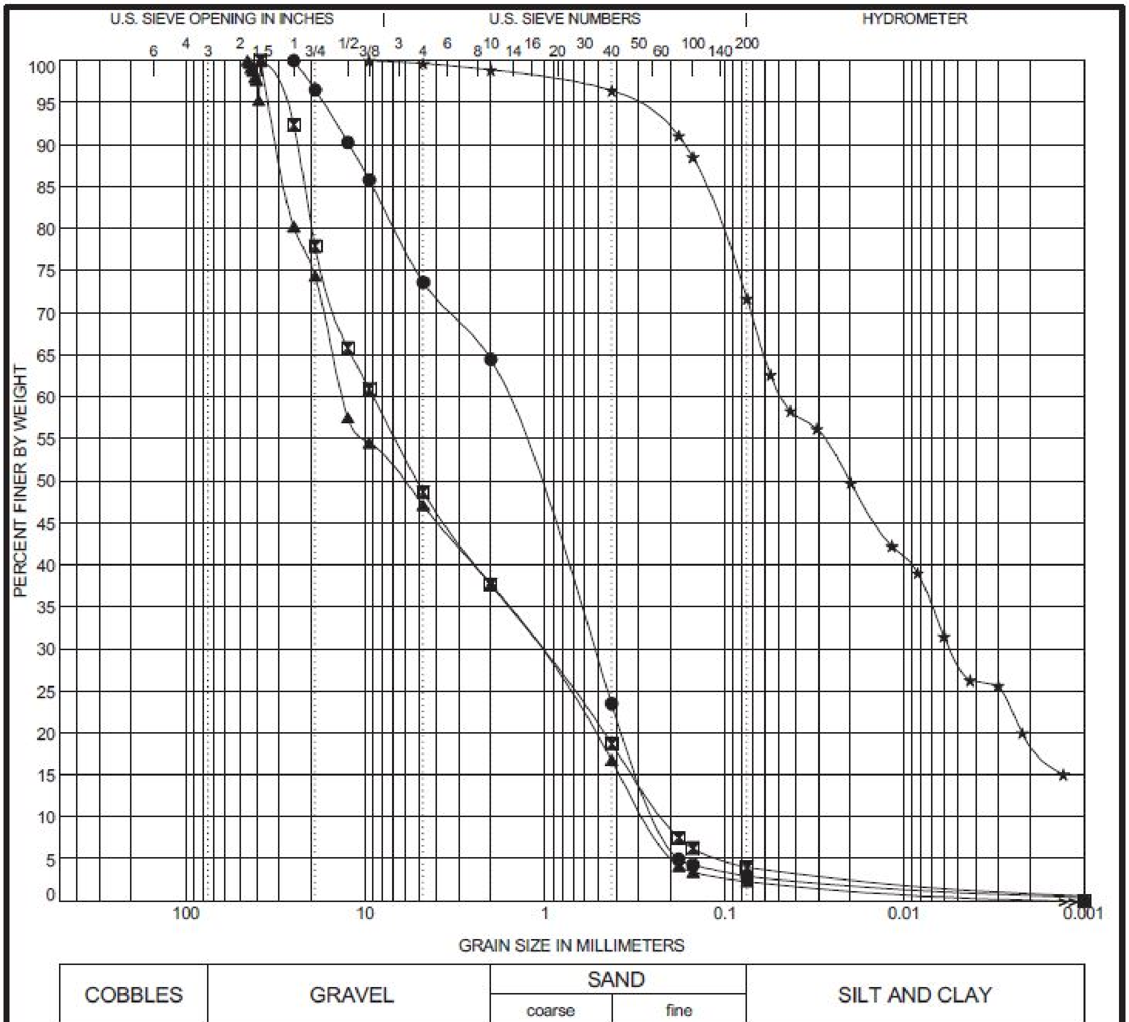


Figure 126. Arial Photo. Boring location plan for Centennial Bridge (JACOBS, 2016).

Grain Size Analysis

The grain size analysis was performed on C-3-SS through C-5-SS samples and the results are shown in Figure 127. C-5-SS is the only sample that is classified as silty loam and has a percent passing sieve #200 of 73% (more than 20%). The other three samples are classified as gravelly sand and has a percent passing through sieve #200 of less than 20% (ranges between ~2% to ~4%). However, there is no analytical data provided for the chemical analysis and contamination of C-3-SS through C-5-SS samples in the scour evaluation report for the Centennial Bridge. Therefore, the suggested 20% passing rule to determine contamination couldn't be verified. However, these gravelly sand samples obtained adjacent to the piers probably represent the pier filters or riprap material and not the river bottom sediments, where it is highly unlikely that dredging will occur within a very close distance from the piers.



	Specimen Identification		IDH Classification	LL	PL	PI	Cc	Cu
●	C-3-SS#1	22.0 ft	Gravelly Sand				0.77	7.43
⊠	C-4-SS#1	12.0 ft	Gravelly Sand				0.59	41.46
▲	C-5-SS#1	14.0 ft	Gravelly Sand				0.36	49.58
★	C-5-SS#2	16.0 ft	Silty Loam					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay
●	C-3-SS#1	22.0 ft	25	1.69	0.544	0.227	35.5	61.5	1.5	2.9	1.4
⊠	C-4-SS#1	12.0 ft	38.1	9.014	1.071	0.217	62.4	33.6	2.0	4.0	2.0
▲	C-5-SS#1	14.0 ft	45.1	13.296	1.131	0.268	62.3	35.4	1.2	2.3	1.1
★	C-5-SS#2	16.0 ft	9.5	0.047	0.005		1.1	27.6	52.2		19.1

WEI GRAIN SIZE IDH 2062601.GPJ US LAB.GDT 7/18/16

WEI
SINCE 1982

Wang Engineering, Inc.
1145 North Main Street
Lombard, IL
Telephone: 630-953-9928
Fax: 630-953-9938

GRAIN SIZE DISTRIBUTION

Project: Centennial Bridge

Location: Rock Island Township, Davenport East Quadrangle

Number: 206-26-01

Figure 127. Illustration. Grain size analysis for C-3-SS through C-5-SS (JACOBS, 2016).

In 2020, the Illinois Department of Transportation (IDOT) tasked Weston Solutions, Inc. (WESTON, 2020) with the review of several laboratory data packages from a sediment removal project in Centennial Bridge, Rock Island, Illinois. A total of 12 laboratory data packages were reviewed for this project, which included a total of 18 samples (but the location and depths of these samples are not know with reference to Centennial Bridge). The samples were analyzed by the Eurofins Test America Laboratory, located in Cedar Fall, Iowa. Table 44 presents the laboratory data package ID, the laboratory sample ID, the field sample ID, and the sample collection date. The recommended management approach for all of the 18 samples is under IDOT 669.05.a(5). Detection limits were found in excess of screening levels in each of the 18 samples evaluated. None of the detected constituent concentrations exceeded a screening level. Based on the inability of the laboratory to meet all of the regulatory screening levels, combined with the unknown nature of the excavated materials, led to the conclusion that all of this material was to be managed as a non-special waste, in accordance with Article 669.05.a(5) of the IDOT Standard Specifications (IDOT, 2022).

Figure 128 through Figure 135 present the analytical data of all the 18 sediment samples and compares the data against applicable screening levels. The screening criteria used include MAC and TACO. The screening level used for comparison is the most stringent of the SRO and the MAC Table values for each constituent. These figures identify detected analyte concentrations with a bold font and identify exceedances of a screening criteria with a yellow highlight. Only non-detect results are highlighted indicating the reported detection limits are greater than their respective screening levels.

Table 44. Summary of Centennial Sediment Data Evaluation (WESTON, 2020)

Laboratory Data Package	Lab Sample ID	Sample ID	Sample Date	Recommended Management Approach based on the Standard Specifications for Road and Bridge Construction (IDOT, 2022)
310-162124-2	310-162124-1	SP-1	8/9/2019	Sediment classified for management under 669.05.a(5)
310-162238-1	310-162238-2	SP-2	8/12/2019	Sediment classified for management under 669.05.a(5)
310-162562-1	310-162562-1	SP-3A	8/15/2019	Sediment classified for management under 669.05.a(5)
	310-162562-2	SP-3B	8/15/2019	Sediment classified for management under 669.05.a(5)
310-163689-1	310-163689-1	SP-4	8/29/2019	Sediment classified for management under 669.05.a(5)
310-164169-1	310-164169-1	SP-5A	9/5/2019	Sediment classified for management under 669.05.a(5)
	310-164169-2	SP-5B	9/5/2019	Sediment classified for management under 669.05.a(5)
310-164393-1	310-164393-1	SP-6A	9/9/2019	Sediment classified for management under 669.05.a(5)
	310-164393-2	SP-6B	9/9/2019	Sediment classified for management under 669.05.a(5)
310-165103-1	310-165103-1	SP-7A	9/17/2019	Sediment classified for management under 669.05.a(5)
	310-165103-2	SP-7B	9/17/2019	Sediment classified for management under 669.05.a(5)
	310-165103-3	SP-7C	9/17/2019	Sediment classified for management under 669.05.a(5)
310-165594-1	310-165594-1	SP-8	9/23/2019	Sediment classified for management under 669.05.a(5)
310-166371-1	310-166371-1	SP-9A	10/2/2019	Sediment classified for management under 669.05.a(5)
	310-166371-2	SP-9B	10/2/2019	Sediment classified for management under 669.05.a(5)
310-169705-1	310-169705-1	SP-10	11/11/2019	Sediment classified for management under 669.05.a(5)
310-170047-1	310-170047-1	SP-11	11/14/2019	Sediment classified for management under 669.05.a(5)
310-170223-1	310-170223-1	SP-12	11/18/2019	Sediment classified for management under 669.05.a(5)

IDOT 669-05 (a-5): When the Engineer determines soil cannot be managed according to Articles 699.05(a)(1) through (a)(4) of the Standard Specifications for Road and Bridge Construction (IDOT, 2022)and the materials do not contain special waste or hazardous waste, as determined by the Engineer, the soil shall be managed and disposed of at a landfill as a non-special waste (IDOT, 2022).

		Screening Level	IEPA Tier 1 Soil Remediation Objectives			MAC Table Values					
			Residential Properties		Soil Component of the Groundwater Ingestion Route		SP-1	SP-2	SP-3A	SP-3B	SP-4
CAS Number	Analytes		Ingestion	Inhalation	Class I		8-9-19	8-12-19	8/15/2019	8/15/2019	8/29/2019
VOCs (mg/kg)											
71-43-2	Benzene	0.03	12	0.8	0.03	0.03	<0.000253	<0.000190	<0.000233	<0.000221	<0.000191
108-88-3	Toluene	12	16,000	650	12	12	<0.000206	<0.000154	<0.000190	<0.000180	<0.000156
100-41-4	Ethylbenzene	13	7,800	400	13	13	<0.000211	<0.000159	<0.000195	<0.000185	<0.000160
1330-20-7	Xylenes (total)	5.6	16,000	320	150	5.6	<0.000593	<0.000445	<0.000548	<0.000520	<0.000450
1634-04-4	Methyl Tertiary-Butyl Ether	0.32	780	8,800	0.32	0.32	<0.000129	<0.0000970	<0.000119	<0.000113	<0.0000980
67-64-1	Acetone	25	70,000	100,000	25	25	<0.00402	<0.00302	**0.0364**	**0.0788**	**0.052**
75-27-4	Bromodichloromethane	0.6	10	3,000	0.6	0.6	<0.000229	<0.000172	<0.000212	<0.000201	<0.000174
75-25-2	Bromoform	0.8	81	53	0.8	0.8	<0.000129	<0.0000970	<0.000119	<0.000113	<0.0000980
74-83-9	Bromomethane	0.2	110	10	0.2	0.2	<0.000182	<0.000137	<0.000168	<0.000160	<0.000138
78-93-3	2-Butanone	17	---	---	---	17	<0.00379	<0.00285	<0.00350	<0.00333	<0.00288
75-15-0	Carbon Disulfide	9	7,800	720	32	9	<0.000206	<0.000154	<0.000190	<0.000180	<0.000156
56-23-5	Carbon Tetrachloride	0.07	5.0	0.3	0.07	0.07	<0.0000940	<0.0000705	<0.0000868	<0.0000824	<0.0000713
108-90-7	Chlorobenzene	1	1,600	130	1.0	1	<0.000176	<0.000132	<0.000163	<0.000155	<0.000134
75-00-3	Chloroethane	0	---	---	---		<0.000153	<0.000115	<0.000141	<0.000134	<0.000116
67-66-3	Chloroform	0.3	100	0.3	0.6	0.3	<0.000229	<0.000172	<0.000212	<0.000201	<0.000174
74-87-3	Chloromethane	0	---	---	---		<0.000112	<0.0000837	<0.000103	<0.0000979	<0.0000846
156-59-2	cis-1,2-Dichloroethene	0	780	1,200	0.4	0.4	<0.000159	<0.000119	<0.000146	<0.000139	<0.000120
124-48-1	Dibromochloromethane	0.4	1,600	1,300	0.4	0.4	<0.000129	<0.0000970	<0.000119	<0.000113	<0.0000980
75-34-3	1,1-Dichloroethane	23	7,800	1,300	23	23	<0.000159	<0.000119	<0.000146	<0.000139	<0.000120
107-06-2	1,2-Dichloroethane	0.02	7.0	0.4	0.02	0.02	<0.000182	<0.000137	<0.000168	<0.000160	<0.000138
75-35-4	1,1-Dichloroethene	0.06	3,900	290	0.06	0.06	<0.000112	<0.0000837	<0.000103	<0.0000979	<0.0000846
78-87-5	1,2-Dichloropropane	0.03	9.0	15	0.03	0.03	<0.000253	<0.000190	<0.000233	<0.000221	<0.000191
75-09-2	Methylene Chloride	0.02	85	13	0.02	0.02	<0.000188	<0.000141	<0.000174	<0.000165	<0.000143
100-42-5	Styrene	4	16,000	1,500	4.0	4	<0.0000646	<0.0000485	<0.0000597	<0.0000567	<0.0000490
79-34-5	1,1,2,2-Tetrachloroethane	0	---	---	---		<0.000112	<0.0000837	<0.000103	<0.0000979	<0.0000846
127-18-4	Tetrachloroethene	0.06	12	11	0.06	0.06	<0.000117	<0.0000881	<0.000109	<0.000103	<0.0000891
156-60-5	trans-1,2-Dichloroethene	0.7	1,600	3,100	0.7	0.7	<0.000112	<0.0000837	<0.000103	<0.0000979	<0.0000846
79-01-6	Trichloroethene	0.06	58	5.0	0.06	0.06	<0.000117	<0.0000881	<0.000109	<0.000103	<0.0000891
71-55-6	1,1,1-Trichloroethane	2	---	1,200	2.0	2	<0.000129	<0.0000970	<0.000119	<0.000113	<0.0000980
79-00-5	1,1,2-Trichloroethane	0.02	310	1,800	0.02	0.02	<0.000188	<0.000141	<0.000174	<0.000165	<0.000143
75-01-4	Vinyl Chloride	0.01	0.46	0.28	0.01	0.01	<0.000170	<0.000128	<0.000157	<0.000149	<0.000129
SVOCs (mg/kg)		0									
83-32-9	Acenaphthene	570	4,700	---	570	570	<0.392	<0.0787	<0.0751	<0.388	<0.384
208-96-8	Acenaphthylene	0	---	---	---		<0.356	<0.0716	<0.0683	<0.353	<0.349
120-12-7	Anthracene	12000	23,000	---	12,000	12000	<0.402	<0.0808	<0.0770	<0.398	<0.394
56-55-3	Benzo(a)anthracene	0.9	0.9	---	2.0	0.9	<0.407	<0.0818	<0.0780	<0.403	<0.399
50-32-8	Benzo(a)pyrene	0.1	0.09	---	8.0	0.09	<0.499	<0.100	<0.0956	<0.494	<0.489
205-99-2	Benzo(b)fluoranthene	0.9	0.9	---	5.0	0.9	<0.392	<0.0787	<0.0751	<0.388	<0.384
191-24-2	Benzo(g,h,i)perylene	0	---	---	---		<0.473	<0.0951	<0.0907	<0.468	<0.464
207-08-9	Benzo(k)fluoranthene	9	9.0	---	49	9	<0.443	<0.0890	<0.0848	<0.438	<0.434
218-01-9	Chrysene	88	88	---	160	88	<0.427	<0.0859	<0.0819	<0.423	<0.419
53-70-3	Dibenzo(a,h)anthracene	0.09	0.09	---	2.0	0.09	<0.371	<0.0747	<0.0712	<0.368	<0.364
206-44-0	Fluoranthene	3100	3,100	---	4,300	3100	<0.371	<0.0747	<0.0712	<0.368	<0.364
86-73-7	Fluorene	560	3,100	---	560	560	<0.371	<0.0747	<0.0712	<0.368	<0.364
193-39-5	Indeno(1,2,3-c,d)pyrene	0.9	0.9	---	14	0.9	<0.402	<0.0808	<0.0770	<0.398	<0.394
91-20-3	Naphthalene	1.8	1,600	170	12	1.8	<0.382	<0.0767	<0.0731	<0.378	<0.374
85-01-8	Phenanthrene	0	---	---	---		<0.377	<0.0757	<0.0722	<0.373	<0.369
129-00-0	Pyrene	2300	2,300	---	4,200	2300	<0.422	<0.0849	<0.0809	<0.418	<0.414
111-91-1	bis(2-Chloroethoxy) methane	0	---	---	---		<0.346	<0.0695	<0.0663	<0.342	<0.339
111-44-4	bis(2-Chloroethyl) ether	0.66	*0.66*	*0.66*	*0.66*	0.66	<0.326	<0.0654	<0.0624	<0.322	<0.319
117-81-7	bis(2-Ethylhexyl)phthalate	46	46	31,000	3,600	46	<0.509	<0.102	<0.0975	<0.504	<0.499
101-55-3	4-Bromophenyl-phenyl ether	0	---	---	---		<0.483	<0.0972	<0.0926	<0.478	<0.474
85-68-7	Butylbenzylphthalate	930	16,000	930	930	930	<0.560	<0.112	<0.107	<0.554	<0.549
86-74-8	Carbazole	0.6	32	---	0.6	0.6	<0.438	<0.0879	<0.0839	<0.433	<0.429
106-47-8	4-Chloroaniline	0.7	310	---	0.7	0.7	<0.488	<0.0982	<0.0936	<0.483	<0.479
91-58-7	2-Chloro--phthalene	0	---	---	---		<0.382	<0.0767	<0.0731	<0.378	<0.374
59-50-7	4-Chloro-3-methylphenol	0	---	---	---		<0.432	<0.0869	<0.0829	<0.428	<0.424
95-57-8	2-Chlorophenol	1.5	390	53,000	4.0	1.5	<0.438	<0.0879	<0.0839	<0.433	<0.429
7005-72-3	4-Chlorophenyl-phenyl ether	0	---	---	---		<0.427	<0.0859	<0.0819	<0.423	<0.419
132-64-9	Dibenzofuran	0	---	---	---		<0.468	<0.0941	<0.0897	<0.463	<0.459
95-50-1	1,2-Dichlorobenzene	17	7,000	560	17	17	<0.351	<0.0706	<0.000179	<0.000170	<0.000147
541-73-1	1,3-Dichlorobenzene	0	---	---	---		<0.000164	<0.0747	<0.000152	<0.368	<0.364
106-46-7	1,4-Dichlorobenzene	2	---	11,000	2.0	2	<0.000182	<0.000137	<0.000168	<0.322	<0.319
91-94-1	3,3'-Dichlorobenzidine	1.3	*1.3*	---	*1.3*	1.3	<0.814	<0.164	<0.156	<0.806	<0.798
120-83-2	2,4-Dichlorophenol	0.48	230	---	1.0	0.48	<0.458	<0.0920	<0.0878	<0.453	<0.449
84-66-2	Diethylphthalate	470	63,000	2,000	470	470	<0.478	<0.0961	<0.0917	<0.473	<0.469
131-11-3	Dimethylphthalate	0	---	---	---		<0.407	<0.0818	<0.0780	<0.403	<0.399
84-74-2	Di-n-butylphthalate	2300	7,800	2,300	2,300	2300	<0.499	<0.100	<0.0956	<0.494	<0.489
105-67-9	2,4-Dimethylphenol	9	1,600	---	9.0	9	<0.417	<0.0839	<0.0800	<0.413	<0.409
534-52-1	4,6-Dinitro-2-methylphenol	0	---	---	---		<0.865	<0.174	<0.166	<0.856	<0.848
51-28-5	2,4-Dinitrophenol	3.3	160	---	*3.3*	3.3	<0.967	<0.194	<0.185	<0.957	<0.948
121-14-2	2,4-Dinitrotoluene	0.25	0.9	---	*0.25*	0.25	<0.392	<0.0787	<0.0751	<0.388	<0.384
606-20-2	2,6-dinitrotoluene	0.26	0.9	---	*0.26*	0.26	<0.438	<0.0879	<0.0839	<0.433	<0.429
117-84-0	Di-n-octylphthalate	1600	1,600	10,000	10,000	1600	<0.560	<0.112	<0.107	<0.554	<0.549
118-74-1	Hexachlorobenzene	0.4	0.4	1.0	2.0	0.4	<0.422	<0.0849	<0.0809	<0.418	<0.414
87-68-3	Hexachlorobutadiene	0	---	---	---		<0.000229	<0.0736	<0.0702	<0.000201	<0.359
77-47-4	Hexachlorocyclopentadiene	1.1	550	10	400	1.1	<0.285	<0.0573	<0.0546	<0.282	<0.279
67-72-1	Hexachloroethane	0.5	78	---	0.5	0.5	<0.300	<0.0603	<0.0575	<0.297	<0.294
78-59-1	Isophorone	8	15,600	4,600	8.0	8	<0.412	<0.0828	<0.0790	<0.408	<0.404
91-57-6	2-Methylnaphthalene	0	---	---	---	---	<0.346	<0.0695	<0.0663	<0.342	<0.339
95-48-7	2-Methylphenol	15	3900	---	15	15	<0.453	<0.0910	<0.0868	<0.448	<0.444
106-44-5	4-Methylphenol	0	---	---	---		<0.509	<0.102	<0.0975	<0.504	<0.499
88-74-4	2-Nitroaniline	0	---	---	---		<0.377	<0.0757	<0.0722	<0.373	<0.369
99-09-2	3-Nitroanaline	0	---	---	---		<0.361	<0.0726	<0.0692	<0.358	<0.354
100-01-6	4-Nitroaniline	0	---	---	---		<0.366	<0.0736	<0.0702	<0.363	<0.359
98-95-3	Nitrobenzene	0.26	39	92	*0.26*	0.26	<0.295	<0.0593	<0.0566	<0.292	<0.289
88-75-5	2-Nitrophenol	0	---	---	---		<0.422	<0.0849	<0.0809	<0.418	<0.414
100-02-7	4-Nitrophenol	0	---	---	---		<0.356	<0.0716	<0.0683	<0.353	<0.349
621-64-7	N-Nitroso-di-n-propylamine	0.0018	0.09	---	*0.0018*	0.0018	<0.366	<0.0736	<0.0702	<0.363	<0.359
86-30-6	N-nitrosodiphenylamine	1	130	---	1.0	1	<0.432	<0.0869	<0.0829	<0.428	<0.424
108-60-1	2,2'-oxybis (1-chloropropane)	0	---	---	---		<0.377	<0.0757	<0.0722	<0.373	<0.369
87-86-5	Pentachlorophenol	0.02	3.0	---	0.03	0.02	<0.763	<0.153	<0.146	<0.755	<0.749
108-95-2	Phenol	100	23,000	---	100	100	<0.412	<0.0828	<0.0790	<0.408	<0.404
120-82-1	1,2,4-Trichlorobenzene	5	780	3,200	5.0	5	<0.000511	<0.0798	<0.000472	<0.393	<0.389
95-95-4	2,4,5-Trichlorophenol	26	7,800	---	270	26	<0.397	<0.0798	<0.0761	<0.393	<0.389
88-06-2	2,4,6-Trichlorophenol	0.66	58	200	*0.66*	0.66	<0.427	<0.0859	<0.0819	<0.423	<0.419

Figure 128. Table. Comparison of analytical data to screening levels (sheet# 1) (WESTON, 2020).

			IEPA Tier 1 Soil Remediation Objectives								
CAS Number	Analytes	Screening Level	Residential Properties		Soil Component of the Groundwater Ingestion Route	MAC Table Values	SP-1	SP-2	SP-3A	SP-3B	SP-4
			Ingestion	Inhalation	Class I		8-9-19	8-12-19	8/15/2019	8/15/2019	8/29/2019
Pesticides and PCBs (mg/kg)		0									
309-00-2	Aldrin	0.94	*0.94*	3.0	*0.94*	0.94	<0.000256	<0.000245	<0.000248	<0.000255	<0.000252
319-84-6	alpha-BHC	0.0074	0.1	0.8	*0.0074*	0.0074	**0.000381**	<0.000167	<0.000169	<0.000174	<0.000171
319-85-7	beta-BHC	0	—	—	—		<0.000328	<0.000315	<0.000318	<0.000327	<0.000323
319-86-8	delta-BHC	0	—	—	—		<0.000236	**0.00103**	<0.000228	<0.000235	<0.000232
60-57-1	Dieldrin	0.603	*0.603*	1.0	*0.603*	0.603	**0.000138**	<0.000118	<0.000119	<0.000123	<0.000121
72-54-8	4,4'-DDD	3	3	—	16	3	<0.000133	<0.000128	<0.000129	<0.000133	<0.000131
72-55-9	4,4'-DDE	2	2	—	54	2	<0.000195	<0.000187	<0.000189	<0.000194	<0.000192
50-29-3	4,4'-DDT	2	2	—	32	2	<0.000123	<0.000118	<0.000119	**0.00017**	<0.000121
959-98-8	Endosulfan I	0	—	—	—		<0.000184	<0.000177	<0.000179	<0.000184	<0.000181
33213-65-9	Endosulfan II	0	—	—	—		<0.000184	<0.000177	<0.000179	<0.000184	<0.000181
1031-07-8	Endosulfan sulfate	0	—	—	—		<0.000205	<0.000197	<0.000199	<0.000204	<0.000202
72-20-8	Endrin	1	23	—	1.0	1	<0.000195	<0.000187	<0.000189	<0.000194	<0.000192
7421-93-4	Endrin aldehyde	0	—	—	—		<0.000492	<0.000472	<0.000477	<0.000490	<0.000484
58-89-9	gamma-BHC	0.009	0.5	—	0.009	0.009	<0.000102	<0.0000983	<0.0000993	<0.000102	<0.000101
76-44-8	Heptachlor	0.871	*0.871*	*0.871*	23	0.871	<0.000143	<0.000138	<0.000139	<0.000143	<0.000141
1024-57-3	Heptachlor epoxide	1.005	*1.005*	5.0	*1.005*	1.005	<0.000205	<0.000197	<0.000199	<0.000204	<0.000202
72-43-5	Methoxychlor	160	390	—	160	160	<0.000328	<0.000315	<0.000318	<0.000327	<0.000323
8001-35-2	Toxaphene	0.6	0.6	89	31	0.6	<0.00533	<0.00511	<0.00517	<0.00531	<0.00524
12674-11-2	Aroclor - 1016	0	—	—	—		<0.00607	<0.00604	<0.00611	<0.00610	<0.00607
11104-28-2	Aroclor - 1221	0	—	—	—		<0.00607	<0.00604	<0.00611	<0.00610	<0.00607
11141-16-5	Aroclor - 1232	0	—	—	—		<0.00607	<0.00604	<0.00611	<0.00610	<0.00607
53469-21-9	Aroclor - 1242	0	—	—	—		<0.00607	<0.00604	<0.00611	<0.00610	<0.00607
12672-29-6	Aroclor - 1248	0	—	—	—		<0.00778	<0.00775	<0.00784	<0.00782	<0.00779
11097-69-1	Aroclor - 1254	0	—	—	—		<0.00778	<0.00775	<0.00784	<0.00782	<0.00779
11096-82-5	Aroclor - 1260	0	—	—	—		<0.00778	<0.00775	<0.00784	<0.00782	<0.00779
1336-36-3	PCBs	1	1.0	—	—	1	<0.00778	<0.00775	<0.00784	<0.00782	<0.00779
Total Metals (mg/kg)		0									
7440-38-2	Arsenic	11.3	13	750	—	11.3	**1.02**	**1.17**	**1.15**	**2.3**	**1.19**
7440-39-3	Barium	1500	5,500	690,000	—	1500	**17.1**	**13.6**	**17.1**	**19.4**	**11.2**
7440-43-9	Cadmium	5.2	78	1,800	—	5.2	<0.0357	**0.0625**	**0.0718**	**0.101**	**0.0677**
7440-47-3	Chromium, total	21	230	270	—	21	**6.02**	**3.79**	**4.31**	**12.2**	**3.96**
16065-83-1	Chromium, ion, trivalent	120000	120,000	—	—	—					
18540-29-9	Chromium, ion, hexavalent	230	230	270	—	—					
7439-92-1	Lead	107	400	—	—	107	**1.53**	**1.59**	**2.61**	**2.31**	**0.992**
7439-97-6	Mercury	0.89	23	10	—	0.89	<0.00573	<0.00525	<0.00569	<0.00586	<0.00571
7782-49-2	Selenium	1.3	390	—	—	1.3	<0.584	<0.512	<0.551	<0.548	<0.550
7440-22-4	Silver	4.4	390	—	—	4.4	**1.1**	**1.43**	**0.958**	**1.25**	**0.522**
TCLP Analyses (mg/l)		0									
7440-38-2-1	Arsenic	0.05	—	—	0.05		<0.0390	<0.0390	<0.0390	<0.0390	<0.0390
7440-39-3-1	Barium	2	—	—	2.0		**0.396**	**0.365**	**0.458**	**0.373**	**0.317**
7440-43-9-1	Cadmium	0.005	—	—	0.005		<0.00390	<0.00390	<0.00390	<0.00390	<0.00390
7440-47-3-1	Chromium, total	0.1	—	—	0.1		<0.00640	<0.00640	<0.00640	<0.00640	<0.00640
16065-83-1	Chromium, ion, trivalent	0	—	—	—						
18540-29-9	Chromium, ion, hexavalent	0	—	—	—						
7439-92-1-1	Lead	0.0075	—	—	0.0075		<0.0310	<0.0310	<0.0310	<0.0310	<0.0310
7439-97-6-1	Mercury	0.002	—	—	0.002		<0.00110	<0.00110	<0.00110	<0.00110	<0.00110
7782-49-2-1	Selenium	0.05	—	—	0.05		<0.0630	<0.0630	<0.0630	<0.0630	<0.0630
7440-22-4-1	Silver	0.05	—	—	0.05		<0.00810	<0.00810	<0.00810	<0.00810	<0.00810
71-43-2	Benzene	0	—	—	—		<0.0140	<0.0140	<0.0140	<0.0140	<0.0140
56-23-5	Carbon Tetrachloride	0	—	—	—		<0.0130	<0.0130	<0.0130	<0.0130	<0.0130
108-90-7	Chlorobenzene	0	—	—	—		<0.0120	<0.0120	**0.0123**	<0.0120	<0.0120
67-66-3	Chloroform	0	—	—	—		<0.0360	<0.0360	<0.0360	<0.0360	<0.0360
95-48-7	o-Cresol	0	—	—	—		<0.00760	<0.00760	<0.00760	<0.00760	<0.00760
106-44-5	p-Cresol	0	—	—	—		<0.00170	<0.00170	<0.00170	<0.00170	<0.00170
	Cresol	0	—	—	—		<0.00760	<0.00760	<0.00760	<0.00760	<0.00760
106-46-7	1,4-Dichlorobenzene	0	—	—	—		<0.00490	<0.00490	<0.00490	<0.00490	<0.00490
107-06-2	1,2-Dichloroethane	0	—	—	—		<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
75-35-4	1,1-Dichloroethylene	0	—	—	—		<0.0110	<0.0110	<0.0110	<0.0110	<0.0110
121-14-2	2,4-Dinitrotoluene	0	—	—	—		<0.00430	<0.00430	<0.00430	<0.00430	<0.00430
118-74-1	Hexachlorobenzene	0	—	—	—		<0.00190	<0.00190	<0.00190	<0.00190	<0.00190
87-68-3	Hexachlorobutadiene	0	—	—	—		<0.00250	<0.00250	<0.00250	<0.00250	<0.00250
67-72-1	Hexachloroethane	0	—	—	—		<0.00360	<0.00360	<0.00360	<0.00360	<0.00360
78-93-3	Methyl ethyl Ketone	0	—	—	—		<1.50	<1.50	<1.50	<1.50	<1.50
98-95-3	Nitrobenzene	0	—	—	—		<0.00240	<0.00240	<0.00240	<0.00240	<0.00240
87-86-5	Pentachlorophenol	0	—	—	—		<0.0210	<0.0210	<0.0210	<0.0210	<0.0210
110-86-1	Pyridine	0	—	—	—		<0.00410	<0.00410	<0.00410	<0.00410	<0.00410
127-18-4	Tetrachloroethylene	0	—	—	—		<0.0870	<0.0870	<0.0870	<0.0870	<0.0870
79-01-6	Trichloroethylene	0	—	—	—		<0.0820	<0.0820	<0.0820	<0.0820	<0.0820
95-95-4	2,4,5-Trichlorophenol	0	—	—	—		<0.00310	<0.00310	<0.00310	<0.00310	<0.00310
88-06-2	2,4,6-Trichlorophenol	0	—	—	—		<0.00270	<0.00270	<0.00270	<0.00270	<0.00270
75-01-4	Vinyl Chloride	0	—	—	—		<0.0190	<0.0190	<0.0190	<0.0190	<0.0190
Herbicides (mg/kg)		0									
93-76-5	2,4,5-T	0	—	—	—		<0.0821	<0.0827	<0.0823	<0.0815	<0.0832
93-72-1	2,4,5-TP (Silvex)	11	630	—	11	11	<0.0865	<0.0872	<0.0867	<0.0858	<0.0876
94-75-7	2,4-D	1.5	780	—	1.5	1.5	<0.0955	<0.0962	<0.0957	<0.0947	<0.0967
Other		0									
	pH (SU)	0	—	—	—		**8.9**	**8.8**	**8.8**	**8.7**	**6.9**
	Flashpoint (F°)	0	—	—	—		<215	<215	<215	<215	>215
	Paint Filter	0	—	—	—		Pass	Pass	Pass	Pass	**Pass**

Notes:
CAS = Chemical Abstract Service
VOCs = volatile organic compounds
SVOC - semivolatile organic compounds
PCBs = polychlorinated biphenyls
TCLP = toxicity characteristic leaching procedure
mg/kg = milligrams per kilogram
mg/L = milligrams per Liter
SU = Standard units
F° = degrees Fahrenheit
BOLD = constituents detected above the method detection limit
Screening level is the minimum of the Residential and Soil component of the groundwater ingestion exposure route values.
= Exceedance of Screening Level

Figure 129. Table. Comparison of analytical data to screening levels (sheet# 2) (WESTON, 2020).

			IEPA Tier 1 Soil Remediation Objectives								
CAS Number	Analytes	Screening Level	Residential Properties		Soil Component of the Groundwater Ingestion Route	MAC Table Values	SP-5A	SP-5B	SP-6A	SP-6B	SP-7A
			Ingestion	Inhalation	Class I		9/5/2019	9/5/2019	9/9/2019	9/9/2019	9/17/2019
VOCs (mg/kg)											
71-43-2	Benzene	0.03	12	0.6	0.03	0.03	<0.000304	<0.000177	**0.000229**	<0.000232	<0.000190
108-88-3	Toluene	12	16,000	650	12	12	<0.000247	<0.000144	<0.000157	<0.000189	<0.000154
100-41-4	Ethylbenzene	13	7,800	400	13	13	<0.000254	<0.000148	**0.000216**	<0.000194	<0.000159
1330-20-7	Xylenes (total)	5.6	16,000	320	150	5.6	<0.000714	<0.000416	<0.000454	<0.000544	<0.000446
1634-04-4	Methyl Tertiary-Butyl Ether	0.32	780	8,800	0.32	0.32	<0.000155	<0.0000907	<0.0000989	<0.000119	<0.0000971
67-64-1	Acetone	25	70,000	100,000	25	25	**0.00783**	**0.0674**	<0.00308	**0.0231**	**0.011**
75-27-4	Bromodichloromethane	0.6	10	3,000	0.6	0.6	<0.000276	<0.000161	<0.000175	<0.000210	<0.000172
75-25-2	Bromoform	0.8	81	53	0.8	0.8	<0.000155	<0.0000907	<0.0000989	<0.000119	<0.0000971
74-83-9	Bromomethane	0.2	110	10	0.2	0.2	<0.000219	<0.000128	<0.000139	<0.000167	<0.000137
78-93-3	2-Butanone	17	—	—	—	17	<0.00457	<0.00266	<0.00290	<0.00348	<0.00285
75-15-0	Carbon Disulfide	9	7,800	720	32	9	<0.000247	**0.000839**	<0.000157	<0.000189	<0.000154
56-23-5	Carbon Tetrachloride	0.07	5.0	0.3	0.07	0.07	<0.000113	<0.0000660	**0.000132**	<0.0000862	<0.0000706
108-90-7	Chlorobenzene	1	1,600	130	1.0	1	<0.000212	<0.000124	**0.00019**	<0.000162	<0.000132
75-00-3	Chloroethane	0	—	—	—		<0.000184	<0.000107	<0.000117	<0.000140	<0.000115
67-66-3	Chloroform	0.3	100	0.3	0.6	0.3	<0.000276	<0.000161	**0.000294**	**0.000227**	<0.000172
74-87-3	Chloromethane	0	—	—	—		<0.000134	<0.0000784	<0.0000854	<0.000102	<0.0000838
156-59-2	cis-1,2-Dichloroethene	0	780	1,200	0.4	0.4	<0.000191	<0.000111	<0.000121	<0.000145	<0.000119
124-48-1	Dibromochloromethane	0.4	1,600	1,300	0.4	0.4	<0.000155	<0.0000907	<0.0000989	<0.000119	<0.0000971
75-34-3	1,1-Dichloroethane	23	7,800	1,300	23	23	<0.000191	<0.000111	<0.000121	<0.000145	<0.000119
107-06-2	1,2-Dichloroethane	0.02	7.0	0.4	0.02	0.02	<0.000219	<0.000128	<0.000139	<0.000167	<0.000137
75-35-4	1,1-Dichloroethene	0.06	3,900	290	0.06	0.06	<0.000134	<0.0000784	<0.0000854	<0.000102	<0.0000838
78-87-5	1,2-Dichloropropane	0.03	9.0	15	0.03	0.03	<0.000304	<0.000177	<0.000193	<0.000232	<0.000190
75-09-2	Methylene Chloride	0.02	85	13	0.02	0.02	<0.000226	<0.000132	<0.000144	<0.000172	<0.000141
100-42-5	Styrene	4	16,000	1,500	4.0	4	<0.0000777	<0.0000454	**0.000123**	<0.0000593	<0.0000485
79-34-5	1,1,2,2-Tetrachloroethane	0	—	—	—		<0.000134	<0.0000784	<0.0000854	<0.000102	<0.0000838
127-18-4	Tetrachloroethene	0.06	12	11	0.06	0.06	<0.000141	<0.0000825	**0.000214**	<0.000108	<0.0000883
156-60-5	trans-1,2-Dichloroethene	0.7	1,600	3,100	0.7	0.7	<0.000134	<0.0000784	**0.000137**	<0.000102	<0.0000838
79-01-6	Trichloroethene	0.06	58	5.0	0.06	0.06	<0.000141	<0.0000825	<0.0000899	<0.000108	<0.0000883
71-55-6	1,1,1-Trichloroethane	2	—	1,200	2.0	2	<0.000155	<0.0000907	<0.0000989	<0.000119	<0.0000971
79-00-5	1,1,2-Trichloroethane	0.02	310	1,800	0.02	0.02	<0.000226	<0.000132	<0.000144	<0.000172	<0.000141
75-01-4	Vinyl Chloride	0.01	0.46	0.28	0.01	0.01	<0.000205	<0.000120	<0.000130	<0.000156	<0.000128
SVOCs (mg/kg)		0									
83-32-9	Acenaphthene	570	4,700	—	570	570	<0.439	<0.0782	<0.0763	<0.0813	<0.404
208-96-8	Acenaphthylene	0	—	—	—		<0.399	<0.0711	<0.0694	<0.0739	<0.367
120-12-7	Anthracene	12000	23,000	—	12,000	12000	<0.450	<0.0803	<0.0783	<0.0834	<0.414
56-55-3	Benzo(a)anthracene	0.9	0.9	—	2.0	0.9	<0.456	<0.0813	<0.0793	<0.0844	<0.419
50-32-8	Benzo(a)pyrene	0.1	0.09	—	8.0	0.09	<0.558	<0.0996	<0.0971	<0.103	<0.514
205-99-2	Benzo(b)fluoranthene	0.9	0.9	—	5.0	0.9	<0.439	<0.0782	<0.0763	<0.0813	<0.404
191-24-2	Benzo(g,h,i)perylene	0	—	—	—		<0.530	<0.0945	<0.0921	<0.0982	<0.487
207-08-9	Benzo(k)fluoranthene	9	9.0	—	49	9	<0.496	<0.0884	<0.0862	<0.0918	<0.456
218-01-9	Chrysene	88	88	—	160	88	<0.479	<0.0853	<0.0832	<0.0887	<0.440
53-70-3	Dibenzo(a,h)anthracene	0.09	0.09	—	2.0	0.09	<0.416	<0.0742	<0.0723	<0.0771	<0.383
206-44-0	Fluoranthene	3100	3,100	—	4,300	3100	<0.416	<0.0742	<0.0723	<0.0771	<0.383
86-73-7	Fluorene	560	3,100	—	560	560	<0.416	<0.0742	<0.0723	<0.0771	<0.383
193-39-5	Indeno(1,2,3-c,d)pyrene	0.9	0.9	—	14	0.9	<0.450	<0.0803	<0.0783	<0.0834	<0.414
91-20-3	Naphthalene	1.8	1,600	170	12	1.8	<0.427	<0.0762	<0.0743	<0.0000754	<0.0000618
85-01-8	Phenanthrene	0	—	—	—		<0.422	<0.0752	<0.0733	<0.0781	<0.388
129-00-0	Pyrene	2300	2,300	—	4,200	2300	<0.473	<0.0843	<0.0822	<0.0876	<0.435
111-91-1	bis(2-Chloroethoxy) methane	0	—	—	—		<0.388	<0.0691	<0.0674	<0.0718	<0.356
111-44-4	bis(2-Chloroethyl) ether	0.66	*0.66*	*0.66*	*0.66*	0.66	<0.365	<0.0650	<0.0634	<0.0676	<0.335
117-81-7	bis(2-Ethylhexyl)phthalate	46	46	31,000	3,600	46	<0.570	<0.102	<0.0991	<0.106	<0.524
101-55-3	4-Bromophenyl-phenyl ether	0	—	—	—		<0.541	<0.0965	<0.0941	<0.100	<0.498
85-68-7	Butylbenzylphthalate	930	16,000	930	930	930	<0.627	<0.112	<0.109	<0.116	<0.576
86-74-8	Carbazole	0.6	32	—	0.6	0.6	<0.490	<0.0874	<0.0852	<0.0908	<0.451
106-47-8	4-Chloroaniline	0.7	310	—	0.7	0.7	<0.547	<0.0975	<0.0951	<0.101	<0.503
91-58-7	2-Chloro--phthalene	0	—	—	—		<0.427	<0.0762	<0.0743	<0.0792	<0.393
59-50-7	4-Chloro-3-methylphenol	0	—	—	—		<0.484	<0.0864	<0.0842	<0.0897	<0.445
95-57-8	2-Chlorophenol	1.5	390	53,000	4.0	1.5	<0.490	<0.0874	<0.0852	<0.0908	<0.451
7005-72-3	4-Chlorophenyl-phenyl ether	0	—	—	—		<0.479	<0.0853	<0.0832	<0.0887	<0.440
132-64-9	Dibenzofuran	0	—	—	—		<0.524	<0.0935	<0.0911	<0.0971	<0.482
95-50-1	1,2-Dichlorobenzene	17	7,000	560	17	17	<0.393	<0.000136	<0.0684	<0.0728	<0.362
541-73-1	1,3-Dichlorobenzene	0	—	—	—		<0.000198	<0.000115	**0.000204**	<0.000151	<0.000124
106-46-7	1,4-Dichlorobenzene	2	—	11,000	2.0	2	<0.365	<0.000128	<0.0634	<0.000167	<0.335
91-94-1	3,3'-Dichlorobenzidine	1.3	*1.3*	—	*1.3*	1.3	<0.912	<0.163	<0.159	<0.169	<0.838
120-83-2	2,4-Dichlorophenol	0.48	230	—	1.0	0.48	<0.513	<0.0914	<0.0892	<0.0950	<0.472
84-66-2	Diethylphthalate	470	63,000	2,000	470	470	<0.536	<0.0955	<0.0931	<0.0992	<0.493
131-11-3	Dimethylphthalate	0	—	—	—		<0.456	<0.0813	<0.0793	<0.0844	<0.419
84-74-2	Di-n-butylphthalate	2300	7,800	2,300	2,300	2300	<0.558	<0.0996	<0.0971	<0.103	<0.514
105-67-9	2,4-Dimethylphenol	9	1,600	—	9.0	9	<0.467	<0.0833	<0.0812	<0.0866	<0.430
534-52-1	4,6-Dinitro-2-methylphenol	0	—	—	—		<0.969	<0.173	<0.168	<0.179	<0.891
51-28-5	2,4-Dinitrophenol	3.3	160	—	*3.3*	3.3	<1.08	<0.193	<0.188	<0.201	<0.996
121-14-2	2,4-Dinitrotoluene	0.25	0.9	—	*0.25*	0.25	<0.439	<0.0782	<0.0763	<0.0813	<0.404
606-20-2	2,6-dinitrotoluene	0.26	0.9	—	*0.26*	0.26	<0.490	<0.0874	<0.0852	<0.0908	<0.451
117-84-0	Di-n-octylphthalate	1600	1,600	10,000	10,000	1600	<0.627	<0.112	<0.109	<0.116	<0.576
118-74-1	Hexachlorobenzene	0.4	0.4	1.0	2.0	0.4	<0.473	<0.0843	<0.0822	<0.0876	<0.435
87-68-3	Hexachlorobutadiene	0	—	—	—		<0.000276	<0.0731	<0.000175	<0.000210	<0.377
77-47-4	Hexachlorocyclopentadiene	1.1	550	10	400	1.1	<0.319	<0.0569	<0.0555	<0.0591	<0.293
67-72-1	Hexachloroethane	0.5	78	—	0.5	0.5	<0.336	<0.0599	<0.0585	<0.0623	<0.309
78-59-1	Isophorone	8	15,600	4,600	8.0	8	<0.462	<0.0823	<0.0802	<0.0855	<0.424
91-57-6	2-Methylnaphthalene	0	—	—	—	—	<0.388	<0.0691	<0.0674	<0.0718	<0.356
95-48-7	2-Methylphenol	15	3900	—	15	15	<0.507	<0.0904	<0.0882	<0.0939	<0.466
106-44-5	4-Methylphenol	0	—	—	—		<0.570	<0.102	<0.0991	<0.106	<0.524
88-74-4	2-Nitroaniline	0	—	—	—		<0.422	<0.0752	<0.0733	<0.0781	<0.388
99-09-2	3-Nitroanaline	0	—	—	—		<0.405	<0.0721	<0.0703	<0.0749	<0.372
100-01-6	4-Nitroaniline	0	—	—	—		<0.410	<0.0731	<0.0713	<0.0760	<0.377
98-95-3	Nitrobenzene	0.26	39	92	*0.26*	0.26	<0.331	<0.0589	<0.0575	<0.0612	<0.304
88-75-5	2-Nitrophenol	0	—	—	—		<0.473	<0.0843	<0.0822	<0.0876	<0.435
100-02-7	4-Nitrophenol	0	—	—	—		<0.399	<0.0711	<0.0694	<0.0739	<0.367
621-64-7	N-Nitroso-di-n-propylamine	0.0018	0.09	—	*0.0018*	0.0018	<0.410	<0.0731	<0.0713	<0.0760	<0.377
86-30-6	N-nitrosodiphenylamine	1	130	—	1.0	1	<0.484	<0.0864	<0.0842	<0.0897	<0.445
108-60-1	2,2'-oxybis (1-chloropropane)	0	—	—	—		<0.422	<0.0752	<0.0733	<0.0781	<0.388
87-86-5	Pentachlorophenol	0.02	3.0	—	0.03	0.02	<0.855	<0.152	<0.149	<0.158	<0.786
108-95-2	Phenol	100	23,000	—	100	100	<0.462	<0.0823	<0.0802	<0.0855	<0.424
120-82-1	1,2,4-Trichlorobenzene	5	780	3,200	5.0	5	<0.445	<0.0792	<0.0773	<0.0823	<0.000384
95-95-4	2,4,5-Trichlorophenol	26	7,800	—	270	26	<0.445	<0.0792	<0.0773	<0.0823	<0.409
88-06-2	2,4,6-Trichlorophenol	0.66	58	200	*0.66*	0.66	<0.479	<0.0853	<0.0832	<0.0887	<0.440

Figure 130. Table. Comparison of analytical data to screening levels (sheet# 3) (WESTON, 2020).

CAS Number	Analytes	Screening Level	IEPA Tier 1 Soil Remediation Objectives: Residential Properties		IEPA Tier 1 Soil Remediation Objectives: Soil Component of the Groundwater Ingestion Route	MAC Table Values	SP-5A	SP-5B	SP-6A	SP-6B	SP-7A
			Ingestion	Inhalation	Class I		9/5/2019	9/5/2019	9/9/2019	9/9/2019	9/17/2019
Pesticides and PCBs (mg/kg)		0									
309-00-2	Aldrin	0.94	*0.94*	3.0	*0.94*	0.94	<0.000288	<0.000251	<0.000256	<0.000268	<0.000253
319-84-6	alpha-BHC	0.0074	0.1	0.8	*0.0074*	0.0074	<0.000196	<0.000171	**0.000174**	<0.000183	**0.000172**
319-85-7	beta-BHC	0	—	—	—		**0.000918**	<0.000322	<0.000327	<0.000344	<0.000324
319-86-8	delta-BHC	0	—	—	—		**0.000968**	<0.000231	<0.000235	<0.000247	**0.00032**
60-57-1	Dieldrin	0.603	*0.603*	1.0	*0.603*	0.603	<0.000138	<0.000121	<0.000123	<0.000129	<0.000121
72-54-8	4,4'-DDD	3	3	—	16	3	**0.000161**	<0.000131	<0.000133	**0.000272**	**0.000157**
72-55-9	4,4'-DDE	2	2	—	54	2	<0.000219	<0.000191	<0.000194	<0.000204	<0.000192
50-29-3	4,4'-DDT	2	2	—	32	2	<0.000138	<0.000121	<0.000123	<0.000129	<0.000121
959-98-8	Endosulfan I	0	—	—	—		<0.000207	<0.000181	<0.000184	<0.000193	<0.000182
33213-65-9	Endosulfan II	0	—	—	—		<0.000207	<0.000181	<0.000184	<0.000193	<0.000182
1031-07-8	Endosulfan sulfate	0	—	—	—		<0.000230	<0.000201	<0.000204	<0.000215	<0.000202
72-20-8	Endrin	1	23	—	1.0	1	<0.000219	<0.000191	<0.000194	<0.000204	<0.000192
7421-93-4	Endrin aldehyde	0	—	—	—		<0.000553	<0.000483	<0.000491	<0.000515	<0.000485
58-89-9	gamma-BHC	0.009	0.5	—	0.009	0.009	**0.0044**	<0.000101	<0.000102	**0.000134**	<0.000101
76-44-8	Heptachlor	0.871	*0.871*	*0.871*	23	0.871	<0.000161	<0.000141	<0.000143	<0.000150	<0.000142
1024-57-3	Heptachlor epoxide	1.005	*1.005*	5.0	*1.005*	1.005	<0.000230	<0.000201	<0.000204	<0.000215	<0.000202
72-43-5	Methoxychlor	160	390	—	160	160	<0.000368	<0.000322	<0.000327	<0.000344	<0.000324
8001-35-2	Toxaphene	0.6	0.6	89	31	0.6	<0.00599	<0.00523	<0.00532	<0.00558	<0.00526
12674-11-2	Aroclor - 1016	0	—	—	—		<0.00681	<0.00615	<0.00608	<0.00631	<0.00620
11104-28-2	Aroclor - 1221	0	—	—	—		<0.00681	<0.00615	<0.00608	<0.00631	<0.00620
11141-16-5	Aroclor - 1232	0	—	—	—		<0.00681	<0.00615	<0.00608	<0.00631	<0.00620
53469-21-9	Aroclor - 1242	0	—	—	—		<0.00681	<0.00615	<0.00608	<0.00631	<0.00620
12672-29-6	Aroclor - 1248	0	—	—	—		<0.00874	<0.00790	<0.00781	<0.00810	<0.00795
11097-69-1	Aroclor - 1254	0	—	—	—		<0.00874	<0.00790	<0.00781	<0.00810	<0.00795
11096-82-5	Aroclor - 1260	0	—	—	—		<0.00874	<0.00790	<0.00781	<0.00810	<0.00795
1336-36-3	PCBs	1	1.0	—	—	1	<0.00874	<0.00790	<0.00781	<0.00810	<0.00795
Total Metals (mg/kg)		0									
7440-38-2	Arsenic	11.3	13	750	—	11.3	**0.71**	**2.17**	**1.7**	**1.51**	**1.43**
7440-39-3	Barium	1500	5,500	690,000	—	1500	**17.7**	**34.2**	**15.1**	**13**	**17.5**
7440-43-9	Cadmium	5.2	78	1,800	—	5.2	**0.203**	**0.105**	**0.0574**	**0.0426**	**0.0814**
7440-47-3	Chromium, total	21	230	270	—	21	**5.6**	**7.74**	**4.02**	**4.15**	**7.76**
16065-83-1	Chromium, ion, trivalent	120000	120,000	—	—	—					
18540-29-9	Chromium, ion, hexavalent	230	230	270	—	—					
7439-92-1	Lead	107	400	—	—	107	**2.89**	**5.22**	**2.49**	**1.78**	**2.24**
7439-97-6	Mercury	0.89	23	10	—	0.89	**0.0118**	**0.00952**	<0.00585	<0.00564	<0.00592
7782-49-2	Selenium	1.3	390	—	—	1.3	**0.952**	<0.587	<0.534	<0.542	<0.617
7440-22-4	Silver	4.4	390	—	—	4.4	**1.17**	**1.28**	**0.766**	**0.845**	**1.78**
TCLP Analyses (mg/l)		0									
7440-38-2-1	Arsenic	0.05	—	—	0.05		<0.0390	<0.0390	<0.0390	<0.0390	<0.0390
7440-39-3-1	Barium	2	—	—	2.0		**0.382**	**0.407**	**0.351**	**0.285**	**0.298**
7440-43-9-1	Cadmium	0.005	—	—	0.005		<0.00390	<0.00390	<0.00390	<0.00390	<0.00390
7440-47-3-1	Chromium, total	0.1	—	—	0.1		<0.00640	<0.00640	<0.00640	<0.00640	<0.00640
16065-83-1	Chromium, ion, trivalent	0	—	—	—						
18540-29-9	Chromium, ion, hexavalent	0	—	—	—						
7439-92-1-1	Lead	0.0075	—	—	0.0075		<0.0310	<0.0310	<0.0310	<0.0310	<0.0310
7439-97-6-1	Mercury	0.002	—	—	0.002		<0.00110	**0.00146**	<0.00110	<0.00110	<0.00110
7782-49-2-1	Selenium	0.05	—	—	0.05		<0.0630	<0.0630	<0.0630	<0.0630	<0.0630
7440-22-4-1	Silver	0.05	—	—	0.05		<0.00810	<0.00810	<0.00810	<0.00810	<0.00810
71-43-2	Benzene	0	—	—	—		**0.0643**	<0.0140	<0.0140	<0.0140	<0.0140
56-23-5	Carbon Tetrachloride	0	—	—	—		<0.0130	<0.0130	<0.0130	<0.0130	<0.0130
108-90-7	Chlorobenzene	0	—	—	—		<0.0120	<0.0120	<0.0120	<0.0120	<0.0120
67-66-3	Chloroform	0	—	—	—		<0.0360	<0.0360	<0.0360	<0.0360	<0.0360
95-48-7	o-Cresol	0	—	—	—		<0.00760	<0.00760	<0.00760	<0.00760	<0.00760
106-44-5	p-Cresol	0	—	—	—		<0.00170	<0.00170	<0.00170	<0.00170	<0.00170
	Cresol	0	—	—	—		<0.00760	<0.00760	<0.00760	<0.00760	<0.00760
106-46-7	1,4-Dichlorobenzene	0	—	—	—		<0.00490	<0.00490	<0.00490	<0.00490	<0.00490
107-06-2	1,2-Dichloroethane	0	—	—	—		<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
75-35-4	1,1-Dichloroethylene	0	—	—	—		<0.0110	<0.0110	<0.0110	<0.0110	<0.0110
121-14-2	2,4-Dinitrotoluene	0	—	—	—		<0.00430	<0.00430	<0.00430	<0.00430	<0.00430
118-74-1	Hexachlorobenzene	0	—	—	—		<0.00190	<0.00190	<0.00190	<0.00190	<0.00190
87-68-3	Hexachlorobutadiene	0	—	—	—		<0.00250	<0.00250	<0.00250	<0.00250	<0.00250
67-72-1	Hexachloroethane	0	—	—	—		<0.00360	<0.00360	<0.00360	<0.00360	<0.00360
78-93-3	Methyl ethyl Ketone	0	—	—	—		<1.50	<1.50	<1.50	<1.50	<1.50
98-95-3	Nitrobenzene	0	—	—	—		<0.00240	<0.00240	<0.00240	<0.00240	**0.00315**
87-86-5	Pentachlorophenol	0	—	—	—		<0.0210	<0.0210	<0.0210	<0.0210	<0.0210
110-86-1	Pyridine	0	—	—	—		<0.00410	<0.00410	<0.00410	<0.00410	<0.00410
127-18-4	Tetrachloroethylene	0	—	—	—		<0.0870	<0.0870	<0.0870	<0.0870	**0.153**
79-01-6	Trichloroethylene	0	—	—	—		<0.0820	<0.0820	<0.0820	<0.0820	**0.112**
95-95-4	2,4,5-Trichlorophenol	0	—	—	—		<0.00310	<0.00310	<0.00310	<0.00310	<0.00310
88-06-2	2,4,6-Trichlorophenol	0	—	—	—		<0.00270	<0.00270	<0.00270	<0.00270	<0.00270
75-01-4	Vinyl Chloride	0	—	—	—		<0.0190	<0.0190	<0.0190	<0.0190	<0.0190
Herbicides (mg/kg)		0									
93-76-5	2,4,5-T	0	—	—	—		<0.0974	<0.0832	<0.0836	<0.0862	<0.0837
93-72-1	2,4,5-TP (Silvex)	11	630	—	11	11	<0.103	<0.0876	<0.0881	<0.0908	<0.0882
94-75-7	2,4-D	1.5	780	—	1.5	1.5	<0.113	<0.0967	<0.0972	<0.100	<0.0973
Other		0									
	pH (SU)	0	—	—	—		**8.4**	**8.5**	**8.4**	**8.6**	**8.6**
	Flashpoint (F°)	0	—	—	—		>215	>215	>215	>215	>215
	Paint Filter	0	—	—	—		**Pass**	**Pass**	**Pass**	**Pass**	**Pass**

Notes:
CAS = Chemical Abstract Service
VOCs = volatile organic compounds
SVOC - semivolatile organic compounds
PCBs = polychlorinated biphenyls
TCLP = toxicity characteristic leaching procedure
mg/kg = milligrams per kilogram
mg/L = milligrams per Liter
SU = Standard units
F° = degrees Fahrenheit
BOLD = constituents detected above the method detection limit
Screening level is the minimum of the Residential and Soil component of the groundwater ingestion exposure route values.
= Exceedance of Screening Level

Figure 131. Table. Comparison of analytical data to screening levels (sheet# 4) (WESTON, 2020).

CAS Number	Analytes	Screening Level	IEPA Tier 1 Soil Remediation Objectives: Residential Properties – Ingestion	IEPA Tier 1 Soil Remediation Objectives: Residential Properties – Inhalation	IEPA Tier 1 Soil Remediation Objectives: Soil Component of the Groundwater Ingestion Route Class I	MAC Table Values	SP-7B 9/17/2019	SP-7C 9/17/2019	SP-8 9/23/2019	SP-9A 10/2/2019	SP-9B 10/2/2019
VOCs (mg/kg)											
71-43-2	Benzene	0.03	12	0.8	0.03	0.03	<0.000162	<0.000228	<0.0245	<0.000191	<0.000231
108-88-3	Toluene	12	16,000	650	12	12	<0.000132	<0.000186	<0.0245	<0.000156	<0.000188
100-41-4	Ethylbenzene	13	7,800	400	13	13	<0.000136	<0.000191	<0.0245	<0.000160	<0.000193
1330-20-7	Xylenes (total)	5.6	16,000	320	150	5.6	<0.000381	<0.000536	<0.0412	<0.000449	<0.000543
1634-04-4	Methyl Tertiary-Butyl Ether	0.32	780	8,800	0.32	0.32	<0.0000831	<0.000117	<0.0245	<0.0000978	<0.000118
67-64-1	Acetone	25	70,000	100,000	25	25	**0.0495**	**0.0108**	<0.141	<0.00305	<0.00368
75-27-4	Bromodichloromethane	0.6	10	3,000	0.6	0.6	<0.000147	<0.000207	<0.0245	<0.000173	<0.000210
75-25-2	Bromoform	0.8	81	53	0.8	0.8	<0.0000831	<0.000117	<0.0245	<0.0000978	<0.000118
74-83-9	Bromomethane	0.2	110	10	0.2	0.2	<0.000117	<0.000164	<0.245	<0.000138	<0.000167
78-93-3	2-Butanone	17	—	—	—	17	**0.00253**	<0.00343	<0.118	<0.00287	<0.00347
75-15-0	Carbon Disulfide	9	7,800	720	32	9	<0.000132	<0.000186	<0.0245	<0.000156	<0.000188
56-23-5	Carbon Tetrachloride	0.07	5.0	0.3	0.07	0.07	<0.0000604	<0.0000849	<0.0339	<0.0000711	<0.0000860
108-90-7	Chlorobenzene	1	1,600	130	1.0	1	<0.000113	<0.000159	<0.0245	<0.000133	<0.000161
75-00-3	Chloroethane	0	—	—	—		<0.0000982	<0.000138	<0.0491	<0.000116	<0.000140
67-66-3	Chloroform	0.3	100	0.3	0.6	0.3	<0.000147	<0.000207	<0.0245	<0.000173	<0.000210
74-87-3	Chloromethane	0	—	—	—		<0.0000717	<0.000101	<0.0304	<0.0000845	<0.000102
156-59-2	cis-1,2-Dichloroethene	0	780	1,200	0.4	0.4	<0.000102	<0.000143	<0.0245	<0.000120	<0.000145
124-48-1	Dibromochloromethane	0.4	1,600	1,300	0.4	0.4	<0.0000831	<0.000117	<0.0358	<0.0000978	<0.000118
75-34-3	1,1-Dichloroethane	23	7,800	1,300	23	23	<0.000102	<0.000143	<0.0245	<0.000120	<0.000145
107-06-2	1,2-Dichloroethane	0.02	7.0	0.4	0.02	0.02	<0.000117	<0.000164	<0.0358	<0.000138	<0.000167
75-35-4	1,1-Dichloroethene	0.06	3,900	290	0.06	0.06	<0.0000717	<0.000101	<0.0314	<0.0000845	<0.000102
78-87-5	1,2-Dichloropropane	0.03	9.0	15	0.03	0.03	<0.000162	<0.000228	<0.0265	<0.000191	<0.000231
75-09-2	Methylene Chloride	0.02	85	13	0.02	0.02	<0.000121	<0.000170	<0.128	<0.000142	<0.000172
100-42-5	Styrene	4	16,000	1,500	4.0	4	<0.0000415	<0.0000584	<0.0245	<0.0000489	<0.0000591
79-34-5	1,1,2,2-Tetrachloroethane	0	—	—	—		<0.0000717	<0.000101	<0.0348	<0.0000845	<0.000102
127-18-4	Tetrachloroethene	0.06	12	11	0.06	0.06	<0.0000755	<0.000106	<0.0329	<0.0000889	<0.000107
156-60-5	trans-1,2-Dichloroethene	0.7	1,600	3,100	0.7	0.7	<0.0000717	<0.000101	<0.0245	<0.0000845	<0.000102
79-01-6	Trichloroethene	0.06	58	5.0	0.06	0.06	<0.0000755	<0.000106	<0.0245	<0.0000889	<0.000107
71-55-6	1,1,1-Trichloroethane	2	—	1,200	2.0	2	<0.0000831	<0.000117	<0.0245	<0.0000978	<0.000118
79-00-5	1,1,2-Trichloroethane	0.02	310	1,800	0.02	0.02	<0.000121	<0.000170	<0.0363	<0.000142	<0.000172
75-01-4	Vinyl Chloride	0.01	0.46	0.28	0.01	0.01	<0.000110	<0.000154	<0.0245	<0.000129	<0.000156
SVOCs (mg/kg)		0									
83-32-9	Acenaphthene	570	4,700	—	570	570	<0.392	<0.391	<0.0779	<0.779	<0.760
208-96-8	Acenaphthylene	0	—	—	—		<0.356	<0.356	<0.0708	<0.708	<0.691
120-12-7	Anthracene	12000	23,000	—	12,000	12000	<0.402	<0.401	<0.0799	<0.799	<0.780
56-55-3	Benzo(a)anthracene	0.9	0.9	—	2.0	0.9	<0.407	<0.407	<0.0809	<0.809	<0.790
50-32-8	Benzo(a)pyrene	0.1	0.09	—	8.0	0.09	<0.498	<0.498	<0.0991	<0.991	<0.967
205-99-2	Benzo(b)fluoranthene	0.9	0.9	—	5.0	0.9	<0.392	<0.391	<0.0779	<0.779	<0.760
191-24-2	Benzo(g,h,i)perylene	0	—	—	—		<0.473	<0.473	<0.0941	<0.940	<0.918
207-08-9	Benzo(k)fluoranthene	9	9.0	—	49	9	<0.442	<0.442	<0.0880	<0.880	<0.859
218-01-9	Chrysene	88	88	—	160	88	<0.427	<0.427	<0.0850	<0.849	<0.829
53-70-3	Dibenzo(a,h)anthracene	0.09	0.09	—	2.0	0.09	<0.371	<0.371	<0.0738	<0.738	<0.720
206-44-0	Fluoranthene	3100	3,100	—	4,300	3100	<0.371	<0.371	<0.0738	<0.738	<0.720
86-73-7	Fluorene	560	3,100	—	560	560	<0.371	<0.371	<0.0738	<0.738	<0.720
193-39-5	Indeno(1,2,3-c,d)pyrene	0.9	0.9	—	14	0.9	<0.402	<0.401	<0.0799	<0.799	<0.780
91-20-3	Naphthalene	1.8	1,600	170	12	1.8	<0.0000529	<0.0000743	<0.0245	<0.0000622	<0.740
85-01-8	Phenanthrene	0	—	—	—		<0.376	<0.376	<0.0749	<0.748	<0.730
129-00-0	Pyrene	2300	2,300	—	4,200	2300	<0.422	<0.422	<0.0840	<0.839	<0.819
111-91-1	bis(2-Chloroethoxy) methane	0	—	—	—		<0.346	<0.346	<0.0688	<0.688	<0.671
111-44-4	bis(2-Chloroethyl) ether	0.66	*0.66*	*0.66*	*0.66*	0.66	<0.325	<0.325	<0.0647	<0.647	<0.632
117-81-7	bis(2-Ethylhexyl)phthalate	46	46	31,000	3,600	46	<0.509	<0.508	<0.101	<1.01	<0.987
101-55-3	4-Bromophenyl-phenyl ether	0	—	—	—		<0.483	<0.483	<0.0961	<0.961	<0.938
85-68-7	Butylbenzylphthalate	930	16,000	930	930	930	<0.559	<0.559	<0.111	<1.11	<1.09
86-74-8	Carbazole	0.6	32	—	0.6	0.6	<0.437	<0.437	<0.0870	<0.870	<0.849
106-47-8	4-Chloroaniline	0.7	310	—	0.7	0.7	<0.488	<0.488	<0.0971	<0.971	<0.947
91-58-7	2-Chloro--phthalene	0	—	—	—		<0.381	<0.381	<0.0759	<0.758	<0.740
59-50-7	4-Chloro-3-methylphenol	0	—	—	—		<0.432	<0.432	<0.0860	<0.859	<0.839
95-57-8	2-Chlorophenol	1.5	390	53,000	4.0	1.5	<0.437	<0.437	<0.0870	<0.870	<0.849
7005-72-3	4-Chlorophenyl-phenyl ether	0	—	—	—		<0.427	<0.427	<0.0850	<0.849	<0.829
132-64-9	Dibenzofuran	0	—	—	—		<0.468	<0.468	<0.0931	<0.930	<0.908
95-50-1	1,2-Dichlorobenzene	17	7,000	560	17	17	<0.000125	<0.000175	<0.0698	<0.698	<0.681
541-73-1	1,3-Dichlorobenzene	0	—	—	—		<0.000106	<0.000149	<0.0245	<0.000124	<0.000150
106-46-7	1,4-Dichlorobenzene	2	—	11,000	2.0	2	<0.000117	<0.325	<0.0245	<0.000138	<0.000167
91-94-1	3,3'-Dichlorobenzidine	1.3	*1.3*	—	*1.3*	1.3	<0.814	<0.813	<0.162	<1.62	<1.58
120-83-2	2,4-Dichlorophenol	0.48	230	—	1.0	0.48	<0.458	<0.457	<0.0910	<0.910	<0.888
84-66-2	Diethylphthalate	470	63,000	2,000	470	470	<0.478	<0.478	<0.0951	<0.950	<0.928
131-11-3	Dimethylphthalate	0	—	—	—		<0.407	<0.407	<0.0809	<0.809	<0.790
84-74-2	Di-n-butylphthalate	2300	7,800	2,300	2,300	2300	<0.498	<0.498	<0.0991	<0.991	<0.967
105-67-9	2,4-Dimethylphenol	9	1,600	—	9.0	9	<0.417	<0.417	<0.0829	<0.829	<0.809
534-52-1	4,6-Dinitro-2-methylphenol	0	—	—	—		<0.864	<0.864	<0.172	<1.72	<1.68
51-28-5	2,4-Dinitrophenol	3.3	160	—	*3.3*	3.3	<0.966	<0.966	<0.192	<1.92	<1.88
121-14-2	2,4-Dinitrotoluene	0.25	0.9	—	*0.25*	0.25	<0.392	<0.391	<0.0779	<0.779	<0.760
606-20-2	2,6-dinitrotoluene	0.26	0.9	—	*0.26*	0.26	<0.437	<0.437	<0.0870	<0.870	<0.849
117-84-0	Di-n-octylphthalate	1600	1,600	10,000	10,000	1600	<0.559	<0.559	<0.111	<1.11	<1.09
118-74-1	Hexachlorobenzene	0.4	0.4	1.0	2.0	0.4	<0.422	<0.422	<0.0840	<0.839	<0.819
87-68-3	Hexachlorobutadiene	0	—	—	—		<0.000147	<0.000207	<0.0728	<0.728	<0.711
77-47-4	Hexachlorocyclopentadiene	1.1	550	10	400	1.1	<0.285	<0.285	<0.0566	<0.566	<0.553
67-72-1	Hexachloroethane	0.5	78	—	0.5	0.5	<0.300	<0.300	<0.0597	<0.597	<0.582
78-59-1	Isophorone	8	15,600	4,600	8.0	8	<0.412	<0.412	<0.0819	<0.819	<0.799
91-57-6	2-Methylnaphthalene	0	—	—	—	—	<0.346	<0.346	<0.0688	<0.688	<0.671
95-48-7	2-Methylphenol	15	3900	—	15	15	<0.453	<0.452	<0.0900	<0.900	<0.878
106-44-5	4-Methylphenol	0	—	—	—		<0.509	<0.508	<0.101	<1.01	<0.987
88-74-4	2-Nitroaniline	0	—	—	—		<0.376	<0.376	<0.0749	<0.748	<0.730
99-09-2	3-Nitroanaline	0	—	—	—		<0.361	<0.361	<0.0718	<0.718	<0.701
100-01-6	4-Nitroaniline	0	—	—	—		<0.366	<0.366	<0.0728	<0.728	<0.711
98-95-3	Nitrobenzene	0.26	39	92	*0.26*	0.26	<0.295	<0.295	<0.0587	<0.586	<0.572
88-75-5	2-Nitrophenol	0	—	—	—		<0.422	<0.422	<0.0840	<0.839	<0.819
100-02-7	4-Nitrophenol	0	—	—	—		<0.356	<0.356	<0.0708	<0.708	<0.691
621-64-7	N-Nitroso-di-n-propylamine	0.0018	0.09	—	*0.0018*	0.0018	<0.366	<0.366	<0.0728	<0.728	<0.711
86-30-6	N-nitrosodiphenylamine	1	130	—	1.0	1	<0.432	<0.432	<0.0860	<0.859	<0.839
108-60-1	2,2'-oxybis (1-chloropropane)	0	—	—	—		<0.376	<0.376	<0.0749	<0.748	<0.730
87-86-5	Pentachlorophenol	0.02	3.0	—	0.03	0.02	<0.763	<0.762	<0.152	<1.52	<1.46
108-95-2	Phenol	100	23,000	—	100	100	<0.412	<0.412	<0.0819	<0.819	<0.799
120-82-1	1,2,4-Trichlorobenzene	5	780	3,200	5.0	5	<0.000329	<0.396	<0.0255	<0.789	<0.000468
95-95-4	2,4,5-Trichlorophenol	26	7,800	—	270	26	<0.397	<0.396	<0.0789	<0.789	<0.770
88-06-2	2,4,6-Trichlorophenol	0.66	58	200	*0.66*	0.66	<0.427	<0.427	<0.0850	<0.849	<0.829

Figure 132. Table. Comparison of analytical data to screening levels (sheet# 5) (WESTON, 2020).

			IEPA Tier 1 Soil Remediation Objectives								
CAS Number	Analytes	Screening Level	Residential Properties		Soil Component of the Groundwater Ingestion Route	MAC Table Values	SP-7B	SP-7C	SP-8	SP-9A	SP-9B
			Ingestion	Inhalation	Class I		9/17/2019	9/17/2019	9/23/2019	10/2/2019	10/2/2019
Pesticides and PCBs (mg/kg)		0									
309-00-2	Aldrin	0.94	*0.94*	3.0	*0.94*	0.94	<0.000262	<0.000248	<0.000252	<0.000250	<0.000250
319-84-6	alpha-BHC	0.0074	0.1	0.8	*0.0074*	0.0074	**0.000192**	<0.000169	<0.000171	**0.000244**	**0.00019**
319-85-7	beta-BHC	0	—	—	—		<0.000336	<0.000318	<0.000322	<0.000320	<0.000320
319-86-8	delta-BHC	0	—	—	—		**0.000291**	<0.000457	<0.00116	<0.000230	<0.000230
60-57-1	Dieldrin	0.603	*0.603*	1.0	*0.603*	0.603	<0.000126	<0.000119	<0.000121	<0.000120	<0.000120
72-54-8	4,4'-DDD	3	3	—	16	3	**0.000168**	**0.000192**	<0.000131	**0.00018**	**0.000389**
72-55-9	4,4'-DDE	2	2	—	54	2	<0.000199	<0.000189	<0.000191	<0.000190	<0.000190
50-29-3	4,4'-DDT	2	2	—	32	2	<0.000126	<0.000119	<0.000121	<0.000120	<0.000120
959-98-8	Endosulfan I	0	—	—	—		<0.000189	<0.000179	<0.000181	<0.000180	<0.000180
33213-65-9	Endosulfan II	0	—	—	—		<0.000189	<0.000179	<0.000181	<0.000180	<0.000180
1031-07-8	Endosulfan sulfate	0	—	—	—		<0.000210	**0.000264**	<0.000201	<0.000200	<0.000200
72-20-8	Endrin	1	23	—	1.0	1	<0.000199	<0.000189	<0.000191	<0.000190	<0.000190
7421-93-4	Endrin aldehyde	0	—	—	—		<0.000504	<0.000477	<0.000483	<0.000480	<0.000479
58-89-9	gamma-BHC	0.009	0.5	—	0.009	0.009	<0.000105	<0.0000994	<0.000101	<0.000100	<0.0000999
76-44-8	Heptachlor	0.871	*0.871*	*0.871*	23	0.871	<0.000147	<0.000139	<0.000141	<0.000140	<0.000140
1024-57-3	Heptachlor epoxide	1.005	*1.005*	5.0	*1.005*	1.005	<0.000210	<0.000199	<0.000201	<0.000200	<0.000200
72-43-5	Methoxychlor	160	390	—	160	160	<0.000336	<0.000318	<0.000322	<0.000320	<0.000320
8001-35-2	Toxaphene	0.6	0.6	89	31	0.6	<0.00546	<0.00517	<0.00523	<0.00521	<0.00519
12674-11-2	Aroclor - 1016	0	—	—	—		<0.00610	<0.00617	<0.00616	<0.00605	<0.00610
11104-28-2	Aroclor - 1221	0	—	—	—		<0.00610	<0.00617	<0.00616	<0.00605	<0.00610
11141-16-5	Aroclor - 1232	0	—	—	—		<0.00610	<0.00617	<0.00616	<0.00605	<0.00610
53469-21-9	Aroclor - 1242	0	—	—	—		<0.00610	<0.00617	<0.00616	<0.00605	<0.00610
12672-29-6	Aroclor - 1248	0	—	—	—		<0.00782	<0.00792	<0.00791	<0.00776	<0.00783
11097-69-1	Aroclor - 1254	0	—	—	—		<0.00782	<0.00792	<0.00791	<0.00776	<0.00783
11096-82-5	Aroclor - 1260	0	—	—	—		<0.00782	<0.00792	<0.00791	<0.00776	<0.00783
1336-36-3	PCBs	1	1.0	—	—	1	<0.00782	<0.00792	<0.00791	<0.00776	<0.00783
Total Metals (mg/kg)		0									
7440-38-2	Arsenic	11.3	13	750	—	11.3	**1.43**	**1.35**	**0.761**	**1.61**	**1.38**
7440-39-3	Barium	1500	5,500	690,000	—	1500	**22.7**	**17**	**14.6**	**12.7**	**18.2**
7440-43-9	Cadmium	5.2	78	1,800	—	5.2	**0.0998**	**0.114**	**0.0728**	<0.0390	<0.0375
7440-47-3	Chromium, total	21	230	270	—	21	**7.11**	**7.42**	**3.13**	**4.51**	**3.79**
16065-83-1	Chromium, ion, trivalent	120000	120,000	—	—	—					
18540-29-9	Chromium, ion, hexavalent	230	230	270	—	—					
7439-92-1	Lead	107	400	—	—	107	**1.77**	**1.83**	**1.49**	**1.83**	**1.72**
7439-97-6	Mercury	0.89	23	10	—	0.89	<0.00591	<0.00581	<0.00562	<0.00516	<0.00519
7782-49-2	Selenium	1.3	390	—	—	1.3	<0.554	<0.546	<0.589	<0.381	<0.366
7440-22-4	Silver	4.4	390	—	—	4.4	**1.03**	**1.11**	**0.798**	<0.0658	<0.0632
TCLP Analyses (mg/l)		0									
7440-38-2-1	Arsenic	0.05	—	—	0.05		<0.0390	<0.0390	<0.0390	<0.0390	<0.0390
7440-39-3-1	Barium	2	—	—	2.0		**0.503**	**0.348**	**0.265**	**0.341**	**0.426**
7440-43-9-1	Cadmium	0.005	—	—	0.005		<0.00390	<0.00390	<0.00390	<0.00390	<0.00390
7440-47-3-1	Chromium, total	0.1	—	—	0.1		<0.00640	<0.00640	<0.00640	<0.00640	<0.00640
16065-83-1	Chromium, ion, trivalent	0	—	—	—						
18540-29-9	Chromium, ion, hexavalent	0	—	—	—						
7439-92-1-1	Lead	0.0075	—	—	0.0075		<0.0310	<0.0310	<0.0310	<0.0310	<0.0310
7439-97-6-1	Mercury	0.002	—	—	0.002		<0.00110	<0.00110	<0.00110	<0.00110	<0.00110
7782-49-2-1	Selenium	0.05	—	—	0.05		<0.0630	<0.0630	<0.0630	<0.0630	<0.0630
7440-22-4-1	Silver	0.05	—	—	0.05		<0.00810	<0.00810	<0.00810	<0.00810	<0.00810
71-43-2	Benzene	0	—	—	—		<0.0140	<0.0140	<0.0140	<0.0140	<0.0140
56-23-5	Carbon Tetrachloride	0	—	—	—		<0.0130	<0.0130	<0.0130	<0.0130	<0.0130
108-90-7	Chlorobenzene	0	—	—	—		<0.0120	<0.0120	<0.0120	<0.0120	<0.0120
67-66-3	Chloroform	0	—	—	—		<0.0360	<0.0360	<0.0360	<0.0360	<0.0360
95-48-7	o-Cresol	0	—	—	—		<0.00760	<0.00760	<0.00760	<0.00760	<0.00760
106-44-5	p-Cresol	0	—	—	—		<0.00170	<0.00170	<0.00170	<0.00170	<0.00170
	Cresol	0	—	—	—		<0.00760	<0.00760	<0.00760	<0.00760	<0.00760
106-46-7	1,4-Dichlorobenzene	0	—	—	—		<0.00490	<0.00490	<0.00490	<0.00490	<0.00490
107-06-2	1,2-Dichloroethane	0	—	—	—		<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
75-35-4	1,1-Dichloroethylene	0	—	—	—		<0.0110	<0.0110	<0.0110	<0.0110	<0.0110
121-14-2	2,4-Dinitrotoluene	0	—	—	—		<0.00430	<0.00430	<0.00430	<0.00430	<0.00430
118-74-1	Hexachlorobenzene	0	—	—	—		<0.00190	<0.00190	<0.00190	<0.00190	<0.00190
87-68-3	Hexachlorobutadiene	0	—	—	—		<0.00250	<0.00250	<0.00250	<0.00250	<0.00250
67-72-1	Hexachloroethane	0	—	—	—		<0.00360	<0.00360	<0.00360	<0.00360	<0.00360
78-93-3	Methyl ethyl Ketone	0	—	—	—		<1.50	<1.50	<1.50	<1.50	<1.50
98-95-3	Nitrobenzene	0	—	—	—		<0.00240	<0.00240	<0.00240	<0.00240	<0.00240
87-86-5	Pentachlorophenol	0	—	—	—		<0.0210	**0.0223**	<0.0210	<0.0210	<0.0210
110-86-1	Pyridine	0	—	—	—		<0.00410	<0.00410	<0.00410	<0.00410	<0.00410
127-18-4	Tetrachloroethylene	0	—	—	—		**0.452**	**0.39**	<0.0870	<0.0870	<0.0870
79-01-6	Trichloroethylene	0	—	—	—		<0.0820	**0.0899**	<0.0820	<0.0820	<0.0820
95-95-4	2,4,5-Trichlorophenol	0	—	—	—		<0.00310	**0.00314**	<0.00310	<0.00310	<0.00310
88-06-2	2,4,6-Trichlorophenol	0	—	—	—		<0.00270	<0.00270	<0.00270	<0.00270	<0.00270
75-01-4	Vinyl Chloride	0	—	—	—		<0.0190	<0.0190	<0.0190	<0.0190	<0.0190
Herbicides (mg/kg)		0									
93-76-5	2,4,5-T	0	—	—	—		<0.0852	<0.0841	<0.0843	<0.0807	<0.0823
93-72-1	2,4,5-TP (Silvex)	11	630	—	11	11	<0.0897	<0.0886	<0.0888	<0.0850	<0.0867
94-75-7	2,4-D	1.5	780	—	1.5	1.5	<0.0990	<0.0978	<0.0980	<0.0938	<0.0956
Other		0									
	pH (SU)	0	—	—	—		**8.6**	**8.6**	**8.6**	**8.6**	**8.7**
	Flashpoint (F°)	0	—	—	—		>215	>215	>215	>215	>215
	Paint Filter	0	—	—	—		**Pass**	**Pass**	**Pass**	**Pass**	**Pass**

Notes:
CAS = Chemical Abstract Service
VOCs = volatile organic compounds
SVOC - semivolatile organic compounds
PCBs = polychlorinated biphenyls
TCLP = toxicity characteristic leaching procedure
mg/kg = milligrams per kilogram
mg/L = milligrams per Liter
SU = Standard units
F° = degrees Fahrenheit
BOLD = constituents detected above the method detection limit
Screening level is the minimum of the Residential and Soil component of the groundwater ingestion exposure route values.
= Exceedance of Screening Level

Figure 133. Table. Comparison of analytical data to screening levels (sheet# 6) (WESTON, 2020).

CAS Number	Analytes	Screening Level	IEPA Tier 1 Soil Remediation Objectives: Residential Properties – Ingestion	Residential Properties – Inhalation	Soil Component of the Groundwater Ingestion Route – Class I	MAC Table Values	SP-10 11/11/2019	SP-11 11/14/2019	SP-12 11/18/2019
VOCs (mg/kg)									
71-43-2	Benzene	0.03	12	0.8	0.03	0.03	<0.000174	<0.000231	<0.000252
108-88-3	Toluene	12	16,000	650	12	12	<0.000142	<0.000188	<0.000205
100-41-4	Ethylbenzene	13	7,800	400	13	13	**0.000284**	<0.000193	<0.000211
1330-20-7	Xylenes (total)	5.6	16,000	320	150	5.6	**0.000777**	<0.000543	<0.000593
1634-04-4	Methyl Tertiary-Butyl Ether	0.32	780	8,800	0.32	0.32	<0.0000890	<0.000118	<0.000129
67-64-1	Acetone	25	70,000	100,000	25	25	**0.0358**	<0.00368	<0.00402
75-27-4	Bromodichloromethane	0.6	10	3,000	0.6	0.6	<0.000158	<0.000210	<0.000229
75-25-2	Bromoform	0.8	81	53	0.8	0.8	<0.0000890	<0.000118	<0.000129
74-83-9	Bromomethane	0.2	110	10	0.2	0.2	<0.000125	<0.000167	<0.000182
78-93-3	2-Butanone	17	---	---	---	17	<0.00261	<0.00347	<0.00379
75-15-0	Carbon Disulfide	9	7,800	720	32	9	<0.000142	<0.000188	<0.000205
56-23-5	Carbon Tetrachloride	0.07	5.0	0.3	0.07	0.07	<0.0000647	<0.0000860	<0.0000939
108-90-7	Chlorobenzene	1	1,600	130	1.0	1	<0.000121	<0.000161	<0.000176
75-00-3	Chloroethane	0	---	---	---		<0.000105	<0.000140	<0.000153
67-66-3	Chloroform	0.3	100	0.3	0.6	0.3	<0.000158	<0.000210	<0.000229
74-87-3	Chloromethane	0	---	---	---		<0.0000768	<0.000102	<0.000111
156-59-2	cis-1,2-Dichloroethene	0	780	1,200	0.4	0.4	<0.000109	<0.000145	<0.000158
124-48-1	Dibromochloromethane	0.4	1,600	1,300	0.4	0.4	<0.0000890	<0.000118	<0.000129
75-34-3	1,1-Dichloroethane	23	7,800	1,300	23	23	<0.000109	<0.000145	<0.000158
107-06-2	1,2-Dichloroethane	0.02	7.0	0.4	0.02	0.02	<0.000125	<0.000167	<0.000182
75-35-4	1,1-Dichloroethene	0.06	3,900	290	0.06	0.06	<0.0000768	<0.000102	<0.000111
78-87-5	1,2-Dichloropropane	0.03	9.0	15	0.03	0.03	<0.000174	<0.000231	<0.000252
75-09-2	Methylene Chloride	0.02	85	13	0.02	0.02	<0.000129	<0.000172	<0.000188
100-42-5	Styrene	4	16,000	1,500	4.0	4	<0.0000445	<0.0000591	<0.0000646
79-34-5	1,1,2,2-Tetrachloroethane	0	---	---	---		<0.0000768	<0.000102	<0.000111
127-18-4	Tetrachloroethene	0.06	12	11	0.06	0.06	**0.000395**	<0.000107	<0.000117
156-60-5	trans-1,2-Dichloroethene	0.7	1,600	3,100	0.7	0.7	<0.0000768	<0.000102	<0.000111
79-01-6	Trichloroethene	0.06	58	5.0	0.06	0.06	<0.0000809	<0.000107	<0.000117
71-55-6	1,1,1-Trichloroethane	2	---	1,200	2.0	2	<0.0000890	<0.000118	<0.000129
79-00-5	1,1,2-Trichloroethane	0.02	310	1,800	0.02	0.02	<0.000129	<0.000172	<0.000188
75-01-4	Vinyl Chloride	0.01	0.46	0.28	0.01	0.01	<0.000117	<0.000156	<0.000170
SVOCs (mg/kg)		0							
83-32-9	Acenaphthene	570	4,700	---	570	570	<0.776	<0.393	<0.0893
208-96-8	Acenaphthylene	0	---	---	---		<0.705	<0.357	<0.0812
120-12-7	Anthracene	12000	23,000	---	12,000	12000	<0.796	<0.403	<0.0916
56-55-3	Benzo(a)anthracene	0.9	0.9	---	2.0	0.9	<0.806	<0.408	<0.0928
50-32-8	Benzo(a)pyrene	0.1	0.09	---	8.0	0.09	<0.987	<0.500	<0.114
205-99-2	Benzo(b)fluoranthene	0.9	0.9	---	5.0	0.9	<0.776	<0.393	<0.0893
191-24-2	Benzo(g,h,i)perylene	0	---	---	---		<0.937	<0.474	<0.108
207-08-9	Benzo(k)fluoranthene	9	9.0	---	49	9	<0.876	<0.444	<0.101
218-01-9	Chrysene	88	88	---	160	88	<0.846	<0.428	<0.0974
53-70-3	Dibenzo(a,h)anthracene	0.09	0.09	---	2.0	0.09	<0.735	<0.372	<0.0847
206-44-0	Fluoranthene	3100	3,100	---	4,300	3100	<0.735	<0.372	<0.0847
86-73-7	Fluorene	560	3,100	---	560	560	<0.735	<0.372	<0.0847
193-39-5	Indeno(1,2,3-c,d)pyrene	0.9	0.9	---	14	0.9	<0.796	<0.403	<0.0916
91-20-3	Naphthalene	1.8	1,600	170	12	1.8	<0.755	<0.383	<0.0000822
85-01-8	Phenanthrene	0	---	---	---		<0.745	<0.377	<0.0858
129-00-0	Pyrene	2300	2,300	---	4,200	2300	<0.836	<0.423	<0.0963
111-91-1	bis(2-Chloroethoxy) methane	0	---	---	---		<0.685	<0.347	<0.0789
111-44-4	bis(2-Chloroethyl) ether	0.66	*0.66*	*0.66*	*0.66*	0.66	<0.645	<0.326	<0.0742
117-81-7	bis(2-Ethylhexyl)phthalate	46	46	31,000	3,600	46	<1.01	<0.510	<0.116
101-55-3	4-Bromophenyl-phenyl ether	0	---	---	---		<0.957	<0.485	<0.110
85-68-7	Butylbenzylphthalate	930	16,000	930	930	930	<1.11	<0.561	<0.128
86-74-8	Carbazole	0.6	32	---	0.6	0.6	<0.866	<0.439	<0.0998
106-47-8	4-Chloroaniline	0.7	310	---	0.7	0.7	<0.967	<0.490	<0.111
91-58-7	2-Chloro--phthalene	0	---	---	---		<0.755	<0.383	<0.0870
59-50-7	4-Chloro-3-methylphenol	0	---	---	---		<0.856	<0.434	<0.0986
95-57-8	2-Chlorophenol	1.5	390	53,000	4.0	1.5	<0.866	<0.439	<0.0998
7005-72-3	4-Chlorophenyl-phenyl ether	0	---	---	---		<0.846	<0.428	<0.0974
132-64-9	Dibenzofuran	0	---	---	---		<0.927	<0.469	<0.107
95-50-1	1,2-Dichlorobenzene	17	7,000	560	17	17	<0.695	<0.000177	<0.0800
541-73-1	1,3-Dichlorobenzene	0	---	---	---		<0.735	<0.000150	<0.000164
106-46-7	1,4-Dichlorobenzene	2	---	11,000	2.0	2	<0.000125	<0.326	<0.000182
91-94-1	3,3'-Dichlorobenzidine	1.3	*1.3*	---	*1.3*	1.3	<1.61	<0.816	<0.186
120-83-2	2,4-Dichlorophenol	0.48	230	---	1.0	0.48	<0.907	<0.459	<0.104
84-66-2	Diethylphthalate	470	63,000	2,000	470	470	<0.947	<0.479	<0.109
131-11-3	Dimethylphthalate	0	---	---	---		<0.806	<0.408	<0.0928
84-74-2	Di-n-butylphthalate	2300	7,800	2,300	2,300	2300	<0.987	<0.500	<0.114
105-67-9	2,4-Dimethylphenol	9	1,600	---	9.0	9	<0.826	<0.418	<0.0951
534-52-1	4,6-Dinitro-2-methylphenol	0	---	---	---		<1.71	<0.867	<0.197
51-28-5	2,4-Dinitrophenol	3.3	160	---	3.3	3.3	<1.91	<0.969	<0.220
121-14-2	2,4-Dinitrotoluene	0.25	0.9	---	*0.25*	0.25	<0.776	<0.393	<0.0893
606-20-2	2,6-dinitrotoluene	0.26	0.9	---	*0.26*	0.26	<0.866	<0.439	<0.0998
117-84-0	Di-n-octylphthalate	1600	1,600	10,000	10,000	1600	<1.11	<0.561	<0.128
118-74-1	Hexachlorobenzene	0.4	0.4	1.0	2.0	0.4	<0.836	<0.423	<0.0963
87-68-3	Hexachlorobutadiene	0	---	---	---		<0.725	<0.000210	<0.000229
77-47-4	Hexachlorocyclopentadiene	1.1	550	10	400	1.1	<0.564	<0.286	<0.0650
67-72-1	Hexachloroethane	0.5	78	---	0.5	0.5	<0.594	<0.301	<0.0684
78-59-1	Isophorone	8	15,600	4,600	8.0	8	<0.816	<0.413	<0.0940
91-57-6	2-Methylnaphthalene	0	---	---	---	---	<0.685	<0.347	<0.0789
95-48-7	2-Methylphenol	15	3900	---	15	15	<0.897	<0.454	<0.103
106-44-5	4-Methylphenol	0	---	---	---		<1.01	<0.510	<0.116
88-74-4	2-Nitroaniline	0	---	---	---		<0.745	<0.377	<0.0858
99-09-2	3-Nitroanaline	0	---	---	---		<0.715	<0.362	<0.0824
100-01-6	4-Nitroaniline	0	---	---	---		<0.725	<0.367	<0.0835
98-95-3	Nitrobenzene	0.26	39	92	*0.26*	0.26	<0.584	<0.296	<0.0673
88-75-5	2-Nitrophenol	0	---	---	---		<0.836	<0.423	<0.0963
100-02-7	4-Nitrophenol	0	---	---	---		<0.705	<0.357	<0.0812
621-64-7	N-Nitroso-di-n-propylamine	0.0018	0.09	---	*0.0018*	0.0018	<0.725	<0.367	<0.0835
86-30-6	N-nitrosodiphenylamine	1	130	---	1.0	1	<0.856	<0.434	<0.0986
108-60-1	2,2'-oxybis (1-chloropropane)	0	---	---	---		<0.745	<0.377	<0.0858
87-86-5	Pentachlorophenol	0.02	3.0	---	0.03	0.02	<1.51	<0.765	<0.174
108-95-2	Phenol	100	23,000	---	100	100	<0.816	<0.413	<0.0940
120-82-1	1,2,4-Trichlorobenzene	5	780	3,200	5.0	5	<0.000352	<0.000467	<0.000511
95-95-4	2,4,5-Trichlorophenol	26	7,800	---	270	26	<0.786	<0.398	<0.0905
88-06-2	2,4,6-Trichlorophenol	0.66	58	200	*0.66*	0.66	<0.846	<0.428	<0.0974

Figure 134. Table. Comparison of analytical data to screening levels (sheet# 7) (WESTON, 2020).

CAS Number	Analytes	Screening Level	IEPA Tier 1 Soil Remediation Objectives: Residential Properties – Ingestion	IEPA Tier 1 Soil Remediation Objectives: Residential Properties – Inhalation	IEPA Tier 1 Soil Remediation Objectives: Soil Component of the Groundwater Ingestion Route – Class I	MAC Table Values	SP-10	SP-11	SP-12
							11/11/2019	11/14/2019	11/18/2019
Pesticides and PCBs (mg/kg)		0							
309-00-2	Aldrin	0.94	*0.94*	3.0	*0.94*	0.94	<0.000263	<0.000252	<0.000267
319-84-6	alpha-BHC	0.0074	0.1	0.8	*0.0074*	0.0074	**0.000196**	**0.000223**	**0.000320**
319-85-7	beta-BHC	0	---	---	---		<0.000337	<0.000322	<0.000367
319-86-8	delta-BHC	0	---	---	---		<0.000242	**0.000781**	**0.000378**
60-57-1	Dieldrin	0.603	*0.603*	1.0	*0.603*	0.603	<0.000126	<0.000121	**0.000144**
72-54-8	4,4'-DDD	3	3	---	16	3	**0.000168**	**0.000150**	**0.000220**
72-55-9	4,4'-DDE	2	2	---	54	2	<0.000200	<0.000191	**0.000288**
50-29-3	4,4'-DDT	2	2	---	32	2	**0.000205**	<0.000121	**0.000433**
959-98-8	Endosulfan I	0	---	---	---		<0.000190	<0.000181	<0.000207
33213-65-9	Endosulfan II	0	---	---	---		<0.000190	<0.000181	<0.000207
1031-07-8	Endosulfan sulfate	0	---	---	---		<0.000211	<0.000202	<0.000230
72-20-8	Endrin	1	23	---	1.0	1	<0.000200	<0.000191	<0.000218
7421-93-4	Endrin aldehyde	0	---	---	---		<0.000506	<0.000484	<0.000551
58-89-9	gamma-BHC	0.009	0.5	---	0.009	0.009	<0.000105	<0.000101	<0.000115
76-44-8	Heptachlor	0.871	*0.871*	*0.871*	23	0.871	<0.000147	**0.000321**	**0.000213**
1024-57-3	Heptachlor epoxide	1.005	*1.005*	5.0	*1.005*	1.005	<0.000211	<0.000202	<0.000230
72-43-5	Methoxychlor	160	390	---	160	160	<0.000337	<0.000322	<0.000367
8001-35-2	Toxaphene	0.6	0.6	89	31	0.6	<0.00548	<0.00524	<0.00597
12674-11-2	Aroclor - 1016	0	---	---	---		<0.00615	<0.00592	<0.00676
11104-28-2	Aroclor - 1221	0	---	---	---		<0.00615	<0.00592	<0.00676
11141-16-5	Aroclor - 1232	0	---	---	---		<0.00615	<0.00592	<0.00676
53469-21-9	Aroclor - 1242	0	---	---	---		<0.00615	<0.00592	<0.00676
12672-29-6	Aroclor - 1248	0	---	---	---		<0.00789	<0.00760	<0.00868
11097-69-1	Aroclor - 1254	0	---	---	---		<0.00789	<0.00760	<0.00868
11096-82-5	Aroclor - 1260	0	---	---	---		<0.00789	<0.00760	<0.00868
1336-36-3	PCBs	1	1.0	---	---	1	<0.00789	<0.00760	<0.00868
Total Metals (mg/kg)		0							
7440-38-2	Arsenic	11.3	13	750	---	11.3	**1.27**	**1.21**	**1.24**
7440-39-3	Barium	1500	5,500	690,000	---	1500	**19.0**	**19.5**	**22.1**
7440-43-9	Cadmium	5.2	78	1,800	---	5.2	**0.0864**	**0.0596**	**0.0459**
7440-47-3	Chromium, total	21	230	270	---	21	**3.78**	**3.37**	**4.68**
16065-83-1	Chromium, ion, trivalent	120000	120,000	---	---	---			
18540-29-9	Chromium, ion, hexavalent	230	230	270	---	---			
7439-92-1	Lead	107	400	---	---	107	**1.63**	**1.50**	**2.21**
7439-97-6	Mercury	0.89	23	10	---	0.89	<0.00604	<0.00536	<0.00632
7782-49-2	Selenium	1.3	390	---	---	1.3	<0.548	**0.531**	<0.609
7440-22-4	Silver	4.4	390	---	---	4.4	**0.859**	**0.951**	**1.01**
TCLP Analyses (mg/l)		0							
7440-38-2-1	Arsenic	0.05	---	---	0.05		<0.0390	<0.0390	<0.0390
7440-39-3-1	Barium	2	---	---	2.0		**0.361**	**0.375**	**0.372**
7440-43-9-1	Cadmium	0.005	---	---	0.005		<0.00390	<0.00390	<0.00390
7440-47-3-1	Chromium, total	0.1	---	---	0.1		<0.00640	<0.00640	<0.00640
16065-83-1	Chromium, ion, trivalent	0	---	---	---				
18540-29-9	Chromium, ion, hexavalent	0	---	---	---				
7439-92-1-1	Lead	0.0075	---	---	0.0075		<0.0310	<0.0310	<0.0310
7439-97-6-1	Mercury	0.002	---	---	0.002		<0.00110	<0.00110	<0.00110
7782-49-2-1	Selenium	0.05	---	---	0.05		<0.0630	<0.0630	<0.0630
7440-22-4-1	Silver	0.05	---	---	0.05		<0.00810	<0.00810	<0.00810
71-43-2	Benzene	0	---	---	---		<0.0140	<0.0140	<0.0140
56-23-5	Carbon Tetrachloride	0	---	---	---		<0.0130	<0.0130	<0.0130
108-90-7	Chlorobenzene	0	---	---	---		<0.0120	<0.0120	<0.0120
67-66-3	Chloroform	0	---	---	---		<0.0360	<0.0360	<0.0360
95-48-7	o-Cresol	0	---	---	---		<0.00760	<0.00760	<0.00760
106-44-5	p-Cresol	0	---	---	---		<0.00170	<0.00170	<0.00170
	Cresol	0	---	---	---		<0.00760	<0.00760	<0.00760
106-46-7	1,4-Dichlorobenzene	0	---	---	---		<0.00490	<0.00490	<0.00490
107-06-2	1,2-Dichloroethane	0	---	---	---		<0.0100	<0.0100	<0.0100
75-35-4	1,1-Dichloroethylene	0	---	---	---		<0.0110	<0.0110	<0.0110
121-14-2	2,4-Dinitrotoluene	0	---	---	---		<0.00430	<0.00430	<0.00430
118-74-1	Hexachlorobenzene	0	---	---	---		<0.00190	<0.00190	<0.00190
87-68-3	Hexachlorobutadiene	0	---	---	---		<0.00250	<0.00250	<0.00250
67-72-1	Hexachloroethane	0	---	---	---		<0.00360	<0.00360	<0.00360
78-93-3	Methyl ethyl Ketone	0	---	---	---		<1.50	<1.50	<1.50
98-95-3	Nitrobenzene	0	---	---	---		<0.00240	<0.00240	<0.00240
87-86-5	Pentachlorophenol	0	---	---	---		<0.0210	<0.0210	<0.0210
110-86-1	Pyridine	0	---	---	---		<0.00410	<0.00410	<0.00410
127-18-4	Tetrachloroethylene	0	---	---	---		<0.0870	<0.0870	<0.0870
79-01-6	Trichloroethylene	0	---	---	---		<0.0820	<0.0820	<0.0820
95-95-4	2,4,5-Trichlorophenol	0	---	---	---		<0.00310	<0.00310	<0.00310
88-06-2	2,4,6-Trichlorophenol	0	---	---	---		<0.00270	<0.00270	<0.00270
75-01-4	Vinyl Chloride	0	---	---	---		<0.0190	<0.0190	<0.0190
Herbicides (mg/kg)		0							
93-76-5	2,4,5-T	0	---	---	---		<0.0834	<0.0822	<0.0918
93-72-1	2,4,5-TP (Silvex)	11	630	---	11	11	<0.0878	<0.0866	<0.0967
94-75-7	2,4-D	1.5	780	---	1.5	1.5	<0.0970	<0.0956	<0.107
Other		0							
	pH (SU)	0	---	---	---		**8.6**	**8.4**	**8.6**
	Flashpoint (F°)	0	---	---	---		>215	>215	>215
	Paint Filter	0	---	---	---		**Pass**	**Pass**	**Pass**

Notes:
CAS = Chemical Abstract Service
VOCs = volatile organic compounds
SVOC - semivolatile organic compounds
PCBs = polychlorinated biphenyls
TCLP = toxicity characteristic leaching procedure
mg/kg = milligrams per kilogram
mg/L = milligrams per Liter
SU = Standard units
F° = degrees Fahrenheit
BOLD = constituents detected above the method detection limit
Screening level is the minimum of the Residential and Soil component of the groundwater ingestion exposure route values.
= Exceedance of Screening Level

Figure 135. Table. Comparison of analytical data to screening levels (sheet# 8) (WESTON, 2020).

APPENDIX G: ROCKTON, ILLINOIS SUPPLEMENTS

Due to the existence of a potential upstream source of contamination in the Rock River in Illinois, WOOD Environment & Infrastructure Solutions, Inc. (2020-a) was tasked by IDOT to complete a preliminary site investigation of potential environmental impacts associated with the improvement to IL Route 2 over the Rock River, in the Village of Rockton, Winnebago County, Illinois. There is no information on construction depth or excavation quantities and the maximum depth of drilling capability was 10 ft below grade. Field investigation activities were completed by WOOD between October 7–8, 2020.

The source of contamination was anticipated because of the existence of Sonoco Products property which is the former location of a paperboard manufacturer (operated from 1963 until it closed in December 2008) situated on the north bank of the Rock River in the central portion of Rockton, Winnebago County, Illinois. The location of the Sonoco facility was first developed as a paper mill in 1851. The Sonoco Products site is approximately five (5) acres in size; the Rock River is located immediately to the south of the facility. Surface water runoff from the site follows the topography which slopes downward in elevation towards the south. The field investigation for this project included screening and sampling soil at the locations depicted on Figure 136 and Figure 137. ISWS collected 8 sediment cores from a boat using a vibracore rig (Figure 136 and Figure 137) where four cores were collected upstream, and 4 cores were collected downstream, from the IL Route 2 bridge (WOOD, 2020-a).

Samples collected via vibracore drilling on the ISWS vessel and transported to WOOD personnel located on the shore of the waterway. All samples were screened for volatile organic compounds (VOCs) using a photoionization detector (PID) in the field. evidence of VOCs was not observed during PID headspace screening of site soils. WOOD collected 16 soil samples from the project area for laboratory analysis. Soil samples collected for laboratory analysis were analyzed for VOCs, SVOCs, total metals, toxicity characteristic leaching procedure (TCLP) metals (WOOD, 2020-a).

WOOD also evaluated sample pH levels and the results of PID headspace screening pursuant to 35 IAC 1100.201(g) and 205(b)(1), respectively. Soil pH must be between 6.25 and 9.0 standard units for the soil to be accepted at a clean construction demolition debris (CCDD) facility or an uncontaminated soil fill operation (USFO). Soils with a pH measurement outside of the acceptable range but otherwise not impacted by COCs may be used on-site as fill and/or managed and disposed of off-site in accordance with Article 202.03 (IDOT, 2022).

PID headspace screening results were compared to PID background readings. The PID instrument is accurate to 1 part per million (ppm) between 0 and 100 ppm. The PID was calibrated at the beginning of each field day and re-calibrated as necessary based on changing field conditions (i.e., primary wind direction, temperature, precipitation). Background was established at 0 ppm for this site. Soil exhibiting PID readings above background cannot be accepted by a CCDD/USFO (WOOD, 2020-a).

Figure 136. Arial Photo. Site investigation area (WOOD, 2020-a).

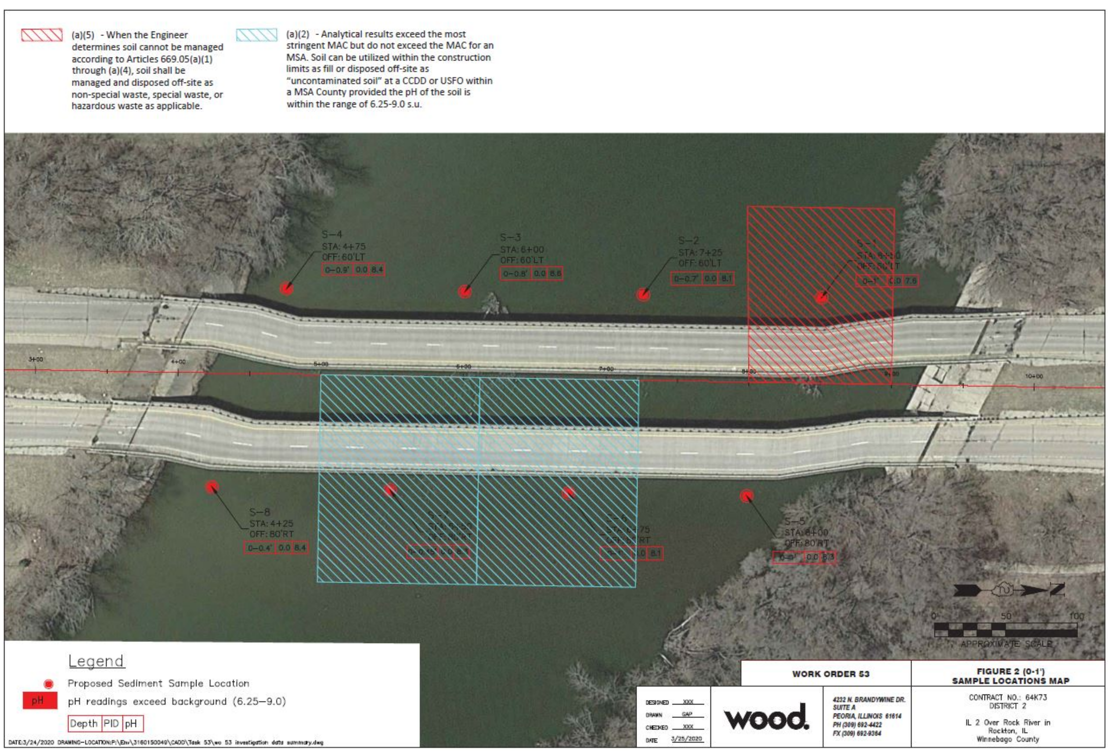


Figure 137. Arial Photo. Proposed Sediment sample location (WOOD, 2020-a).

Nature and Extent of Contamination Above Applicable Criteria at Illinois Route 2

The following analyte were observed (WOOD, 2020-a):

- Benzo(a)pyrene was detected at a concentration exceeding a MAC criterion and the TACO Tier 1 Residential criteria for soil samples submitted from S-1 (0-1’), S-6 (0.09-1.0’) and S-7 (0-0.45’).
- Benzo(b)fluoranthene was detected at a concentration exceeding a MAC criterion and the TACO Tier 1 Residential criteria for soil samples submitted from S-1 (0-1’).
- Dibenz(a,h)anthracene was detected at a concentration exceeding a MAC criteria and the TACO Tier 1 Residential criteria for soil samples submitted from S-1 (0-1’).
- Cadmium was detected at a concentration exceeding a TCLP criteria for soil samples submitted from S-7 (0-0.45’).
- Chromium was detected at a concentration exceeding a MAC criterion for soil samples submitted from S-1 (0-1’).
- Manganese was detected at a concentration exceeding a TCLP criteria for all soil samples submitted for analysis.
- Mercury was detected at a concentration exceeding the Construction Worker Protection criteria for soil sample submitted from S-1 (0-1’).
- No other analyte investigated in accordance with the approved workplan exceeded any applicable criteria.

Table 45 summarizes the constituents of concern that exceed IDOT-specific criteria categories. Table 45 provides a summary of the soil sampling locations, the constituents of concern, the IDOT-specific criteria categories and the IDOT soil and groundwater management classification per Section 669 of the IDOT Standard Specifications (IDOT, 2022). The COCs detected in site soil were compared with TACO Tier 1 ROs for construction worker exposure. Analytical results from samples collected within the proposed excavation area were above the applicable TACO Tier 1 Remediation Objectives for Construction Worker Exposure.

Even though there are no grain size analysis performed, but the boring logs could be used to check the type of soils observed during the investigation. It is clear from Table 45 and from the observed analytes above that all the samples have a manganese concentration exceeding the TACO Tier 1. S-1 (0-1’), S-6 (0.09-1.0’) and S-7 (0-0.45’) also have SVOCs exceeding MAC and TACO Tier 1. Soil boring logs for the eight soil borings, S-1 through S-8 are showing in Figure 138 through Figure 145, respectively. S-1 (0-1’) has dark clay silty clay, S-6 (0.09-1.0’) has fine to coarse gravels with fine sand, and S-7 (0-0.45’) brown fine sand with trace fine gravel. Nevertheless, almost all other samples were found to be brown fine to medium to coarse sand with gravel. Therefore, S-1 (0-1’), S-6 (0.09-1.0’) and S-7 (0-0.45’) are designated with IDOT 669 (a)(5), IDOT 669 (a)(2), and IDOT 669 (a)(2), respectively, while all other samples IDOT classification is unrestrictive. S-1 (0-1’) has to be disposed off in a non-special waste facility while all the other samples are eligible for CCDD or uncontaminated soil fill operation (WOOD, 2020-a).

Table 45. Summary of Soil Impacts and Contaminants of Concern and IDOT Classification (WOOD, 2020-a).

Boring ID	pH	PID Reading	Contaminations of concern above total metal, TCLP, and SPLP criteria	Contaminations of concern above commercial/industrial criteria	Contaminations of concern above TCLP and/or SPLP criteria	Contaminations of concern above MAC	Eligible for CCDD or uncontaminated soil fill operation?	Classification	Article 669.05 of the Standard Specifications for Road and Bridge Construction (IDOT, 2022)
S-1 (0-1')	7.6	0	None	Mercury	Manganese	Benzo(a)pyrene, Chromium, Iron	No	Non-Special waste	Article 669.05 (a)(5)
S-1 (5-9.5')	8.6	0	None	None	Manganese	None	Yes	Unrestrictive	--
S-2 (0-0.7')	8.1	0	None	None	Manganese	None	Yes	Unrestrictive	--
S-1 (0.7-6.4')	8.4	0	None	None	Manganese	None	Yes	Unrestrictive	--
S-3 (0-0.8')	8.6	0	None	None	Manganese	None	Yes	Unrestrictive	--
S-3 (0.8-4.5')	8.6	0	None	None	Manganese	None	Yes	Unrestrictive	--
S-4 (0-0.9')	8.4	0	None	None	Manganese	None	Yes	Unrestrictive	--
S-4 (0.9-4.2')	8.8	0	None	None	Manganese	None	Yes	Unrestrictive	--
S-5 (0-1')	8.3	0	None	None	Manganese	None	Yes	Unrestrictive	--
S-5 (1.9-4.3')	8.3	0	None	None	Manganese	None	Yes	Unrestrictive	--
S-6 (0.09-1')	8.1	0	None	None	Manganese	Benzo(a)pyrene	Yes	Uncontaminated	Article 669.05 (a)(2)
S-6 (1-2.7')	8.3	0	None	None	Manganese	None	Yes	Unrestrictive	--
S-7 (0-0.45')	8.3	0	None	None	Cadmium, Manganese	Benzo(a)pyrene	Yes	Uncontaminated	Article 669.05 (a)(2)
S-7 (0.45-2.8')	8.5	0	None	None	Manganese	None	Yes	Unrestrictive	--
S-8 (0-0.4')	8.4	0	None	None	Manganese	None	Yes	Unrestrictive	--
S-8 (0.4-1.9')	8.6	0	None	None	Manganese	None	Yes	Unrestrictive	--

IDOT 669-05 (a-2): The excavated soil can be utilized within the right-of-way as embankment or fill, when suitable, or managed and disposed of at a clean construction and demolition debris (CCDD) facility or an uncontaminated soil fill operation (USFO) within an MSA County provided the pH of the soil is within the range of 6.25 - 9.0, inclusive.

IDOT 669-05 (a-5): When the Engineer determines soil cannot be managed according to Articles 699.05(a)(1) through (a)(4) of the Standard Specifications for Road and Bridge Construction (IDOT, 2022) and the materials do not contain special waste or hazardous waste, as determined by the Engineer, the soil shall be managed and disposed of at a landfill as a non-special waste.

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BORING NUMBER S-1

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CLIENT IDOT	**PROJECT NAME** W.O. 53
PROJECT NUMBER 3160150049.53	**PROJECT LOCATION** ROCKTON, IL
DATE STARTED 10/7/20 **COMPLETED** 10/7/20	**GROUND SURFACE ELEVATION** ____ **HOLE SIZE** 2
DRILLING CONTRACTOR ISWS	**GROUND WATER LEVELS:**
DRILLING METHOD VIBRACORE	**AT TIME OF DRILLING** ---
LOGGED BY R. PLETZ **CHECKED BY** J. STRICKLIN	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS		MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S-1 (0-1')	12	0.0		1.0	DARK GREY SILTY SLAY, WET, TRACE FINE GRAVEL AND MEDIUM GRAINED SAND	
					1.2	BROWN MEDIUM TO FINE GRAINED SAND, TRACE FINE GRAVEL AT BOTTOM, MEDIUM DENSE BECOMING LOOSE, WET	
	GB S-1 (5'-9.5')	43	0.0			NO RECOVERY	
5			0.0		5.0	COARSE SAND WITH SOME FINE SAND AND FINE TO COARSE GRAVELS, TRACE SMALL COBBLES, LOOSE, WET	
			0.0		9.3	Bottom of Boring	

AMECFW TEMPLATE ROCKTON.GPJ GINT STD US.GDT 12/11/20

Figure 138. Illustration. Soil boring log for sample S-1 (WOOD, 2020-a).

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BORING NUMBER S-2
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CLIENT IDOT	**PROJECT NAME** W.O. 53
PROJECT NUMBER 3160150049.53	**PROJECT LOCATION** ROCKTON, IL
DATE STARTED 10/7/20 **COMPLETED** 10/7/20	**GROUND SURFACE ELEVATION** ____ **HOLE SIZE** 2
DRILLING CONTRACTOR ISWS	**GROUND WATER LEVELS:**
DRILLING METHOD VIBRACORE	**AT TIME OF DRILLING** ---
LOGGED BY R. PLETZ **CHECKED BY** J. STRICKLIN	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S-2 (0-0.7')	8	0.0		BROWN FINE TO COARSE SAND, TRACE FINE GRAVEL AND COBBLES, MOIST TO WET, LOOSE	
	GB S-2 (0.7'-6.4')	68	0.0			
5			0.0			
			0.0	6.4	Bottom of Boring	

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Figure 139. Illustration. Soil boring log for sample S-2 (WOOD, 2020-a).

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BORING NUMBER S-3

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CLIENT IDOT

PROJECT NAME W.O. 53

PROJECT NUMBER 3160150049.53

PROJECT LOCATION ROCKTON, IL

DATE STARTED 10/7/20 **COMPLETED** 10/7/20

GROUND SURFACE ELEVATION **HOLE SIZE** 2

DRILLING CONTRACTOR ISWS

GROUND WATER LEVELS:

DRILLING METHOD VIBRACORE

AT TIME OF DRILLING ---

LOGGED BY R. PLETZ **CHECKED BY** J. STRICKLIN

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S-3 (0-0.8')	10	0.0		BROWN FINE TO COARSE SAND, COMMING FINE TO COARSE GRAVELS, TRACE FINE COBBLES, MOIST TO WET, LOOSE	
	GB S-3 (0.8'-4.5')	44	0.0			
			0.0			
4.5			0.0		Bottom of Boring	

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Figure 140. Illustration. Soil boring log for sample S-3 (WOOD, 2020-a).

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BORING NUMBER S-4

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CLIENT IDOT

PROJECT NAME W.O. 53

PROJECT NUMBER 3160150049.53

PROJECT LOCATION ROCKTON, IL

DATE STARTED 10/7/20 **COMPLETED** 10/7/20

GROUND SURFACE ELEVATION **HOLE SIZE** 2

DRILLING CONTRACTOR ISWS

GROUND WATER LEVELS:

DRILLING METHOD VIBRACORE

AT TIME OF DRILLING ---

LOGGED BY R. PLETZ **CHECKED BY** J. STRICKLIN

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S-4 (0-0.9')	11	0.0		BROWN FINE SAND, TRACE COARSE SAND AND FINE GRAVEL, TRACE CLAM SHELLS, MOIST TO WET, LOOSE	
			0.0			
	GB S-4 (0.9-4.2')	38	0.0			
			0.0	4.2	Bottom of Boring	

AMECFWTEMPLATE ROCKTON.GPJ GINT STD US.GDT 12/11/20

Figure 141. Illustration. Soil boring log for sample S-4 (WOOD, 2020-a).

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BORING NUMBER S-5

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CLIENT IDOT | **PROJECT NAME** W.O. 53

PROJECT NUMBER 3160150049.53 | **PROJECT LOCATION** ROCKTON, IL

DATE STARTED 10/7/20 **COMPLETED** 10/7/20 | **GROUND SURFACE ELEVATION** ____ **HOLE SIZE** 2

DRILLING CONTRACTOR ISWS | **GROUND WATER LEVELS:**

DRILLING METHOD VIBRACORE | **AT TIME OF DRILLING** ---

LOGGED BY R. PLETZ **CHECKED BY** J. STRICKLIN | **AT END OF DRILLING** ---

NOTES | **AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS		MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S-5 (0-1')	12	0.0			DARK BROWN MEDIUM TO FINE SAND, TRACE FINE TO COARSE GRAVEL, SLIGHTLY SILTY SAND LENS AT 1.1'-1.28', MOIST TO WET, LOOSE	
			0.0		1.8	BROWN COARSE SAND WITH COMMON FINE TO COARSE GRAVEL, MOIST TO WET, LOOSE	
	GB S-5 (1.9'-4.3')	29	0.0		3.2	BROWN FINE TO MEDIUM SAND, TRACE FINE GRAVEL AND COARSE SAND, MOIST, LOOSE	
			0.0		4.3	Bottom of Boring	

AMECFWTEMPLATE ROCKTON.GPJ GINT STD US.GDT 12/11/20

Figure 142. Illustration. Soil boring log for sample S-5 (WOOD, 2020-a).

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BORING NUMBER S-6
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CLIENT IDOT
PROJECT NAME W.O. 53
PROJECT NUMBER 3160150049.53
PROJECT LOCATION ROCKTON, IL
DATE STARTED 10/7/20 **COMPLETED** 10/7/20
GROUND SURFACE ELEVATION **HOLE SIZE** 2
DRILLING CONTRACTOR ISWS
GROUND WATER LEVELS:
DRILLING METHOD VIBRACORE
AT TIME OF DRILLING ---
LOGGED BY R. PLETZ **CHECKED BY** J. STRICKLIN
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0						
	GB S-6 (0.09'-1')	12	0.0	0.1	DARK BROWN FINE SAND, LARGE SHELLS, TRACE FINE GRAVEL, LOOSE	
	GB S-6 (1'-2.7')	20	0.0 0.0	2.7	FINE TO COARSE GRAVELS WITH FINE SAND, MOIST, LOOSE	
					Bottom of Boring	

AMECFWTEMPLATE ROCKTON.GPJ GINT STD US.GDT 12/11/20

Figure 143. Illustration. Soil boring log for sample S-6 (WOOD, 2020-a).

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BORING NUMBER S-7
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CLIENT IDOT | **PROJECT NAME** W.O. 53
PROJECT NUMBER 3160150049.53 | **PROJECT LOCATION** ROCKTON, IL
DATE STARTED 10/8/20 **COMPLETED** 10/8/20 | **GROUND SURFACE ELEVATION** **HOLE SIZE** 2
DRILLING CONTRACTOR ISWS | **GROUND WATER LEVELS:**
DRILLING METHOD VIBRACORE | **AT TIME OF DRILLING** ---
LOGGED BY R. PLETZ **CHECKED BY** J. STRICKLIN | **AT END OF DRILLING** ---
NOTES | **AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S-7 (0-0.45')	0.45	0.0		0.5 BROWN FINE SAND WITH TRACE FINE GRAVEL, MOIST TO WET, LOOSE	
		16	0.0			
	GB S-7 (0.45'-2.8')		0.0		2.8 BROWN INTERBEDDED COARSE, MEDIUM, AND FINE SAND, COMMON FINE TO MEDIUM GRAVEL, TRACE COARSE GRAVEL AND COBBLES	
					Bottom of Boring	

AMECFWTEMPLATE ROCKTON.GPJ GINT STD US.GDT 12/11/20

Figure 144. Illustration. Soil boring log for sample S-7 (WOOD, 2020-a).

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BORING NUMBER S-8

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CLIENT IDOT	**PROJECT NAME** W.O. 53
PROJECT NUMBER 3160150049.53	**PROJECT LOCATION** ROCKTON, IL
DATE STARTED 10/8/20 **COMPLETED** 10/8/20	**GROUND SURFACE ELEVATION** **HOLE SIZE** 2
DRILLING CONTRACTOR ISWS	**GROUND WATER LEVELS:**
DRILLING METHOD VIBRACORE	**AT TIME OF DRILLING** ---
LOGGED BY R. PLETZ **CHECKED BY** J. STRICKLIN	**AT END OF DRILLING** ---
NOTES	**AFTER DRILLING** ---

DEPTH (ft.)	SAMPLE TYPE	RECOVERY (in.)	PID (ppm)	USCS	MATERIAL DESCRIPTION	WELL DIAGRAM
0	GB S-8 (0-0.4')	0.4	0.0		0.4 BROWN FINE TO MEDIUM SAND, COMMON FINE GRAVEL, WET, LOOSE	
	GB S-8 (0.4'-1.9')	1.5	0.0		1.9 BROWN MEDIUM TO COARSE SAND, COMMON FINE TO COARSE GRAVELS, TRACE COBBLES, MOIST, LOOSE	
			0.0		Bottom of Boring	

AMECFWTEMPLATE ROCKTON.GPJ GINT STD US.GDT 12/11/20

Figure 145. Illustration. Soil boring log for sample S-8 (WOOD, 2020-a).

Figure 146 and Figure 147 provide a comparison of analytical results for soil with applicable regulatory criteria. Analytes detected at concentrations above applicable regulatory criteria in project area soil are considered contaminants of concern (COC). In these figures, analyte concentrations identified in soil borings were compared to the Maximum Allowable Concentrations (MAC) of Chemical Constituents in Uncontaminated Soil Used as Fill Material at regulated Fill Operations presented in 35 Illinois Administrative Code (IAC) Part 1100, Subpart F. The total concentration of the analyte was completed when a MAC for an inorganic analyte was based on the 35 IAC Tiered Approach to Corrective Action Objectives (TACO) Class I soil component of the groundwater ingestion exposure route (SCGIER) (35 IAC Part 742). Results from the TCLP and SPLP analyses were independently compared with the TACO Class I SCGIER for analytes included in 35 IAC Part 742 (Residential Properties). The analyte was considered to exceed a MAC if the Total results exceed the applicable criteria. Additionally, if the TCLP and SPLP concentrations, for a given constituent, exceeded the TACO Soil Remediation Objective (SRO) for the Soil Component of the Groundwater Ingestion Exposure Route, the constituent was considered a contaminant of concern (WOOD, 2020-a).

Sample ID	S-1 (0-1')	S-1 (5-9.5')	S-2 (0-.7')	S-2 (.7-6.4')	S-3 (0-.8')	S-3 (.8-4.5')	S-4 (.9-4.2')	S-4 (0-.9')	Maximum Allowable Concentrations							TACO Remediation Objectives	
Sample Depth (ft)	0-1	5-9.5	0-0.7	0.7-6.4	0-0.8	0.8-4.5	0.9-4.2	0-0.9	Most Stringent Maximum Allowable Concentration [1]	Within Chicago Corporate Limits [2]	Within a Populated Area in a MSA (excluding Chicago) [3]	Within a MSA County [4]	Within a Populated Area in a non-MSA County [5]	Outside a Populated Area [6]	Within a non-MSA County [7]	Most Stringent TACO Tier 1 Construction Worker Exposure Objective [8]	Most Stringent TACO Tier 1 Residential Objective [9] and Groundwater Protection (TCLP/SPLP) [10]
Sample Date	10/07/2020	10/07/2020	10/07/2020	10/07/2020	10/07/2020	10/07/2020	10/07/2020	10/07/2020									
PID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0									
Sample pH	7.6	8.6	8.1	8.4	8.6	8.6	8.8	8.4									
Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment									
IDOT 669 Designation	(a)(5)	Unrestrictive	Unrestrictive	Unrestrictive	Unrestrictive	Unrestrictive	Unrestrictive	Unrestrictive									
VOCs (mg/kg)																	
Methylene Chloride	<0.0087	0.0017 J	<0.0044	<0.0040	<0.0041	<0.0043	<0.0046	<0.0046	0.02	NA	NA	NA	NA	NA	NA	24	13
Tetrachloroethene	0.0019 J	0.00062 J	0.00077 J	0.00067 J	<0.0017	<0.0017	<0.0018	<0.0018	0.06	NA	NA	NA	NA	NA	NA	20	11
SVOCs (mg/kg)																	
Acenaphthene	0.052 J	<0.034	<0.038	<0.036	<0.034	<0.036	<0.035	<0.038	570	NA	NA	NA	NA	NA	NA	120,000	4,700
Acenaphthylene	0.075	<0.034	<0.038	<0.036	<0.034	<0.036	<0.035	<0.038	NA	NA	NA	NA	NA	NA	NA	–	–
Anthracene	0.12	<0.034	<0.038	<0.036	<0.034	<0.036	<0.035	<0.038	12,000	NA	NA	NA	NA	NA	NA	610,000	23,000
Benzo[a]anthracene	0.72	<0.034	0.023 J	<0.036	0.0050 J	<0.036	<0.035	0.013 J	0.9	1.1	1.8	NA	0.9	0.9	NA	170	0.9
Benzo[a]pyrene	1.3 1,5,6,9	<0.034	0.031 J	<0.036	<0.034	<0.036	<0.035	0.014 J	0.09	1.3	2.1	NA	0.98	0.09	NA	17	0.09
Benzo[b]fluoranthene	1.5 1,5,6,9	<0.034	0.038	<0.036	<0.034	<0.036	<0.035	0.016 J	0.9	1.5	2.1	NA	0.9	0.9	NA	170	0.9
Benzo[g,h,i]perylene	0.64	<0.034	0.024 J	<0.036	<0.034	<0.036	<0.035	<0.038	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[k]fluoranthene	0.89	<0.034	0.015 J	<0.036	<0.034	<0.036	<0.035	<0.038	9	NA	NA	NA	NA	NA	NA	1,700	9
Butyl benzyl phthalate	0.95	<0.17	<0.19	<0.18	<0.17	<0.18	<0.18	<0.19	930	NA	NA	NA	NA	NA	NA	930	930
Chrysene	0.82	<0.034	0.025 J	<0.036	<0.034	<0.036	<0.035	0.014 J	88	NA	NA	NA	NA	NA	NA	17,000	88
Dibenz(a,h)anthracene	0.20 1,7,9	<0.034	<0.038	<0.036	<0.034	<0.036	<0.035	<0.038	0.09	0.2	0.42	NA	NA	NA	0.15	0.8	0.09
Fluoranthene	0.79	<0.034	0.030 J	<0.036	<0.034	<0.036	<0.035	0.014 J	3,100	NA	NA	NA	NA	NA	NA	82,000	3,100
Fluorene	0.045 J	<0.034	<0.038	<0.036	<0.034	<0.036	<0.035	<0.038	560	NA	NA	NA	NA	NA	NA	82,000	3,100
Indeno(1,2,3-cd)pyrene	0.63	<0.034	0.021 J	<0.036	<0.034	<0.036	<0.035	<0.038	0.9	0.9	1.6	NA	0.9	0.9	NA	170	0.9
2-Methylnaphthalene	0.026 J	<0.069	<0.078	<0.073	<0.070	<0.073	<0.072	<0.076	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	0.022 J	<0.034	<0.038	<0.036	<0.034	<0.036	<0.035	<0.038	1.8	0.04	0.2	NA	NA	0.17	NA	1.8	170
Phenanthrene	0.34	<0.034	0.011 J	<0.036	<0.034	<0.036	<0.035	<0.038	0.99	1.3	2.5	NA	2.5	0.99	NA	NA	NA
Pyrene	0.93	<0.034	0.034 J	<0.036	<0.034	<0.036	<0.035	0.018 J	2,300	NA	NA	NA	NA	NA	NA	61,000	2,300
Pesticides (mg/kg)																	
4,4'-DDD	0.0085	<0.0018 F2 F1	<0.0020	<0.0019	<0.0019	<0.0019	<0.0019	<0.0020	2	NA	NA	NA	NA	NA	NA	17	2
Inorganics (mg/kg)																	
Antimony	0.36 J	<0.98	<1.1	<1.1	<1.1	<1.0	<1.0	<1.1	5	NA	NA	NA	NA	NA	NA	82	31
Arsenic	3.4	1.0	1.0	1.5	0.88	0.60	1.5	0.67	11.3	NA	NA	13.0	NA	NA	11.3	61	750
Barium	79	5.8	15	10	16	5.0	7.1	10	1,500	NA	NA	NA	NA	NA	NA	14,000	5,500
Beryllium	0.55	0.12 J	0.090 J	0.10 J	0.11 J	0.077 J	0.18 J	0.097 J	22	NA	NA	NA	NA	NA	NA	410	160
Cadmium	0.81	0.057 J	0.076 J	0.061 J	0.071 J	0.057 J	0.049 J	0.11	5.2	NA	NA	NA	NA	NA	NA	200	78
Chromium	27 1	5.4	4.3	4.3	3.6	3.3	6.1	3.8	21	NA	NA	NA	NA	NA	NA	690	230
Cobalt	5.4	1.7	1.4	1.4	2.1	1.1	2.8	1.4	20	NA	NA	NA	NA	NA	NA	12,000	4,700
Copper	24	2.9	2.0	2.0	2.0	1.8	3.8	1.2	2,900	NA	NA	NA	NA	NA	NA	8,200	2,900
Iron	12000 B	3600 B	3300 B	3700 B	3800 B	2600 B	5800 B	3000 B	15,000	NA	NA	15,900	NA	NA	15,000	NA	NA
Lead	42	1.9	6.0	2.0	3.9	1.5	2.5	3.7	107	NA	NA	NA	NA	NA	NA	700	400
Manganese	200	95	210	180	360	79	120	110	630	NA	NA	636	NA	NA	630	4,100	1,600
Mercury	0.42 8	<0.016	0.026	<0.017	<0.017	<0.018	<0.017	<0.018	0.89	NA	NA	NA	NA	NA	NA	0.1	10
Nickel	15	4.8	3.3	3.1	3.4	2.6	5.1	2.8	100	NA	NA	NA	NA	NA	NA	4,100	1,600
Selenium	<0.79	<0.49	<0.55	<0.55	<0.55	<0.52	<0.52	<0.54	1.3	NA	NA	NA	NA	NA	NA	1,000	390
Silver	0.51	<0.24	<0.27	<0.27	<0.27	<0.26	<0.26	<0.27	4.4	NA	NA	NA	NA	NA	NA	1,000	390
Thallium	<0.79	<0.49	<0.55	<0.55	<0.55	<0.52	<0.52	<0.54	2.6	NA	NA	NA	NA	NA	NA	160	6.3
Vanadium	22	7.3	7.1	10	9.4	5.3	11	7.5	550	NA	NA	NA	NA	NA	NA	1,400	550
Zinc	84	8.8	8.3	6.0	7.6	4.5	11	11	5,100	NA	NA	NA	NA	NA	NA	61,000	23,000
TCLP Metals (mg/L)																	
Antimony	<0.0060 ^	<0.0060 ^	<0.0060 ^	<0.0060 ^	<0.0060 ^	<0.0060 ^	<0.0060 ^	<0.0060 ^	–	–	–	–	–	–	--	–	0.006
Arsenic	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	–	–	–	–	–	–	--	–	0.05
Barium	0.45 J	0.072 J	0.17 J	0.090 J	0.17 J	0.081 J	0.088 J	0.18 J	–	–	–	–	–	–	--	–	2
Beryllium	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	–	–	–	–	–	–	--	–	0.004
Cadmium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0022 J	–	–	–	–	–	–	--	–	0.005
Chromium	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	–	–	–	–	–	–	--	–	0.1
Cobalt	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	–	–	–	–	–	–	--	–	1
Copper	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	–	–	–	–	–	–	--	–	0.65
Iron	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	–	–	–	–	–	–	--	–	5
Lead	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	–	–	–	–	–	–	--	–	0.0075
Manganese	0.34 10	0.57 10	0.53 10	0.74 10	1.0 10	0.76 10	0.66 10	1.3 10	–	–	–	–	–	–	--	–	0.15
Mercury	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	–	–	–	–	–	–	--	–	0.002
Nickel	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	–	–	–	–	–	–	--	–	0.1
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	–	–	–	–	–	–	--	–	0.05
Silver	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	–	–	–	–	–	–	--	–	0.05
Thallium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	–	–	–	–	–	–	--	–	0.002
Vanadium	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	–	–	–	–	–	–	--	–	0.049
Zinc	0.035 J	<0.50	0.025 J	<0.50	0.024 J	<0.50	<0.50	0.071 J	–	–	–	–	–	–	--	–	5
SPLP Metals (mg/L)																	
Manganese	0.13	<0.025	0.051	<0.025	<0.025	<0.025	<0.025	0.029	–	–	–	–	–	–	--	–	0.15

Notes:

NA= Not available
ND= Not detected above laboratory reporting limit
NT= Not tested
mg/kg= Milligrams per kilogram
mg/L= Milligrams per liter
TCLP= Toxicity Characteristic Leaching Procedure
SPLP= Synthetic Precipitation Leaching Procedure
MAC= Maximum Allowable Concentrations of Chemical Constituents in Uncontaminated Soil Used as Fill Material at Regulated Fill Operations (35 Ill. Adm. Code 110, Subpart F).
TACO = Tiered Approach to Corrective Action Objectives

*= Laboratory Control Sample (LCS) or Laboratory Control Sample Duplicate (LCSD) is outside acceptance limits.
^= Instrument related QC is outside acceptance limits.
B= Compound was found in the blank and sample.
J= Result is less than the reporting limit but greater than or equal to the method detection limit, concentration reported as an approximate value.
F1= Matrix spike or matrix spike duplicate recovery is outside acceptance limits.
F2= Matrix spike or matrix spike duplicate relative percent difference exceeds control limits.
CCDD = Clean Construction Demolition Debris

Applicable Screening Criteria

[1] Exceeds the most stringent MAC value (35 IAC (1100.605(a))
[2] Exceeds the Chicago Corporate Limits MAC values
[3] Exceeds the Within a Populated Area in a MSA (excluding Chicago) MAC value
[4] Exceeds the Within a MSA County MAC value
[5] Exceeds the Within a Populated Area in a non-MSA County MAC value
[6] Exceeds the Outside a Populated Area MAC value
[7] Exceeds the Within a non-MSA County MAC value
[8] Exceeds the Most Stringent TACO Tier 1 Construction Worker Exposure Objective
[9] Exceeds the Most Stringent TACO Tier 1 Residential Objective
[10] Exceeds the TACO Tier 1 Soil to Groundwater TCLP/SPLP Objective

PID value detected above background or pH value outside the acceptable range (6.25 to 9.0) but can be managed on-Site.
Unrestrictive- metals exceed Totals but not TCLP and SPLP; or metals exceed TCLP or SPLP but not both
CCDD Eligible- metals exceed TCLP and SPLP but not Totals
CCDD Eligible- VOCs or SVOCs exceedances; limited CCDD disposal availability
Greater than TACO Construction Worker Exposure Objectives
Non-special Waste- Greater than all MACs, Greater than most stringent TACO Tier 1 Criteria; Metals exceed Totals, TCLP, and SPLP; Metals exceed

Figure 146. Table. Comparison of analytical data to screening levels (Sheet #1) (WOOD, 2020-a).

Sample ID	S-5 (0-1')	S-5 (1.9-4.3')	S-6 (0.09-1.0')	S-6 (1-2.7')	S-7 (0'-.45')	S-7 (.45'-2.8')	S-8 (0'-.4')	S-8 (.4'-1.9')	Maximum Allowable Concentrations: Most Stringent Maximum Allowable Concentration [1]	Within Chicago Corporate Limits [2]	Within a Populated Area in a MSA (excluding Chicago) [3]	Within a MSA County [4]	Within a Populated Area in a non-MSA County [5]	Outside a Populated Area [6]	Within a non-MSA County [7]	TACO Remediation Objectives: Most Stringent TACO Tier 1 Construction Worker Exposure Objective [8]	Most Stringent TACO Tier 1 Residential Objective [9] and Groundwater Protection
Sample Depth (ft)	0-1	1.9-4.3	0-1	1-2.7	0-0.45	0.45-2.8	0-0.4	0.4-1.9									
Sample Date	10/07/2020	10/07/2020	10/07/2020	10/07/2020	10/08/2020	10/08/2020	10/08/2020	10/08/2020									
PID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0									
Sample pH	8.3	8.3	8.1	8.3	8.3	8.5	8.4	8.6									
Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment									
IDOT 669 Designation	Unrestrictive	Unrestrictive	(a)(2)	Unrestrictive	(a)(2)	Unrestrictive	Unrestrictive	Unrestrictive									
VOCs (mg/kg)																	
Acetone	<0.018	<0.019	<0.017	<0.017	<0.018	<0.018	<0.018	0.014 J	25	NA	NA	NA	NA	NA	NA	100,000	70,000
Methylene Chloride	<0.0045	<0.0047	<0.0043	<0.0041	<0.0044	<0.0044	<0.0046	0.0028 J	0.02	NA	NA	NA	NA	NA	NA	24	13
SVOCs (mg/kg)																	
Acenaphthene	<0.038	<0.039	<0.039	0.0083 J	0.015 J	<0.036	<0.039	<0.036	570	NA	NA	NA	NA	NA	NA	120,000	4,700
Acenaphthylene	<0.038	<0.039	0.018 J	0.0079 J	0.013 J	<0.036	<0.039	<0.036	NA	NA	NA	NA	NA	NA	NA	--	--
Anthracene	<0.038	<0.039	0.033 J	0.037	0.041	<0.036	<0.039	<0.036	12,000	NA	NA	NA	NA	NA	NA	610,000	23,000
Benzo[a]anthracene	0.032 J	0.0097 J	0.11	0.10	0.13	0.0057 J	<0.039	<0.036	0.9	1.1	1.8	NA	0.9	0.9	NA	170	0.9
Benzo[a]pyrene	0.038	0.0095 J	0.12 1,6,9	0.085	0.092 1,6,9	<0.036	<0.039	<0.036	0.09	1.3	2.1	NA	0.98	0.09	NA	17	0.09
Benzo[b]fluoranthene	0.051	0.011 J	0.14	0.090	0.092	<0.036	<0.039	<0.036	0.9	1.5	2.1	NA	0.9	0.9	NA	170	0.9
Benzo[g,h,i]perylene	0.027 J	<0.039	0.077	0.041	0.079	<0.036	<0.039	<0.036	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[k]fluoranthene	0.020 J	<0.039	0.053	0.042	0.034 J	<0.036	<0.039	<0.036	9	NA	NA	NA	NA	NA	NA	1,700	9
Chrysene	0.033 J	<0.039	0.11	0.097	0.12	<0.036	<0.039	<0.036	88	NA	NA	NA	NA	NA	NA	17,000	88
Dibenz[a,h]anthracene	<0.038	<0.039	0.024 J	0.013 J	0.035 J	<0.036	<0.039	<0.036	0.09	0.2	0.42	NA	0.15	0.09	NA	17	0.09
Fluoranthene	0.046	0.014 J	0.18	0.18	0.22	<0.036	<0.039	<0.036	3,100	NA	NA	NA	NA	NA	NA	82,000	3,100
Fluorene	<0.038	<0.039	0.0090 J	0.013 J	0.028 J	<0.036	<0.039	<0.036	560	NA	NA	NA	NA	NA	NA	82,000	3,100
Indeno[1,2,3-cd]pyrene	0.024 J	<0.039	0.069	0.038	0.045	<0.036	<0.039	<0.036	0.9	0.9	1.6	NA	0.9	0.9	NA	170	0.9
2-Methylnaphthalene	<0.078	<0.079	<0.078	<0.074	0.0090 J	<0.074	<0.079	<0.072	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	<0.038	<0.039	<0.039	0.0072 J	0.034 J	<0.036	<0.039	<0.036	1.8	0.04	0.2	NA	NA	0.17	NA	1.8	170
Phenanthrene	0.016 J	0.0061 J	0.093	0.10	0.13	<0.036	<0.039	<0.036	0.99	1.3	2.5	NA	2.5	0.99	NA	NA	NA
Pyrene	0.050	0.013 J	0.18	0.15	0.19	0.013 J	<0.039	<0.036	2,300	NA	NA	NA	NA	NA	NA	61,000	2,300
Pesticides (mg/kg)																	
4,4'-DDE	0.00057 J	<0.0020	0.013	<0.0019	<0.0019	<0.0019	<0.0020	<0.0019	2	NA	NA	NA	NA	NA	NA	17	2
4,4'-DDT	<0.0020	<0.0020	0.042	<0.0019	<0.0019	<0.0019	<0.0020	<0.0019	2	NA	NA	NA	NA	NA	NA	17	2
Inorganics (mg/kg)																	
Antimony	<1.1	<1.1	0.27 J	0.29 J	<1.1	<1.1	<1.1	<1.1	5	NA	NA	NA	NA	NA	NA	82	31
Arsenic	1.6	0.79	1.0	1.9	0.72	1.4	1.1	0.84	11.3	NA	NA	13.0	NA	NA	11.3	61	750
Barium	15	6.1	21	11	17	14	8.1	6.6	1,500	NA	NA	NA	NA	NA	NA	14,000	5,500
Beryllium	0.20 J	0.12 J	0.13 J	0.095 J	0.091 J	0.13 J	0.11 J	0.13 J	22	NA	NA	NA	NA	NA	NA	410	160
Cadmium	0.13	0.064 J	0.071 J	0.073 J	0.23	0.060 J	0.046 J	0.064 J	5.2	NA	NA	NA	NA	NA	NA	200	78
Chromium	6.3	4.8	4.9	3.9	3.7	4.2	9.9	5.5	21	NA	NA	NA	NA	NA	NA	690	230
Cobalt	1.9	1.4	1.5	1.8	1.6	1.7	1.9	1.6	20	NA	NA	NA	NA	NA	NA	12,000	4,700
Copper	4.9	2.9	3.2	6.6	1.7	2.7	2.8	2.5	2,900	NA	NA	NA	NA	NA	NA	8,200	2,900
Iron	4400 B	3200 B	4700 B	4400 B	2700 B	4200 B	3600 B	3700 B	15,000	NA	NA	15,900	NA	NA	15,000	NA	NA
Lead	7.9	2.2	9.5	5.4	4.9	2.4	1.7	1.9	107	NA	NA	NA	NA	NA	NA	700	400
Manganese	97	79	190	140	280	210	130	110	630	NA	NA	636	NA	NA	630	4,100	1,600
Mercury	0.0095 J	<0.019	0.015 J	0.0064 J	0.0090 J	<0.017	<0.018	<0.017	0.89	NA	NA	NA	NA	NA	NA	0.1	10
Nickel	4.7	3.2	4.3	12	3.4	4.2	7.3	4.0	100	NA	NA	NA	NA	NA	NA	4,100	1,600
Selenium	<0.55	<0.57	<0.58	<0.52	<0.57	<0.53	<0.55	<0.54	1.3	NA	NA	NA	NA	NA	NA	1,000	390
Silver	<0.28	<0.28	<0.29	<0.26	<0.29	<0.26	<0.27	<0.27	4.4	NA	NA	NA	NA	NA	NA	1,000	390
Thallium	<0.55	<0.57	<0.58	<0.52	<0.57	<0.53	0.28 J	<0.54	2.6	NA	NA	NA	NA	NA	NA	160	6.3
Vanadium	8.1	6.4	7.8	8.3	6.6	11	7.8	6.6	550	NA	NA	NA	NA	NA	NA	1,400	550
Zinc	19	6.3	31	7.0	9.3	8.9	9.0	7.7	5,100	NA	NA	NA	NA	NA	NA	61,000	23,000
TCLP Metals (mg/L)																	
Antimony	<0.0060 ^	<0.0060 ^	<0.0060 ^	<0.0060 ^	<0.0060	<0.0060	<0.0060	<0.0060	--	--	--	--	--	--	--	--	0.006
Arsenic	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	--	--	--	--	--	--	--	0.05
Barium	0.12 J	0.071 J	0.20 J	0.14 J	0.27 J	0.15 J	0.12 J	0.11 J	--	--	--	--	--	--	--	--	2
Beryllium	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	--	--	--	--	--	--	--	--	0.004
Cadmium	<0.0050	<0.0050	<0.0050	<0.0050	0.0054 10	<0.0050	<0.0050	<0.0050	--	--	--	--	--	--	--	--	0.005
Chromium	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	--	--	--	--	--	--	--	--	0.1
Cobalt	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	--	--	--	--	--	--	--	--	1
Copper	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	--	--	--	--	--	--	--	--	0.65
Iron	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	--	--	--	--	--	--	--	--	5
Lead	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	--	--	--	--	--	--	--	--	0.0075
Manganese	0.78 10	0.67 10	1.1 10	1.2 10	1.5 10	0.74 10	0.77 10	0.75 10	--	--	--	--	--	--	--	--	0.15
Mercury	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	--	--	--	--	--	--	--	--	0.002
Nickel	<0.025	<0.025	<0.025	<0.025	0.011 J	<0.025	<0.025	<0.025	--	--	--	--	--	--	--	--	0.1
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	--	--	--	--	--	--	--	0.05
Silver	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	--	--	--	--	--	--	--	--	0.05
Thallium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020 *	<0.0020 *	<0.0020 *	<0.0020 *	--	--	--	--	--	--	--	--	0.002
Vanadium	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	--	--	--	--	--	--	--	--	0.049
Zinc	0.040 J	<0.50	0.068 J	0.039 J	0.047 J	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--	5
SPLP Metals (mg/L)																	
Cadmium	NA	NA	NA	NA	<0.0050	NA	NA	NA	--	--	--	--	--	--	--	--	0.005
Manganese	0.062	<0.025	0.091	<0.025	0.14	<0.025	<0.025	<0.025	--	--	--	--	--	--	--	--	0.15

Notes:

NA= Not available
ND= Not detected above laboratory reporting limit
NT= Not tested
mg/kg= Milligrams per kilogram
mg/L= Milligrams per liter
TCLP= Toxicity Characteristic Leaching Procedure
SPLP= Synthetic Precipitation Leaching Procedure
MAC= Maximum Allowable Concentrations of Chemical Constituents in Uncontaminated Soil Used as Fill Material at Regulated Fill Operations (35 Ill. Adm. Code 110. Subpart F).
TACO = Tiered Approach to Corrective Action Objectives

*= Laboratory Control Sample (LCS) or Laboratory Control Sample Duplicate (LCSD) is outside acceptance limits.
^= Instrument related QC is outside acceptance limits.
B= Compound was found in the blank and sample.
J= Result is less than the reporting limit but greater than or equal to the method detection limit, concentration reported as an approximate value.
F1= Matrix spike or matrix spike duplicate recovery is outside acceptance limits.
F2= Matrix spike or matrix spike duplicate relative percent difference exceeds control limits.
CCDD = Clean Construction Demolition Debris

Applicable Screening Criteria

[1] Exceeds the most stringent MAC value (35 IAC (1100.605(e))
[2] Exceeds the Chicago Corporate Limits MAC values
[3] Exceeds the Within a Populated Area in a MSA (excluding Chicago) MAC value
[4] Exceeds the Within a MSA County MAC value
[5] Exceeds the Within a Populated Area in a non-MSA County MAC value
[6] Exceeds the Outside a Populated Area MAC value
[7] Exceeds the Within a non-MSA County MAC value
[8] Exceeds the Most Stringent TACO Tier 1 Construction Worker Exposure Objective
[9] Exceeds the Most Stringent TACO Tier 1 Residential Objective
[10] Exceeds the TACO Tier 1 Soil to Groundwater TCLP/SPLP Objective

PID value detected above background or pH value outside the acceptable range (6.25 to 9.0) but can be managed on-Site.
Unrestrictive- metals exceed Totals but not TCLP and SPLP; or metals exceed TCLP or SPLP but not both
CCDD Eligible- metals exceed TCLP and SPLP but not Totals
CCDD Eligible- VOCs or SVOCs exceedances; limited CCDD disposal availability
Greater than TACO Construction Worker Exposure Objectives
Non-special Waste- Greater than all MACs, Greater than most stringent TACO Tier 1 Criteria; Metals exceed Totals, TCLP, and SPLP; Metals exceed TACO Residential and not considered background; pH outside of the acceptable range (6.25 to 9.0)

Figure 147. Table. Comparison of analytical data to screening levels (Sheet #2) (WOOD, 2020-a).

APPENDIX H: MIDWEST STATES SURVEY

The following is the survey questions and answers from each of eight Midwest states on their activities related to beneficial use of dredged material. The questions are bolded and numbered while the answers are preceded by (A). In addition (N/A) means that the answer is not available.

Wisconsin (contact: michaels.halsted@dot.wi.gov):

1. **What is the typical size of dredged material re-use projects that you have worked on?**

   A. Only used on a limited number of projects and amounts vary. WisDOT is not opposed to beneficial reuse but recognized opportunities will not be available often.

2. **What type of soil (fine or coarse grained) was used in your previous re-use of dredged material projects?**

   A. a. Organic silt outside 1:1 embankment
   b. Sand in embankment
3. **Identify any applicable rules or constraints for re-using dredged material, e.g., contaminant concentrations and/or routes of exposure.**

   A. a. Cost of characterization (lab testing), trucking costs, logistics, uniformity of material, and the existence of fines.
   b. NR 718, NR 500 – Wis. Adm. Code – for contamination assessment costs
   c. The contractor locates borrow sources. The contractor will use the least costly alternative to provide quantities
4. **How do you justify the beneficial use? Cost savings?**

   A. The least costly alternative when the material meets specs and is near the highway project as opposed to borrow.
5. **What are typical locations and/or applications of the re-use?**

   A. Embankment fills or topsoil outside 1:1 slope on highway projects. For Harbor Assistance Program projects, habitat creation, navigation aids/channel management, confined disposal facilities, floodplain filling, soil amendments, construction, asphalt/concrete production, etc...
6. **What type of chemical testing/screening of the dredged material is required?**

   A. Comply with WisDOT Roadway Standards (screening) – onus on the supplier to provide analyses. Sieve analysis is important before material can be allowed on the project.

   WDNR Administrative Codes include but are not limited to NR 345-347, NR 718, NR 500, etc…

7. **Do you have a screening criteria based on the grain size particle of the dredged material? (For example, passing sieve# 200 or 230)**

   A. Grain size determines where specific material can be used in highway projects.
8. **Does your state allow use of coarse-grained dredged material, i.e., a small % passing #200 sieve, without restrictions?**

A. WisDOT will look at using coarse-grained material where and when possible. Coarse-grained material is a preferred material for highway construction.

9. **Do you have any additional comments to add regarding the beneficial use of dredged material in your state?**

   A. WisDOT considers dredge materials a viable option for use on highway projects provided the material meets WisDOT specifications. However, the timing, amount available, and location of the highway project must align with the dredging project and/or dredge material storage facility.

   WisDOT's Harbor Assistance Program also funds projects to dredge the Mississippi and the Great Lakes to ensure navigation and port infrastructure are maintained. The reuse of dredge materials produced during Harbor Assistance Program projects is also a program goal. Disposing of dredge material in landfills can be prohibitively expensive and poor use of landfill space.

   WisDOT has supported and funded the creation of dredge materials management and/or confined disposal facilities created to beneficially reuse dredged materials to create usable waterfront real estate through the Harbor Assistance Program. While beach nourishment projects do occur in Wisconsin, WisDOT has yet to fund this type of project.

   WisDOT participates on various teams and/or associations that share the goal to reuse dredged material, maintain navigation for shipping, and/or keep Wisconsin's commercial ports useable. Some examples include the Great Lakes Dredging Team, Upper Mississippi River Basin Association, Wisconsin Ports Association, and others.

   WisDOT seeks multimodal solutions to transport materials including dredge spoils; thereby limiting the number of truck/trailer miles. The WisDOT State Freight Plan describes this effort.

Michigan (contact: spencerj3@michigan.gov):

1. **What is the typical size of dredged material re-use projects that you have worked on?**

   A. The Materials Management Division within the Department of Environment, Great Lakes, and Energy will be involved in dredge projects of various sizes from hundreds of cubic yards of spoils to potential tens or even hundreds of thousands of cubic yards.

2. **What type of soil (fine or coarse grained) was used in your previous re-use of dredged material projects?**

   A. For course grained sediment, they can be considered uncontaminated; however, finer grained sediments would need to be properly characterized for possible reuse and/or disposal.

3. **Identify any applicable rules or constraints for re-using dredged material, e.g., contaminant concentrations and/or routes of exposure.**

   A. Michigan's Part 201 criteria along with applicable exposure pathways are evaluated for possible reuse options. Typically sediments will be tested for heavy metals, Volatile and Semi-Volatiles, PCBs, and possibly other contaminates based on historic uses. Routes of exposure for possible reuse projects can include direct contact, criteria protective of groundwater (may require leaching data SPLP), groundwater-surface water interface criteria, and various background values.

4. **How do you justify the beneficial use? Cost savings?**

   A. Beneficial use is justified through identifying an actual benefit along with applicable analytical testing showing that it is protective of the most vulnerable resource associated with the beneficial use project proposed.

5. **What are typical locations and/or applications of the re-use?**

   A. Upland placement of spoils versus landfill disposal when appropriate shows economic benefits.

6. **What type of chemical testing/screening of the dredged material is required?**

   A. Heavy metals, volatiles/semi-volatiles, PCBs, PFAS, Chlorinated solvents, and others depending upon historic information (i.e. dioxins).

7. **Do you have a screening criteria based on the grain size particle of the dredged material? (For example, passing sieve# 200 or 230)**

   A. Dredge material that has less than 10%, on average, passing the #200 sieve is considered to be uncontaminated.

8. **Does your state allow use of coarse-grained dredged material, i.e., a small % passing #200 sieve, without restrictions?**

   A. Yes, dredge material that has less than 10%, on average, passing the #200 sieve is considered to be uncontaminated and can be disposed into a licensed landfill, a
   Corps of Engineers Confined Disposal Facility or it can be placed upland with no restriction.

9. **Do you have any additional comments to add regarding the beneficial use of dredged material in your state?**

   A. It is critical for project success to have all necessary parties involved from the beginning of any dredge project.

Iowa (contact: melissa.serio@iowadot.us):

1. **What is the typical size of dredged material re-use projects that you have worked on?**

   A. Typically used for just contractor temporary causeways/access pads/stream crossing where this has been included as part of Army Corps 404 permit approval.

2. **What type of soil (fine or coarse grained) was used in your previous re-use of dredged material projects?**

   A. Granular material

3. **Identify any applicable rules or constraints for re-using dredged material, e.g., contaminant concentrations and/or routes of exposure.**
   A. It would have to be allowed by 404 permit.
4. **How do you justify the beneficial use? Cost savings?**
   A. Uncertain on how to respond.
5. **What are typical locations and/or applications of the re-use?**
   A. As noted in response to Question 1, it is primarily used in contractor temporary causeways/access pads/stream crossings.
6. **What type of chemical testing/screening of the dredged material is required?**
   A. None.
7. **Do you have a screening criteria based on the grain size particle of the dredged material? (For example, passing sieve# 200 or 230)**
   A. Material must contain 10% or less passing the #200 sieve.
8. **Does your state allow use of coarse-grained dredged material, i.e., a small % passing #200 sieve, without restrictions?**
   A. It would typically only be allowed for use as noted in response to Question 1.
9. **Do you have any additional comments to add regarding the beneficial use of dredged material in your state?**
   A. We have information located here:
   https://iowadot.gov/construction_materials/FAQs/Environmental#4928119-ew-401-and-construction-ofbr-temporary-stream-crossings

Minnesota (contact: patrick.phenow@state.mn.us)

1. **What is the typical size of dredged material re-use projects that you have worked on?**

   A. Typically large bridge projects or big river crossings but most of it is contaminated and don't end being reused.

2. **What type of soil (fine or coarse grained) was used in your previous re-use of dredged material projects?**
   A. No reuse projects due to contamination of dredged material.
3. **Identify any applicable rules or constraints for re-using dredged material, e.g., contaminant concentrations and/or routes of exposure.**
   A. The residential and industrial (or roadway) exposure limits.
   Soil is classified into three categories:
   1-Unregulated soil: Can be used without constrains
   2-Regulated soil: When the soil contamination exceeds the industrial limits and have to be disposed of at an MPCA permitted municipal or industrial landfill or as a daily cover for a landfill if eligible for a daily cover.
   3-Mildly impacted: Soil with contamination level between the residential and industrial limits.

The industrial exposure limits can be used instead of the residential exposure limits for road cores, but more precautions need to be implemented, for example capping the dredged material by the pavement. If the material in mildly impacted and not used in road cores under pavement, for example, an embankment, then it should be used above the water table with a uncontaminated cover with thickness between 2’ to 4’ at the top of it. The cover is 4’ in green spaces and parks and 2’ in the shoulders of roadways. If the material is unregulated, it can be used anywhere.

4. **How do you justify the beneficial use? Cost savings?**
   A. It is encouraged and no need to justify it.
5. **What are typical locations and/or applications of the re-use?**
   A. Anywhere that would meet the material specifications.
6. **What type of chemical testing/screening of the dredged material is required?**
   A. Depending on the historical land use of the site where the material was dredged from. For example, if it has been near a metal recycler, factory, gas station, then the chemical testing would suit the historical land use.
7. **Do you have a screening criteria based on the grain size particle of the dredged material? (For example, passing sieve# 200 or 230)**
   A. According to the Minnesota Pollution Control Agency (MPCA), no permit is required for the management of dredged material when the material has greater than or equal to 93% of sand based on the No. 200 sieve.
8. **Does your state allow use of coarse-grained dredged material, i.e., a small % passing #200 sieve, without restrictions?**
   A. According to the Minnesota Pollution Control Agency (MPCA), no permit is required for the management of dredged material when the material has greater than or equal to 93% of sand based on the No. 200 sieve.
9. **Do you have any additional comments to add regarding the beneficial use of dredged material in your state?**
   A. MnDOT have a program that allows the reuse of dredged material by contractors. This document is a one-page form includes general questions about the quantity of dredged material, address, phases, contamination criteria. After the contractor fills the form, MnDOT will review it and may require no further or few more questions to the contractor before allowing the contractor to reuse the material.

Ohio (contact: mark.locker@dot.ohio.gov)

1. **What is the typical size of dredged material re-use projects that you have worked on?**

   A. Very minimal for ODOT projects and still at the early stages. There is a future project that is planning to reuse dredged material called CHEERS that envisions returning the hardened edge of Cleveland's East Side lakefront to a natural living shoreline with play spaces, amenities, trails, picnic lawns, fishing areas, habitats and overlooks.

However, for Cleveland harbor, there is about 250,000 cy3 of material being dredged annually. 200,000 cy3 out of the 250,000 dredged material goes to the sediment processing facility that is operated by the port of Cleveland every year. 140,000 cy3 out of the 200,000 cy3 is being beneficially reused as filter uplands and soil blends. For Toledo harbor, there is about 650,000 cy3 of material being dredged annually. The dredged material from Toledo harbor is rich in nutrients and 30,000 cy3 of this dredged material is used after dewatering for urban development in the Glass City Metropark project.

As of 2022, there are ecosystem wetland creation projects in both Sandusky harbor and Ashtabula harbor, where all of the dredged material from each of those harbors is being used for in-water wetland creation, habitat restoration projects. Ohio department of natural resources is the lead agency in cooperation with the USACE for this project.

2. **What type of soil (fine or coarse grained) was used in your previous re-use of dredged material projects?**
   A. Varies and is harbor specific.
3. **Identify any applicable rules or constraints for re-using dredged material, e.g., contaminant concentrations and/or routes of exposure.**
   A. The USEPA residential regional screening levels and background metal levels. Also, it is harbor specific.
4. **How do you justify the beneficial use? Cost savings?**
   A. It is necessary because there is a ban to dispose of the dredged material in open lakes as of July 1st 2020.
5. **What are typical locations and/or applications of the re-use?**
   A. Mainly not for structural applications like fill or roads, but for soil blend applications or landscape materials, and mixed with other soils to be used as park benches.
6. **What type of chemical testing/screening of the dredged material is required?**
   A. At least every five years, the USACE perform a full sediment evaluation of the federal navigation channels including PCBs, pH, metals, pesticides, and grain size analysis.
7. **Do you have a screening criteria based on the grain size particle of the dredged material? (For example, passing sieve# 200 or 230)**
   A. According to the Ohio revised code 6111-32, if the sediment have 60% sand content, it can be applied littoral drift. If the sediment have 80% sand content, it can be used for beach nourishment.
8. **Does your state allow use of coarse-grained dredged material, i.e., a small % passing #200 sieve, without restrictions?**
   A. No.
9. **Do you have any additional comments to add regarding the beneficial use of dredged material in your state?**
   A. According to the Ohio revised code 5111-32, as of July 1st 2020 no open lake disposal of dredged material is allowed in Ohio, and therefore, the reuse of dredged material is strongly encouraged. OEPA recently issued a harbor sediment authorization for sediment processing

facilities for individual harbors. This project is in its final phase and the material that will be dewatered will be uncontaminated soil without solid waste. Additional information on the Ohio's Dredge Material Program and projects underway in each Harbor can be found on the Ohio Lake Erie Commission website at: https://lakeerie.ohio.gov/programs-and-projects/dredge-material-program/dredge-material-program

Kentucky (contact: jeremy.edgeworth@ky.gov):

1. **What is the typical size of dredged material re-use projects that you have worked on?**

   A. N/A

2. **What type of soil (fine or coarse grained) was used in your previous re-use of dredged material projects?**
   A. N/A
3. **Identify any applicable rules or constraints for re-using dredged material, e.g., contaminant concentrations and/or routes of exposure.**
   A. N/A
4. **How do you justify the beneficial use? Cost savings?**
   A. N/A
5. **What are typical locations and/or applications of the re-use?**
   A. N/A
6. **What type of chemical testing/screening of the dredged material is required?**
   A. N/A
7. **Do you have a screening criteria based on the grain size particle of the dredged material? (For example, passing sieve# 200 or 230)**
   A. N/A
8. **Does your state allow use of coarse-grained dredged material, i.e., a small % passing #200 sieve, without restrictions?**
   A. N/A
9. **Do you have any additional comments to add regarding the beneficial use of dredged material in your state?**
   A. N/A

The answer from Kentucky state is that they are not aware of any state use of dredged material.

Kansas (contact: johnm@ksdot.org)

1. **What is the typical size of dredged material re-use projects that you have worked on?**

   A. N/A

2. **What type of soil (fine or coarse grained) was used in your previous re-use of dredged material projects?**
   A. N/A

3. **Identify any applicable rules or constraints for re-using dredged material, e.g., contaminant concentrations and/or routes of exposure.**
   A. N/A
4. **How do you justify the beneficial use? Cost savings?**
   A. N/A
5. **What are typical locations and/or applications of the re-use?**
   A. N/A
6. **What type of chemical testing/screening of the dredged material is required?**
   A. N/A
7. **Do you have a screening criteria based on the grain size particle of the dredged material? (For example, passing sieve# 200 or 230)**
   A. N/A
8. **Does your state allow use of coarse-grained dredged material, i.e., a small % passing #200 sieve, without restrictions?**
   A. N/A
9. **Do you have any additional comments to add regarding the beneficial use of dredged material in your state?**
   A. N/A

Missouri (contact: cheryl.ball@modot.mo.gov)

1. **What is the typical size of dredged material re-use projects that you have worked on?**

   A. N/A

2. **What type of soil (fine or coarse grained) was used in your previous re-use of dredged material projects?**
   A. N/A
3. **Identify any applicable rules or constraints for re-using dredged material, e.g., contaminant concentrations and/or routes of exposure.**
   A. N/A
4. **How do you justify the beneficial use? Cost savings?**
   A. N/A
5. **What are typical locations and/or applications of the re-use?**
   A. N/A
6. **What type of chemical testing/screening of the dredged material is required?**
   A. N/A
7. **Do you have a screening criteria based on the grain size particle of the dredged material? (For example, passing sieve# 200 or 230)**
   A. N/A

8. **Does your state allow use of coarse-grained dredged material, i.e., a small % passing #200 sieve, without restrictions?**
   A. N/A
9. **Do you have any additional comments to add regarding the beneficial use of dredged material in your state?**
   A. N/A

APPENDIX I: BUD REQUEST SUPPLEMENTS

The application to Request a Beneficial Use Determination (LPC-PA27) is shown in Figure 148 through Figure 152 and can be downloaded from https://www2.illinois.gov/epa/topics/forms/land-permits/Pages/beneficial-use.aspx (IEPA, 2020-a).

Illinois Environmental Protection Agency

1021 North Grand Avenue East • P.O. Box 19276 • Springfield • Illinois • 62794-9276 • (217) 782-3397

LPC-PA27
Application to Request a
Beneficial Use Determination

OFFICIAL USE ONLY

This form must be submitted with an application for a beneficial use in accordance with Section 22.54 of the Illinois Environmental Protection Act (Act). This application must include an original and three (3) photocopies of this form and all supporting information including any reports, plans specifications etc. necessary to fully describe the activities proposed and to demonstrate compliance with the Act. Incomplete applications will be rejected. Please refer to the instructions for further guidance. If there is not enough in the space provided on the form, attach your responses on a separate sheet of paper following the application format.

Section 22.54 can be viewed at https://pcb.illinois.gov/SLR/TheEnvironmentalProtectionAct.

I. General Information

Click to view instructions

Type of Beneficial Use: ______

If the material is asphalt shingles, 39(i) form(s) must be submitted as part of this application, pursuant to Section 22.54(j).

Length of Time: We request this beneficial use determination be authorized for ___ years and ___ months.
(The Illinois EPA cannot authorize a time period greater than 5 years.)

Description of the Beneficial Use (Box will expand as needed)

II. Site Identification

A. Material Generator Information

Site Name: ______ Site # (IEPA): ______
Physical Site Address: ______ County: ______
City: ______ State: ___ Zip: ______

Site Owner	**Site Operator**
Name: ______	Name: ______
Addr: ______	Addr: ______
City: ______ State: ___ Zip: ______	City: ______ State: ___ Zip: ______
Contact Name: ______	Contact Name: ______
Phone #: ______	Phone #: ______

Add a row | Delete last row

B. Material User Information

Site Name: ______ Site # (IEPA): ______
Physical Site Address: ______ County: ______
City: ______ State: ___ Zip: ______

LPC-PA27 Rev. 7/2020 *Application to Request a Beneficial Use Determination* Page 1 of 5

Figure 148. Screenshot. BUD request application (Page #1) (IEPA, 2020-a).

Site Owner	**Site Operator**
Name: ______	Name: ______
Addr: ______	Addr: ______
City: ______ State: ___ Zip: ______	City: ______ State: ___ Zip: ______
Contact Name: ______	Contact Name: ______
Phone #: ______	Phone #: ______

Add a row   Delete last row

III. Affidavits

The following affidavits must be included in your request:

A. An affidavit or certification, from the generator, that the characteristics and method of generation of the material described in the application is accurate. (Original signatures required. Signature stamps or applications transmitted electronically or by facsimile are not acceptable.)

B. An affidavit or certification from the product manufacturer or end user that the description of the storage and use of the material by the manufacturer or end user described in the application is accurate.

C. If applicable, an affidavit or certification from the intermediate management facility such as a marketer that the description of the storage and use of the material by the intermediate facility described in the application is accurate.

IV. Process Generating the Material

Description of the process generating the material (Box will expand as needed)

V. Location of Intermediate Storage and Processing

Description of location of the intermediate storage and processing of the material (Box will expand as needed)

VI. Justification of Legitimate and Effective Beneficial Use

Justification that the material is legitimately used beneficially as defined in Sec. 22.54(a)(3) of the Act and that it is used as an effective substitute for a commercially available material (Box will expand as needed)

VII. Hazardous Constituents and Explanation of No Negative Impact

Identification of any of the hazardous constituents and an explanation of why the concentration of each constituent and the material's management and use will not negatively impact human health, safety, and the environment (Box will expand as needed)

VIII. Chemical and Physical Analysis

(Attach to the application.)

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Figure 149. Screenshot. BUD request application (Page #2) (IEPA, 2020-a).

IX. Geology and Potential to Migrate to Groundwater

(Attach to the application.) If the material is applied to the land, a discussion of the site-specific geology and the potential for constituents to migrate to groundwater.

X. Volumes, Timeframes, and Justification

(Attach to the application) Volumes and timeframes for use of the material and any resulting products containing the substitute material. Justification for the volumes and timeframes for storange and processing that were selected.

XI. Other Information

(Attach to the application.)

XII. Signatures

(Original signatures required. Signature stamps or applications transmitted electronically or by facsimile are not acceptable.)

The application must be signed by the person responsible for using the material or processing the material into a product that is marketable to the general public. All applications shall be signed by the person designated below as a duly authorized representative of the applicant.

1. Corporation – By a principal executive officer of at least the level of vice president.
2. Partnership or Sole Proprietorship – By a partner or proprietor, respectively.
3. Government – by either a principal executive officer or a ranking elected official.

A person is a duly authorized representative of the applicant only if: (1) they meet the criteria above or the authorization has been granted in writing by the person described above; and (2) is submitted with this application.

I hereby affirm that all information contained in this application is true and accurate to the best of my knowledge and belief.

I do herein swear that I am duly authorized representative of the applicant and I am authorized to sign this application form.

Applicant

Company: ______________________________

Address: ______________________________

City: ______________ State: ____ Zip: ________

Phone: ______________________________

Name: ______________________________

Title: ______________________________

Signature: ______________________________

Date: ______________________________

Engineer

Company: ______________________________

Address: ______________________________

City: ______________ State: ____ Zip: ________

Phone: ______________________________

Name: ______________________________

Title: ______________________________

Signature: ______________________________

Date: ______________________________

Seal

Any person who knowingly makes a false, fictitious, or fraudulent material statement, orally or in writing, to the Illinois EPA commits a Class 4 felony. A second or subsequent offense after conviction is a Class 3 felony. (415 ILCS 5/44(h))

LPC-PA27 Rev. 7/2020 *Application to Request a Beneficial Use Determination* Page 3 of 5

Figure 150. Screenshot. BUD request application (Page #3) (IEPA, 2020-a).

Click to return to form

Instructions for Form LPC-PA27
Application to Request a
Beneficial Use Determination

The Illinois EPA will evaluate an application for a beneficial use in accordance with Section 22.54 of the Illinois Environmental Protection Act (Act). If there is not enough in the space provided on the form, please include your information on a separate sheet of paper following the application format and attach it to the application.

Section 22.54 can be viewed at https://pcb.illinois.gov/SLR/TheEnvironmentalProtectionAct.

The following information must be included in your request:

I. This application is limited to requests for a beneficial use determination in accordance with Section 22.54 of the Act. Indicate if the material will be used as a raw material or ingredient, used directly as a product, or used as a catalyst or carrier. Indicate the length of time the beneficial use determination will be needed. Describe the beneficial use. Please note that the Illinois EPA cannot issue a beneficial use determination for a period greater than five years.

II. Identify the location and persons generating the material and using the material. Include proof that the application accurately describes how the material was generated, managed, and will ultimately be used. To do this the application must include the following information:

   A. An affidavit or certification from the generator that the characteristics and method of generation of the material described in the application is accurate.

   B. An affidavit or certification from the product manufacturer or end user that the description of the storage and use of the material by the manufacturer or end user described in the application is accurate.

   C. If applicable, an affidavit or certification from the intermediate management facility such as a marketer that the description of the storage and use of the material by the intermediate facility described in the application is accurate.

III. A description of the process generating the material.

IV. A description of the intermediate storage and processing and end use of the material. This must include a discussion of how the material is managed separately from waste; storage time is minimized; and a description of the methods for collection and storage of the substitute material. This information is required to demonstrate that the material has value and the collection and storage will not negatively impact the environment and that its storage is conducted in a manner that preserves the recyclability of the material. Also discuss how and where the material is currently being specifically handled, stored or disposed when not being used or reused as a product.

V. Justification that the material is used beneficially including comparisons of the physical and chemical properties of the beneficially usable material versus the virgin material it will replace and a discussion of the effectiveness of the use of substitute material versus the virgin product considering the volumes and methods of processing and use. Identify the constituents and their concentrations in the substitute material that are beneficial to the product.

VI. Identification of any of the hazardous constituents identified in 35 Illinois Administrative Code 721 Appendix H that may be present in the material and an explanation why the concentration will not negatively impact human health or the environment when used beneficially as described in the request.

VII. A chemical and physical analysis of the beneficially usable material for all parameters discussed in V and VI above. Also provide a chemical and physical analysis of the virgin material (that will be replaced by the beneficially usable material) for all parameters discussed in V and VI above unless the information is provided from a documented source that has been identified in the application.

VIII. If the material is applied to the land, a discussion of the site-specific geology and the potential for constituents of the material to migrate to groundwater. If groundwater modeling is included, a copy of the modeling results and a copy of the model must be provided to the Illinois EPA for use in verifying the modeling results. Please note that the Illinois EPA cannot issue a beneficial use determination under Section 22.54 for the land application of sludge. Please contact the Bureau of Water Permit Section for instruction on how to apply for authorization for that activity.

LPC-PA27 Rev. 7/2020 *Application to Request a Beneficial Use Determination* Page 4 of 5

Figure 151. Screenshot. BUD request application (Page #4) (IEPA, 2020-a).

IX. Volumes and timeframes for use of the material and any resulting products containing the substitute material. Discuss the market demand for the material and resulting product, the volumes that will be used and the volume of beneficially usable material and resulting product that will be stored versus the time frames needed to collect the beneficially usable material, process it and distribute the end product to demonstrate that the material will be used in a reasonable amount of time, storage times will be minimized and the beneficially usable material and end product will not be abandoned, discharged, deposited, injected, dumped, spilled, leaked or placed into or on any land or water or into any well so that such material or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters.

X. Any other information that is necessary to demonstrate that the material is used beneficially and that the resulting use will not cause a violation of the Act or regulations. Discuss other environmental laws and regulations that may apply to the proposed use and how the recycling activity will comply with those laws and regulations.

XI. The application must be signed by a representative of the company that submitted the application. The applicant must be the person that will beneficially use the material or convert the material to a product that can be marketed for use by the general public. The material generator may sign and submit the application if they can demonstrate in the application that they have sufficient control over the beneficial use activity to ensure the beneficial use will be conducted in accordance with the procedures described in the application.

Click to return to form

LPC-PA27 Rev. 7/2020 *Application to Request a Beneficial Use Determination* Page 5 of 5

Figure 152. Screenshot. BUD request application (Page #5) (IEPA, 2020-a).

An example of an actual BUD request (Log No. BUD20-001) is shown in Figure 153 through Figure 159 (IEPA, 2020-b).

Illinois Environmental Protection Agency

Bureau of Land • 1021 N. Grand Avenue E. • P.O. Box 19276
Springfield • Illinois • 62794-9276

OFFICIAL USE ONLY
BUD20-001

LPC-PA-27
APPLICATION TO REQUEST A BENEFICIAL USE DETERMINATION

This form must be submitted with an application for a beneficial use in accordance with Section 22.54 of the Illinois Environmental Protection Act (Act). This application must include an original and three (3) photocopies of this form and all supporting information including any reports, plans specifications etc. necessary to fully describe the activities proposed and to demonstrate compliance with the Act. Incomplete applications will be rejected. Please refer to the instructions for further guidance. If there is not enough in the space provided on the form, attach your responses on a separate sheet of paper following the application format. Section 22.54 can be viewed at http://www.ipcb.state.il.us/SLR/TheEnvironmentalProtectionAct.asp.

I. GENERAL INFORMATION

TYPE OF BENEFICIAL USE: Used directly as a product

LENGTH OF TIME:
We request this beneficial use determination be authorized for 5 years and 0 months. (The Illinois EPA cannot authorize a time period greater than 5 years.)

I.A DESCRIPTION OF THE BENEFICIAL USE:
This application is to request a beneficial use determination for the sediment / dredged material from Calumet Harbor. The U.S. Army Corps of Engineers (USACE), Chicago District, proposes to use the sediment for general fill. (Continued on Pg. 5)

II. SITE IDENTIFICATION

A. MATERIAL GENERATOR INFORMATION Calumet Harbor Dredged Material Facility

Site Name: The existing site is the Chicago Area Confined Disposal Facility (CDF) Site # (IEPA): 0316485186
Physical Site Address: 3600 East 95th Street - C County: Cook
City: Chicago State: Illinois Zip Code: 60617

SITE OWNER	SITE OPERATOR
Name: Chicago Park District	Name: U.S. Army Corps of Engineers
Address: 541 North Fairbanks Court	Address: 231 South LaSalle Street
City: Chicago State: IL Zip: 60611	City: Chicago State: IL Zip: 60604
Contact Name: Daniel Cooper	Contact Name: Richard Saichek
Phone #: (312) 742-4287	Phone #: (312) 846-5507

B. MATERIAL USER INFORMATION Calumet Harbor Dredged Material Facility 0316485186

Site Name: Dredged Material Disposal Facility (DMDF) Site # (IEPA):
Physical Site Address: 3600 East 95th Street - C County: Cook
City: Chicago State: Illinois Zip Code: 60617

SITE OWNER	SITE OPERATOR
Name: Same as above.	Name: Same as above.
Address:	Address:
City: State: Zip:	City: State: Zip:
Contact Name:	Contact Name:
Phone #:	Phone #:

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Figure 153. Screenshot. BUD request of an actual application (Log No. BUD20-001) (Page #1) (IEPA, 2020-b).

III. AFFIDAVITS

The following affidavits must be included in your request:

A. An affidavit or certification, from the generator, that the characteristics and method of generation of the material described in the application is accurate. (Original signatures required. Signature stamps or applications transmitted electronically or by facsimile are not acceptable.)

B. An affidavit or certification from the product manufacturer or end user that the description of the storage and use of the material by the manufacturer or end user described in the application is accurate.

C. If applicable, an affidavit or certification from the intermediate management facility such as a marketer that the description of the storage and use of the material by the intermediate facility described in the application is accurate.

IV. DESCRIPTION OF THE PROCESS GENERATING THE MATERIAL:

This application is to request a beneficial use determination for sediment / dredged material from Calumet Harbor. The description of the process for generating the material is continued on Pg. 5.

V. DESCRIPTION OF LOCATION OF THE INTERMEDIATE STORAGE AND PROCESSING OF THE MATERIAL:

Section IV describes the drying pad where the Calumet Harbor sediment will be placed to dry. The rate at which the material dries can vary depending on a number of factors. (Additional text is on Pg. 6)

VI. JUSTIFICATION THAT THE MATERIAL IS LEGITIMATELY USED BENEFICIALLY AS DEFINED IN SEC. 22.54 (a)(3) OF THE ACT AND THAT IT IS USED AS AN EFFECTIVE SUBSTITUTE FOR A COMMERCIALLY AVAILABLE MATERIAL:

The Calumet Harbor dredged material will be legitimately used beneficially as defined in Sec. 22.54(a)(3) of the Act, and it will be used as an effective substitute for commercially available "general fill" or "satisfactory fill" material. (Additional text is on Pg. 6.)

VII. IDENTIFICATION OF ANY OF THE HAZARDOUS CONSTITUENTS AND AN EXPLANATION WHY THE CONCENTRATION OF EACH CONSTITUENT AND THE MATERIAL'S MANAGEMENT AND USE WILL NOT NEGATIVELY IMPACT HUMAN HEALTH, SAFETY AND THE ENVIRONMENT:

The constituents of concern in the Calumet Harbor sediment were evaluated in a study titled "Human Health Risk-Based Screening for Upland Beneficial Use Determination" (Attachment #2). (Additional text for Section VII continues on Pg. 7.)

VIII. CHEMICAL AND PHYSICAL ANALYSIS: (ATTACH TO THE APPLICATION)

IX. IF THE MATERIAL IS APPLIED TO THE LAND, A DISCUSSION OF THE SITE-SPECIFIC GEOLOGY AND THE POTENTIAL FOR CONSTITUENTS OF THE MATERIAL TO MIGRATE TO GROUNDWATER: (ATTACH TO THE APPLICATION)

X. VOLUMES AND TIMEFRAMES FOR USE OF THE MATERIAL AND ANY RESULTING PRODUCTS CONTAINING THE SUBSTITUTE MATERIAL. JUSTIFICATION FOR THE VOLUMES AND TIMEFRAMES FOR STORAGE AND PROCESSING THAT WERE SELECTED: (ATTACH TO THE APPLICATION)

XI. OTHER INFORMATION: (ATTACH TO THE APPLICATION)

XII. SIGNATURES: (Original signatures required. Signature stamps or applications transmitted electronically or by facsimile are not acceptable.)

The application must be signed by the person responsible for using the material or processing the material into a product that is marketable to the general public. All applications shall be signed by the person designated below as a duly authorized representative of the applicant.

1. Corporation = By a principal executive officer of at least the level of vice president.
2. Partnership or Sole Proprietorship – By a partner or proprietor, respectively.
3. Government- by either a principal executive officer or a ranking elected official.

A person is a duly authorized representative of the applicant only if: (1) they meet the criteria above or the authorization has been granted in writing by the person described above; and (2) is submitted with this application.

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Figure 154. Screenshot. BUD request of an actual application (Log No. BUD20-001) (Page #2) (IEPA, 2020-b).

I hereby affirm that all information contained in this application is true and accurate to the best of my knowledge and belief.

I do herein swear that I am duly authorized representative of the applicant and I am authorized to sign this application form.

APPLICANT

Signature: ____________________ Date: 1-28-20

Name: Mr. Steven A. Fischer, P.E.

Title: Deputy District Engineer

Company Name: U.S. Army Corps of Engineers, Chicago District

Address: 231 South LaSalle Street, Suite 1500

City: Chicago State: Illinois

Zip Code: 60604 Phone: (312) 846-5302

ENGINEER

Signature: ____________________ Date: ____________

Name: ____________________

Title: ____________________ Engineer Seal

Address: ____________________

City: ____________ State: ____________

Zip Code: ____________ Phone: ____________

"Any person who knowingly makes a false, fictitious, or fraudulent material statement, orally or in writing, to the Illinois EPA commits a Class 4 felony. A second or subsequent offense after conviction is a Class 3 felony. (415 ILCS 5/44(h))"

Figure 155. Screenshot. BUD request of an actual application (Log No. BUD20-001) (Page #3) (IEPA, 2020-b).

INSTRUCTIONS FOR BENEFICIAL USE DETERMINATION REQUEST FORM LPC-PA-27
SEPTEMBER 10, 2009

The Illinois EPA will evaluate an application for a beneficial use in accordance with Section 22.54 of the Illinois Environmental Protection Act (Act). If there is not enough in the space provided on the form, please include your information on a separate sheet of paper following the application format and attach it to the application. Section 22.54 can be viewed at http://www.ipcb.state.il.us/SLR/TheEnvironmentalProtectionAct.asp . The following information must be included in your request:

I. This application is limited to requests for a beneficial use determination in accordance with Section 22.54 of the Act. Indicate if the material will be used as a raw material or ingredient, used directly as a product, or used as a catalyst or carrier. Indicate the length of time the beneficial use determination will be needed. Describe the beneficial use. Please note that the Illinois EPA cannot issue a beneficial use determination for a period greater than five years.

II. Identify the location and persons generating the material and using the material. Include proof that the application accurately describes how the material was generated, managed, and will ultimately be used. To do this the application must include the following information:

A. An affidavit or certification from the generator that the characteristics and method of generation of the material described in the application is accurate.

B. An affidavit or certification from the product manufacturer or end user that the description of the storage and use of the material by the manufacturer or end user described in the application is accurate.

C. If applicable, an affidavit or certification from the intermediate management facility such as a marketer that the description of the storage and use of the material by the intermediate facility described in the application is accurate.

III. A description of the process generating the material.

IV. A description of the intermediate storage and processing and end use of the material. This must include a discussion of how the material is managed separately from waste; storage time is minimized, and a description of the methods for collection and storage of the substitute material. This information is required to demonstrate that the material has value and the collection and storage will not negatively impact the environment and that its storage is conducted in a manner that preserves the recyclability of the material. Also discuss how and where the material is currently being specifically handled, stored or disposed when not being used or reused as a product.

V. Justification that the material is used beneficially including comparisons of the physical and chemical properties of the beneficially usable material versus the virgin material it will replace and a discussion of the effectiveness of the use of substitute material versus the virgin product considering the volumes and methods of processing and use. Identify the constituents and their concentrations in the substitute material that are beneficial to the product.

VI. Identification of any of the hazardous constituents identified in 35 Illinois Administrative Code 721 Appendix H that may be present in the material and an explanation why the concentration will not negatively impact human health or the environment when used beneficially as described in the request.

VII. A chemical and physical analysis of the beneficially usable material for all parameters discussed in V and VI above. Also provide a chemical and physical analysis of the virgin material (that will be replaced by the beneficially usable material) for all parameters discussed in V and VI above unless the information is provided from a documented source that has been identified in the application.

VIII. If the material is applied to the land, a discussion of the site-specific geology and the potential for constituents of the material to migrate to groundwater. If groundwater modeling is included, a copy of the modeling results and a copy of the model must be provided to the Illinois EPA for use in verifying the modeling results. Please note that the Illinois EPA cannot issue a beneficial use determination under Section 22.54 for the land application of sludge. Please contact the Bureau of Water Permit Section for instruction on how to apply for authorization for that activity.

IX. Volumes and timeframes for use of the material and any resulting products containing the substitute material. Discuss the market demand for the material and resulting product, the volumes that will be used and the volume of beneficially usable material and resulting product that will be stored versus the time frames needed to collect the beneficially usable material, process it and distribute the end product to demonstrate that the material will be used in a reasonable amount of time, storage times will be minimized and the beneficially usable material and end product will not be abandoned, discharged, deposited, injected, dumped, spilled, leaked or placed into or on any land or water or into any well so that such material or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters.

X. Any other information that is necessary to demonstrate that the material is used beneficially and that the resulting use will not cause a violation of the Act or regulations. Discuss other environmental laws and regulations that may apply to the proposed use and how the recycling activity will comply with those laws and regulations.

XI. The application must be signed by a representative of the company that submitted the application. The applicant must be the person that will beneficially use the material or convert the material to a product that can be marketed for use by the general public. The material generator may sign and submit the application if they can demonstrate in the application that they have sufficient control over the beneficial use activity to ensure the beneficial use will be conducted in accordance with the procedures described in the application.

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Figure 156. Screenshot. BUD request of an actual application (Log No. BUD20-001) (Page #4) (IEPA, 2020-b).

I.A DESCRIPTION OF THE BENEFICIAL USE: (additional text)

The USACE, Chicago District, is responsible for maintenance of the Calumet Harbor and River Federal navigation channel and performs dredging to the authorized depth to provide safe and efficient navigation. Since 1984, the dredged material from the channel has been placed into the Chicago Area Confined Disposal Facility (CDF), but this facility is nearing its capacity. This facility is located directly south of the entrance channel to the Calumet River in Lake Michigan (Calumet Harbor). A study known as a Dredged Material Management Plan (DMMP) was conducted to identify alternatives for managing the dredged material from future maintenance operations, and the tentatively selected plan is to vertically expand the existing facility by constructing a new Dredged Material Disposal Facility (DMDF) within that site. Attachment #1 contains a drawing showing the conceptual design for the vertical expansion plan and DMDF.

This application is to request a beneficial use determination for the sediment / dredged material from Calumet Harbor. The USACE, Chicago District, proposes to use the Calumet Harbor dredged material as a substitute for clean "general fill" or "satisfactory fill" for several purposes; including the use of the dredged material as surcharge material for compacting and dewatering the existing confined sediment, as cover material below the drying pads or other features to be constructed on the site; as embankment material for the construction of the new confining dikes for the Calumet River sediment, and as eventual cover material for the closure of the facility. It is anticipated that these on-site uses of the Calumet Harbor dredged material will require approximately 120,000 to 160,000 cubic yards (CY). The Calumet Harbor dredged material will be managed separately from the Calumet River dredged material, and it will be used instead of commercially available "general fill" or "satisfactory fill" material.

IV. DESCRIPTION OF THE PROCESS GENERATING THE MATERIAL: (additional text)

Areas where sediment accumulates (shoals) in Calumet Harbor are dredged mechanically using a crane with a conventional dredge (clamshell) bucket. After the sediment is removed from the lake bottom, it is placed into a barge (or scow). When the barge / scow is full of dredged material, it is transported to the placement site (CDF / DMDF). At the placement site, a crane with a mechanical bucket is then used to remove (rehandle / off-load) the dredged material from the barge / scow and place it into the facility. Sediment that is dredged mechanically is typically close to the density and water content that it was at prior to removal (in-situ), and, unlike hydraulic dredging, mechanical dredging does not add much water during the removal process.

A drying pad was constructed on the northern side of the facility over the existing confined sediment in 2014. The existing sediment underlying the drying pad area was graded, a geotextile fabric was installed, and then the geotextile fabric was covered with a layer of reclaimed asphalt (asphalt chips). The layer of reclaimed asphalt has a minimum thickness of one-foot, and strips of stone were included within the reclaimed asphalt material to help facilitate drainage. Pre-cast concrete blocks were placed along the southern perimeter of the drying pad, and the drying pad area has a separate access road to segregate the Calumet Harbor dredged material from the existing confined sediment. The existing drying pad is approximately 7.5 acres, and it has the capacity to hold roughly 25,000 CY of dry Calumet Harbor dredged material. Attachment #1 shows that for the vertical expansion plan, the DMDF will have separate drying pad areas for the Calumet Harbor and Calumet River dredged material.

The water associated with the wet dredged material evaporates, infiltrates, and drains by gravity towards an existing settling pond located at the southern end of the facility. During dredging and placement operations, while dredged material is actively being placed into the facility, water is pumped from the pond to a filter cell, and effluent from the filter cell is discharged to the Calumet River. The discharge to the Calumet River is regulated under an Illinois EPA water pollution control permit (Number 2016-EO-60898; issued June 7, 2016) and the Chicago District performs water quality monitoring, as described in the permit.

After the Calumet Harbor dredged material that was placed onto the drying pad is sufficiently dry, the USACE, Chicago District, proposes to either use it directly for one or more of the proposed beneficial uses described above in Section I.A or the material will be transported and stockpiled near the facility until needed.

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Figure 157. Screenshot. BUD request of an actual application (Log No. BUD20-001) (Page #5) (IEPA, 2020-b).

V. DESCRIPTION OF LOCATION OF THE INTERMEDIATE STORAGE AND PROCESSING OF THE MATERIAL: (additional text)

After the Calumet Harbor dredged material on the drying pad is sufficiently dry, the USACE, Chicago District, proposes to either use it directly for one or more of the proposed beneficial uses described above in Section I A, or the material will be transported and stockpiled near the facility until needed.

The amount of time needed to dry the sediment can vary due to different factors such as the time of year when the material is placed on the drying pad, the lift thickness of the material, the physical characteristics / percentage of fine and coarse particles, and weather conditions. As the material becomes drier and more consolidated, trenching or other steps may be taken to reduce the drying time. Under ordinary conditions, it takes roughly about a year for the Calumet Harbor dredged material to sufficiently dry.

A stockpile of roughly 25,000 CY of the dry Calumet Harbor dredged material (soil) is presently located south of the settling pond at the southern end of the facility, shown in Attachment #1. On 12 June 2019, grab samples of the material were collected from the surface of this stockpile, and a photographs from the sample collection are shown in Attachment #2.

Processing the dry Calumet Harbor dredged material by mixing it with other types of materials may be proposed in the future, but this request for a beneficial use determination is solely for the dredged material alone.

VI. JUSTIFICATION THAT THE MATERIAL IS LEGITIMATELY USED BENEFICIALLY (additional text)

The Calumet Harbor dredged material will be managed and stored separately from the existing confined sediment and the Calumet River sediment. As a result, the Calumet Harbor dredged material is expected to maintain its chemical and physical properties and usefulness. When the material is stockpiled or if it will be susceptible to erosion, interim and/or permanent stabilization practices, such as temporary seeding or vegetative buffer strips, will be used to minimize the loss of the material to wind erosion or storm water runoff.

As described in Section 1.A, the Calumet Harbor dredged material is an effective substitute for commercially available "general fill" or "satisfactory fill" material. General or satisfactory fill materials, with physical and chemical properties similar to the Calumet Harbor dredged material, are commercially available and may be marketed as fill dirt. While plants commonly grow in the Calumet Harbor dredged material, it is not as rich in organics and nutrients as topsoil. However, even if "general fill" or "satisfactory fill" materials are available at a low cost, the transportation costs to bring these materials to the placement site can be considerable. It is unlikely that a source for "general fill" or "satisfactory fill" material would be as close to the placement site as the readily available dredged material, so it is valuable to use this resource instead of commercially available fill.

Figure 158. Screenshot. BUD request of an actual application (Log No. BUD20-001) (Page #6) (IEPA, 2020-b).

VII. IDENTIFICATION OF ANY OF THE HAZARDOUS CONSTITUENTS (additional text)

In October 2011, the USACE, Chicago District, collected sediment samples from Calumet Harbor and performed chemical testing to evaluate whether the material was suitable for upland placement / beneficial use as "general fill" or "satisfactory fill" material. The results were evaluated and discussed in the "Human Health Risk-Based Screening for Upland Beneficial Use Determination" - (Attachment #2). The main conclusions from the screening were that some individual sediment or aqueous phase Synthetic Precipitation Leaching Procedure (SPLP) concentrations exceeded either the Illinois Environmental Protection Agency (EPA) Tiered Approach to Corrective Action Objectives (TACO) or U.S. EPA screening levels, but some of the constituents are either naturally occurring (metals) or are found at low ambient levels throughout most soils (Polycyclic Aromatic Hydrocarbons - PAHs), and so should not be considered a health threat when compared to background soil and/or streambed sediment concentrations of these constituents measured across Illinois. No constituents of potential concern were identified that would preclude placement of sediments dredged from Calumet Harbor to be used beneficially in an upland setting in Illinois.

In order to acquire more recent data, samples of the Calumet Harbor dredged material were collected in June 2019 from a stockpile located on the southern end of the placement site, and the analytical results from these samples are provided in Attachment #3 (Memorandum - Subject: Analysis of Calumet Harbor Dredged Material for Beneficial Use). The range of constituent concentrations in the samples collected in June 2019 were similar to the range of constituent concentrations in the samples collected in October 2011.

The sediment is fine-grained, silty material, and samples occasionally have high nitrogen levels. As a consequence, the material does not seem to be good candidate for open water placement or beach nourishment at this time.

Figure 159. Screenshot. BUD request of an actual application (Log No. BUD20-001) (Page #7) (IEPA, 2020-b).

APPENDIX J: APPLICABLE PERMIT(S) FOR CREATING ILLINOIS RIVER ISLANDS SUPPLEMENTS

The joint permit application is shown in Figure 160 through Figure 163 (USACE, n.d.).

JOINT APPLICATION FORM FOR ILLINOIS

ITEMS 1 AND 2 FOR AGENCY USE

1. Application Number	2. Date Received

3. and 4. (SEE SPECIAL INSTRUCTIONS) NAME, MAILING ADDRESS AND TELEPHONE NUMBERS

3a. Applicant's Name:	3b. Co-Applicant/Property Owner Name (if needed or if different from applicant):	4. Authorized Agent (an agent is not required):
Company Name (if any) :	Company Name (if any):	Company Name (if any):
Address:	Address:	Address:
Email Address:	Email Address:	Email Address:
Applicant's Phone Nos. w/area code	Applicant's Phone Nos. w/area code	Agent's Phone Nos. w/area code
Business:	Business:	Business:
Residence:	Residence:	Residence:
Cell:	Cell:	Cell:
Fax:	Fax:	Fax:

STATEMENT OF AUTHORIZATION

I hereby authorize, ______________________________ to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

_______________________________ Applicant's Signature

_______________________________ Date

5. ADJOINING PROPERTY OWNERS (Upstream and Downstream of the water body and within Visual Reach of Project)

Name	Mailing Address	Phone No. w/area code
a.		
b.		
c.		
d.		

6. PROJECT TITLE:

7. PROJECT LOCATION:

LATITUDE: °N LONGITUDE: °W	UTMs Northing: Easting:				
STREET, ROAD, OR OTHER DESCRIPTIVE LOCATION	LEGAL DESCRIPT	QUARTER	SECTION	TOWNSHIP NO.	RANGE
☐ IN OR ☐ NEAR CITY OF TOWN (check appropriate box) Municipality Name	WATERWAY				RIVER MILE (if applicable)
COUNTY / STATE / ZIP CODE					

Revised 2010

☐ Corps of Engineers ☐ IL Dep't of Natural Resources ☐ IL Environmental Protection Agency ☐ Applicant's Copy

Figure 160. Screenshot. Joint permit application (Page #1) (USACE, n.d.).

8. PROJECT DESCRIPTION (Include all features):

9. PURPOSE AND NEED OF PROJECT:

COMPLETE THE FOLLOWING FOUR BLOCKS IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

10. REASON(S) FOR DISCHARGE:

11. TYPE(S) OF MATERIAL BEING DISCHARGED AND THE AMOUNT OF EACH TYPE IN CUBIC YARDS FOR WATERWAYS:

TYPE:

AMOUNT IN CUBIC YARDS:

12. SURFACE AREA IN ACRES OF WETLANDS OR OTHER WATERS FILLED (See Instructions)

13. DESCRIPTION OF AVOIDANCE, MINIMIZATION AND COMPENSATION (See instructions)

14. Date activity is proposed to commence | Date activity is expected to be completed

15. Is any portion of the activity for which authorization is sought now complete? Yes ☐ No ☐

Month and Year the activity was completed

NOTE: If answer is "YES" give reasons in the Project Description and Remarks section. Indicate the existing work on drawings.

16. List all approvals or certification and denials received from other Federal, interstate, state, or local agencies for structures, construction, discharges or other activities described in this application.

Issuing Agency	Type of Approval	Identification No.	Date of Application	Date of Approval	Date of Denial

17. CONSENT TO ENTER PROPERTY LISTED IN PART 7 ABOVE IS HEREBY GRANTED. Yes No

18. APPLICATION VERIFICATION (SEE SPECIAL INSTRUCTIONS)

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and that to the best of my knowledge and belief, such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities.

Signature of Applicant or Authorized Agent | Date

Signature of Applicant or Authorized Agent | Date

Signature of Applicant or Authorized Agent | Date

☐ Corps of Engineers ☐ IL Dep't of Natural Resources ☐ IL Environmental Protection Agency ☐ Applicant's Copy

Revised 2010

SEE INSTRUCTIONS FOR ADDRESS

Figure 161. Screenshot. Joint permit application (Page #2) (USACE, n.d.).

LOCATION MAP

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- ☐ Corps of Engineers
- ☐ IL Dep't of Natural Resources
- ☐ IL Environmental Protection Agency
- ☐ Applicant's Copy

Figure 162. Screenshot. Joint permit application (Page #3) (USACE, n.d.).

PLAN VIEW

FOR AGENCY USE ONLY

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☐ Corps of Engineers ☐ IL Dep't of Natural Resources ☐ IL Environmental Protection Agency ☐ Applicant's Copy

Figure 163. Screenshot. Joint permit application (Page #4) (USACE, n.d.).

The permit application instructions are shown in Figure 164 through Figure 173 (IDNR, n.d.-b).

PERMIT REQUIREMENTS FOR THE STATE OF ILLINOIS

JOINT APPLICATION PROCESS

Construction projects in Illinois waterways, floodplains and wetlands often require both State and Federal authorization. This application packet is designed to simplify the approval process for the applicant seeking project authorizations from the U.S. Army Corps of Engineers (USCOE), The Illinois Department of Natural Resources/Office of Water Resources (IDNR/OWR) and the Illinois Environmental Protection Agency (IEPA). Please refer to the map on page 11 for agency addresses and telephone numbers. Each of these agency's authorities and requirements are briefly explained in the following paragraphs. Application forms are available from any of the listed agencies.

Anyone proposing to construct, operate or maintain any dam, dock, pier, wharf, sluice, levee, dike, building, utility and road crossings, piling, wall, fence or other structure in; or dredge, fill or otherwise alter the bed or banks of any stream, lake, wetland, floodplain or floodway subject to State or Federal regulatory jurisdiction should apply for agency approvals. The appropriate copy of the **joint application form, drawings,** and **copy of any additional support information** should be sent to each of the regulatory agencies. Approvals may be required by any or all of the agencies. Applications filed simultaneously with the USCOE, IDNR/OWR, and IEPA will be processed concurrently in an independent manner, and should result in expedited receipt of all agency determinations. If a permit is not required by one or more of the agencies, they will inform the applicant and the other agencies.

Coordination with the regulatory and other review agencies is recommended as early as possible during the project planning stage. This allows revisions or other measures necessary to meet agency requirements to be made before project plans are finalized.

AGENCY AUTHORITIES AND REQUIREMENTS

1. The basis for the **U.S. Army Corps of Engineers** regulatory function over public waterways was formed in 1899 when Congress passed the Rivers and Harbors Act of 3 March 1899. Until 1968, the Rivers and Harbors Act of 1899 was administered to protect only navigation and navigable capacity of this nation's waters. In 1968, in response to a growing national concern for environmental values, the policy for review of permit applications with respect to Sections 9 and 10 of the Rivers and Harbors Act was revised to include additional factors (fish and wildlife conservation, pollution, aesthetics, ecology, and general Welfare) besides navigation. This new type of review was identified as a "public interest review."

The Corps of Engineers regulatory function was expanded when Congress passed the Federal Water Pollution Control Act Amendments of 1972 and the Clean Water Act Amendments in 1977. The purpose of the Clean Water Pollution Act was to restore and maintain the chemical, physical, and biological integrity of this nation's waters. The "waters of the United States" regulated by the Corps of Engineers under Section 404 of the Clean Water Act includes wetlands.

The Corps of Engineers is responsible for determining the jurisdictional limits of wetlands and other Waters of the United States. Applicants may, however, elect to have a qualified representative conduct the appropriate preliminary wetland delineation for submittal with the permit application. All such determinations are subject to verification and confirmation by the Corps of Engineers. Although applicants are not required to provide a wetland delineation, these can assist in reducing delays associated with normal permit processing. Contact the appropriate Corps District Office for additional information.

WITH YOUR HELP ILLINOIS WATERS CAN BE PROTECTED FOR FUTURE GENERATIONS

1

Figure 164. Screenshot. Permit application instructions (Page #1) (IDNR, n.d.-b).

2. **The Illinois Department of Natural Resources/Office of Water Resources** regulatory authority is the Rivers, Lakes and Streams Act (615 ILCS, 1994). Under this authority, permits are required for dams, for any construction within a public body of water; and for construction within floodways. Generally, floodway projects also require local authorization. In addition, floodway map revision approvals may be required by IDNR/OWR and by the Federal Emergency Management Agency (FEMA) for major projects. Information and specific project requirements may be obtained as follows:

For Lake Michigan – All projects in or along Lake Michigan are subject to the Regulation of Public Waters rules (17 Illinois Administrative Code, Part 3704). Joint permits are required for any work in Lake Michigan from IDNR/OWR and IEPA. Contact the Illinois Department of Natural Resources/Office of Water Resources, Lake Michigan Management Section, 160 N. LaSalle Street, Suite S-700, Chicago, Illinois 60601, (312) 793-3123, or on the web www.dnr.state.il.us/owr/ResmanPermitProgs.htm.

For Cook, Lake, McHenry, DuPage, Kane and Will Counties – All projects within designated floodways are subject to the Floodway Construction in Northeastern Illinois Rules (17 Illinois Administrative Code Part 3708). Dams are subject to the Rules for Construction and Maintenance of Dams (17 Illinois Administrative Code, Part 3702). All projects in public waters are subject to the Regulation of Public Waters Rules (17 Illinois Administrative Code, Part 3704). All other Floodway construction projects are subject to the Construction in Floodways of Rivers, Lakes and Streams rules (17 Illinois Administrative Code, Part 3700). Contact the Illinois Department of Natural Resources/Office of Water Resources, Northeastern Illinois Regulatory Programs Section, 2050 West Stearns Road, Bartlett, Illinois 60103, (847) 608-3100 ext 2025 or on the web www.dnr.state.il.us/owr/ResmanPermitProgs.htm.

For the remainder of the State – Dams are subject to the Rules for Construction and Maintenance of Dams (17 Illinois Administrative Code, Part 3702). All projects in public waters are subject to the Regulation of Public Waters rules (17 Illinois Administrative Code, Part 3704). All other Floodway construction projects are subject to the Construction in Floodways of Rivers, Lakes and Streams rules (17 Illinois Administrative Code, Part 3700). Contact the Illinois Department of Natural Resources/Office of Water Resources, Downstate Regulatory Programs Section, One Natural Resources Way, Springfield, Illinois 62702-1271, (217) 782-3863, or on the web www.dnr.state.il.us/owr/ResmanPermitProgs.htm.

The **Illinois Department of Natural Resources** is also responsible under Illinois Statutes for conserving and preserving the State's natural resources.

Under the provisions of the Fish and Wildlife Coordination Act (16 U.S.C. 661-664) the Department is given permit review responsibilities relative to Corps of Engineers permit applications.

Under the Illinois Endangered Species Protection Act and the Illinois Natural Areas Preservation Act, the Department is responsible for reviewing actions that are authorized, funded or performed by units of state and local government, if the action will change environmental conditions. Questions pertaining to natural resource reviews should be addressed to the Illinois Department of Natural Resources, Division of Ecosystems & Environment, Impact Assessment, One Natural Resources Way, Springfield, Illinois 62702-1271, (217) 785-5500. To submit a request for consultation on-line, go to http://www.dnrecocat.state.il.us/ecopublic/.

3. **The Illinois Environmental Protection Agency** provides water quality certification pursuant to Section 401 of the Clean Water Act. This certification is mandatory for all projects requiring a Section 404 Permit from the Corps of Engineers. In addition to determining that the proposed work will not violate the applicable water quality standards, the IEPA also makes a determination of additional permit and regulatory requirements pursuant to the Illinois Pollution Control Board rules and regulations. Additional permits may be required for activities such as the construction of sanitary sewers, water mains, sewage and water treatment plants, landfill and mining activities, special waste hauling and disposal (of dredged material). Separate applications are necessary for these other permits.

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Figure 165. Screenshot. Permit application instructions (Page #2) (IDNR, n.d.-b).

Individual 401 Water Quality Certification

If it is determined that your project is not covered by an Illinois EPA certified Section 404 nationwide or regional permit issued by the Corps of Engineers and an individual 401 water quality certification is required for your project, you must submit the information specified below and in blocks 9 through 12 in the instructions for dredge and/or fill material to be discharged. In accordance with 35 Ill. Adm. Code Part 302.105, applicants for an individual 401 water quality certification shall provide the Illinois EPA with an anti-degradation report discussing the items listed below, including supporting documentation. In regards to the anti-degradation requirements, it is recommended that you contact the Illinois EPA Water Quality Standards Unit at 217-558-2012 or on the web at epa.401.docs@illinois.gov prior to submittal of your application.

- An assessment of the alternatives to the proposed project that will result in a reduced pollutant load to the water body, no load increase or minimal environmental degradation. Alternatives that result in no discharge to the water body and changes in the location of the activity must be addressed in the submittal. Further, the assessment of alternatives must consider all technically and economically reasonable measures to avoid or minimize the pollutant loading;

- If a pollutant load increase or environmental degradation cannot be avoided (e.g. wetlands are filled), a complete mitigation plan must be provided or reasons provided why mitigation is not proposed;

- Identification and characterization (e.g., the current physical, biological and chemical conditions) of the water body affected by the proposed project and the water body's existing uses, including a wetland delineation report and drainage area (in acres) of the impacted water bodies at the downstream limits of the project area;

- Consideration of the fate and effects of parameters that are proposed to increase the pollutant loading;

- The quantity of the pollutant load increase to the water body. Increases in pollutant loading must be protective of all existing uses of the impacted water body;

- The potential impacts of the proposed project on the water body. The proposed activity must be conducted in a manner that water quality standards are not violated;

- The purpose and anticipated benefits of the proposed project. Benefits for the applicant as well as benefits to the community at large must be discussed.

If an individual 401 Water Quality Certification is required, it is recommended that you contact the Illinois EPA, Bureau of Water, Division of Water Pollution Control, Facility Evaluation Unit, 1021 North Grand Avenue East, P.O. Box 19276, Springfield, Illinois 62794-9276, (217) 782-3362, or on the web at epa.401.docs@illinois.gov regarding application and anti-degradation assessment requirements.

4. If the project involves the construction of a power plant, utility pipelines, electric transmission of distribution lines, Illinois Commerce Commission approval may be required.

5. Also, depending on the location and type of work to be performed, there may be additional local government approvals required.

3

Figure 166. Screenshot. Permit application instructions (Page #3) (IDNR, n.d.-b).

INSTRUCTIONS

General

Provide a complete and accurate application (form, drawings, and support information) concerning your project. If the application is incomplete or unacceptable, it will be returned. This usually results in delaying the evaluation of your application.

Four copies of the application form and drawing sheets are required. Submit one copy of the completed application form and drawings to each agency specified on the bottom of each form. The mailing address and telephone number of each agency is provided beginning on Page 8. The copy labeled "Applicant's Copy" is for the applicant's records. Send one copy to the appropriate Corps of Engineers office, one copy to the Illinois EPA and one copy to the appropriate Illinois DNR office. In addition, if available, sending an electronic copy of your application, plans, drawings, etc. to each agency would be appreciated. The application form may be photocopied.

IF YOU NEED ASSISTANCE IN FILLING OUT THE APPLICATION FORM, PLEASE CALL ANY AGENCY OFFICE LISTED.

Additional information may be required by any or all of the agencies before further processing of your application may proceed. The applicant will, however, be notified of such needs by the agencies.

Specific instructions on completing the form and the information to be provided on the drawings are provided below.

DISCLOSURE STATEMENT

Information in the application is a matter of public record. Disclosure of the information is voluntary; however, the data requested are necessary in order to communicate with the applicant and to evaluate the permit application. If necessary information is not provided, the permit application cannot be processed nor can a permit be issued.

18 United States Code, Section 1001, provides that who ever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up by any trick, scheme, or disguises a material fact or makes any false, fictitious, or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than 5 years or both.

APPLICANTS MUST OBTAIN ALL APPROVALS BEFORE WORK CAN BE STARTED. PROCEEDING WITHOUT THE REQUIRED PERMITS IS AGAINST STATE AND FEDERAL LAWS AND MAY RESULT IN LEGAL PROCEEDINGS AND FINES.

SPECIAL INSTRUCTIONS FOR COMPLETING THE JOINT APPLICATION FORM

Blocks 1 and 2 For Agency Use. To be completed by Corps of Engineers and/or Illinois Department of Natural Resources and/or Illinois Environmental Protection Agency.

Block 3(a and b) Applicant(s). The applicant(s) shall be the person(s), firm(s), corporation(s), etc who have or will have the responsibility for the property on which the project will be located by reason of ownership, easement, or other agreement. If the property is not presently owned by the applicant, attach an explanation of any easements or rights-of-way which have been or will be obtained or how such land will be acquired. If a project is being proposed by a lessee, the lessee and lessor should be joint applicants. In some instances, agency staff may request additional information on all parties having a legal or equitable interest in the involved land.

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Figure 167. Screenshot. Permit application instructions (Page #4) (IDNR, n.d.-b).

Applicant's Name. Enter the name of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the name of the organization and responsible officer and title. If more than one party is associated with the application, please attach a sheet with the necessary information marked Block 5.
Address of Applicant. Please provide the full mailing address of the party or parties responsible for the application.
Email Address of Applicant. Please provide the email address of the party or parties responsible for the application.
Applicant Telephone Number(s). Please provide the number where you can usually be reached during normal business hours. Include a fax number if available.
List all applicants. Space has been provided for the listing of two applicants. Attach an additional sheet (marked Block 3) if more space is needed.

Block 4 – Authorized Agent. If the applicant designates an authorized agent for the purpose of obtaining the permits, list the name, address, email address, phone and fax numbers of the authorized agent in Block 4. During the permit process, all correspondence, such as requests for additional information, will be sent to the authorized agent.
Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, or any other person or organization. Note: An agent is not required.
Agent's Address and Telephone Number. Please provide the complete mailing address of the agent, along with the telephone and fax numbers where he / she can be reached during normal business hours.
Statement of Authorization. To be completed by applicant, if an agent is to be employed.

Block 5. Names and Mailing Addresses of Adjoining Property Owners, Lessees, etc., Whose Property Adjoins the Project Site. List complete names and full mailing addresses of the adjacent property owners (public and private) lessees, etc., whose property adjoins the water body or aquatic site or whose property is in visual reach where the work is being proposed so that they may be notified of the proposed activity (usually by public notice). If more space is needed, attach an extra sheet of paper marked Block 5.
Information regarding adjacent landowners is usually available through the office of the tax assessor in the county or counties where the project is to be developed.

Block 6. Proposed Project Name or Title. Please provide name identifying the proposed project, e.g., Landmark Plaza, Rolling Hills Subdivision, or Edsall Commercial Center.

Block 7. Project Location.
Latitude and Longitude. Enter the latitude and longitude of where the proposed project is located.
UTMs Northing and Easting. Enter the Northing and Easting coordinates of where the proposed project is located. Include coordinate system information.
Proposed Project Street Address. If the proposed project is located at a site having a street address (not a box number), please enter it here.
Other Location Descriptions. Please provide the Section, Township, and Range of the site, and / or local Municipality that the site is located in or near, as well as the County, State and Zip code.
Name of Waterway. Please provide the name of any stream, lake, marsh, or other waterway to be directly impacted by the activity. If it is an unnamed stream, identify the waterway the tributary stream enters. If a large river or stream, include the river mile of the proposed project site if known.

Directions to the Site. On a separate sheet, please provide directions to the site from a known location or landmark. Include highway and street numbers as well as names. Also provide distances from known locations and any other information that would assist in locating the site. You may also provide description of the proposed project location, such as lot numbers, tract numbers, or you may choose to locate the proposed project site from a known point (such as the right descending bank of Smith Creek, one mile downstream from the Highway 14 bridge). If a large river or stream is within the vicinity of the project, include the river mile of the proposed project site, if known.

5

Figure 168. Screenshot. Permit application instructions (Page #5) (IDNR, n.d.-b).

Block 8. Project Description. Describe the overall activity or project. Give appropriate dimensions of structures such as wing walls, dikes (identify the materials to be used in construction, as well as the methods by which the work is to be done), or excavations (length, width, and height). Indicate whether discharge of dredged or fill material is involved. Also, identify any structure to be constructed on a fill, piles, or float-supported platforms. The written descriptions and illustrations are an important part of the application. Please describe, in detail, what you wish to do. If more space is needed, attach an extra sheet of paper marked Block 7.

Block 9. Project Purpose and Need. Describe the purpose and need for the proposed project. What will it be used for and why? Also include a brief description of any related activities to be developed as the result of the proposed project. Give the approximate dates you plan to both begin and complete all work.
If additional space is needed, attach an extra sheet of paper marked Block 8.

COMPLETE THE FOLLOWING FOUR BLOCKS IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED. If the project requires an individual 401 water quality certification from Illinois EPA, provide Illinois EPA with the anti-degradation assessment report, material analysis data, mitigation plan and other information identified in item 3 under Agency Authorities and Requirements of these instructions.

Block 10. Reasons for Discharge. If the activity involves the discharge of dredged and/or fill material into a wetland or other water body, including the temporary placement of material, explain the specific purpose of the placement of the material (such as erosion control).

Block 11. Types of Material Being Discharged and the Amount of Each Type in Cubic Yards and Acres. Describe the material to be discharged and amount of each material to be discharged within Corps jurisdiction. Please be sure this description agrees with your illustrations. Discharge material includes: soil, rock, sand, clay, concrete, etc.

Block 12. Surface Areas of Wetlands or Other Waters Filled. Describe the area to be filled at each location. Specifically identify the surface areas, or part thereof, to be filled. Also include the means by which the discharge is to be done (backhoe, dragline, etc.). If dredged material is to be discharged on an upland site, identify the site and the steps to be taken (if necessary) to prevent runoff from the dredged material back into a water body. If more space is needed, attach an extra sheet of paper marked Block 11.

Block 13. Description of Avoidance, Minimization, and Compensation. Provide a brief explanation describing how impacts to waters of the United States are being avoided and minimized on the project site. Also provide a brief description of how impacts to waters of the United States will be compensated for, if mitigation is required. If additional space is needed, attach an extra sheet of paper marked Block 12.

Note: You will need to submit additional information for evaluation of the permit application, including a wetland delineation report; avoidance, minimization and alternatives analysis report; and mitigation plan. This information must be submitted to Illinois EPA, prior to completion of review and public notice of an anti-degradation assessment for the individual 401 water quality certification. This information will also be required by the Corps of Engineers prior to issuance of the Section 404 permit.

Block 14. Date activity is proposed to commence and completed. Please provide the date (if known) that you intend to start work, as well as the date work should be completed.

Block 15. Is Any Portion of the Work Already Complete? Provide all background information on those portions of the proposed project already completed. Describe the area already developed, structures completed, any dredged or fill material already discharged, the type of material, volume in cubic yards, and acres or square feet filled if discharge occurred in a wetland or other water body. If the work was done under an existing Corps permit, identify the authorization, if possible.

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Figure 169. Screenshot. Permit application instructions (Page #6) (IDNR, n.d.-b).

Block 16. Information about Approvals or Denials by Other Agencies. You may need the approval of other federal, state, or local agencies for your project. Identify any applications you have submitted and the status, if any (approved or denied) of each application. You need not have obtained all other permits before applying for a Corps permit.

Block 17. Consent to enter property listed in Block 7.

Block 18. Application Verification. The signature shall be an affirmation that the party applying for the permit possesses the requisite property rights to undertake the activity applied for (including compliance with special conditions, mitigation, etc.).
The application must be signed by each applicant. However, the application may be signed by a duly authorized agent (Name in Block 4) if this form is accompanied by a statement by the applicant(s) designating the agent.

NOTE:

a. If the applicant is a corporation, the president or other authorized officer shall sign the application form.

b. If the applicant is a county, city or other political subdivision, the application form shall be assigned by an appropriate authorized officer.

c. If the applicant is a partnership, each partner shall sign the application form.

d. If the applicant is a trust, the trust officer shall sign the name of the trustee by him (or her) as trust officer. A disclosure affidavit must be filed with the application, identifying each beneficiary of the trust by name and address and defining the respective interest therein.

DRAWINGS AND ILLUSTRATIONS

General Information.
Three types of illustrations are needed to properly depict the work to be undertaken. These illustrations or drawings are identified as a Vicinity/Location Map, a Plan View and a Typical Cross-Section Map. Please submit one original, or good quality copy, of all drawings on 8½ x11 inch plain white paper (electronic media may be substituted). Use the fewest number of sheets necessary for your drawings or illustrations.
Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross-section).
While illustrations need not be professional (many small, private project illustrations are prepared by hand), they should be clear, accurate, and contain all necessary information.

Certified engineering plans may be submitted in lieu of the drawing sheets if the magnitude of the project warrants.

(1) A vicinity/location map which shows:
a. project site;
b. name of waterway;
c. name of and distance to local town, community or other identifying location such as roads; and
d. north arrow.

(2) A plan (overhead) view of the project showing:
a. existing wetland boundary and shoreline of all waterways, including the normal water surface elevation (if mean sea level datum is not used, adjustment should be indicated):
b. adjacent property lines and ownership as listed in the application form;

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Figure 170. Screenshot. Permit application instructions (Page #7) (IDNR, n.d.-b).

c. principal dimensions of the structure or work and extent of encroachment into the waterway (as measured from a fixed structure or object);

d. floodway/floodplain lines if established and if known;

e. north arrow; and

f. graphic or numerical scale.

(3) A cross-sectional view of the project showing:

a. wetland boundary and/or shoreline, elevations, extent of encroachment, principal dimensions of the work as shown in plan view; and

b. graphic or numerical scales (horizontal and vertical).

AGENCY MAILING ADDRESSES

Send appropriate copies of the completed application to each agency listed below. (Agencies are specified at the bottom of each sheet in the packet.)

For U.S. Army Corps of Engineers (refer to the IL Regulatory Jurisdictional Boundary Map for your District office):

U.S. Army Corps of Engineers, Rock Island
ATTN: Regulatory Branch
Clock Tower Building
Post Office Box 2004
Rock Island, IL 61204-2004

U.S. Army Corps of Engineers, Chicago District
ATTN: Regulatory Branch
231 S. LaSalle Street, Suite 1500
Chicago, IL 60604

US Army Corps of Engineers, St. Louis District
ATTN: Regulatory Branch
1222 Spruce St.
St. Louis, MO 63103-2833

U.S. Army Corps of Engineers, Louisville District
ATTN: Regulatory Branch
P.O. BOX 59
Louisville, KY 40201-0059

U.S. Army Corps of Engineers, Memphis District
ATTN: Regulatory Branch
167 North Main, B-202
Memphis, TN 38103-1894

Your application to the Illinois Environmental Protection Agency should request Section 401 water quality certification.

Illinois Environmental Protection Agency
Bureau of Water
Division of Water Pollution Control
Facility Evaluation Unit
1021 North Grand Avenue East
Post Office Box 19276
Springfield, IL 62794-9276

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Figure 171. Screenshot. Permit application instructions (Page #8) (IDNR, n.d.-b).

For the Illinois Department of Natural Resources

For the majority of the state:

Illinois Department of Natural Resources
Office of Water Resources
Downstate Regulatory Programs Section
One Natural Resources Way
Springfield, IL 62702-1271

For Cook, Lake, McHenry, DuPage, Kane and Will Counties (including all of Chicago District):

Illinois Department of Natural Resources
Office of Water Resources
Northeastern Illinois Regulatory Programs Section
2050 West Stearns Road
Bartlett, IL 60103

For Lake Michigan:

Illinois Department of Natural Resources
Office of Water Resources
Lake Michigan Management Section
160 N. LaSalle Street
Suite S-700
Chicago, IL 60601

In addition, you should complete and submit the attached certification sheet to the Illinois State agencies (the Illinois Department of Natural Resources and the Illinois Environmental Protection Agency) along with your application. The Corps of Engineers does not require this certification.

IMPORTANT:

Mitigation for wetland or stream impacts resulting from your proposed actions may be a permit requirement. Prior to completing your application, it is recommended that you read through the Wetland Mitigation information available on the Web at: http://www2.mvr.usace.army.mil/Regulatory/ . (Click on Wetland Mitigation to open the link to the documents.) This may help you avoid or minimize wetland and stream impacts, thus reducing or eliminating the requirement for mitigation.

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Figure 172. Screenshot. Permit application instructions (Page #9) (IDNR, n.d.-b).

Illinois State Permit Applicants

Illinois State Law requires individuals to certify that they are not delinquent in the payment of child support before State agencies can accept applications for State permits, certifications, etc. You must complete the following statement and include it with copies of the joint permit applications you send to the Illinois Department of Natural Resources and the Illinois Environmental Protection Agency. The Corps of Engineers does not require a copy of this statement.

WARNING: Failure to fully complete one of the following certifications will result in rejection of this application. Making a false statement may subject you to contempt of court.

I hereby certify, under penalty of perjury, that I am not more than 30 days' delinquent in complying with a child support order [5 ILCS 100/10-65(c)].

______________________________ ______________________________

Applicant's Signature Applicant's Social Security Number

OR

I hereby certify, under penalty of perjury, that the permit applicant is a governmental or business entity and, therefore, not subject to child support payment requirements.

____

Applicant's Name

____

Applicant's Representative Signature and Title

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Figure 173. Screenshot. Permit application instructions (Page #10) (IDNR, n.d.-b).

The permit fee notice is shown in Figure 174 and Figure 175 (IDNR, 2022).

Illinois Department of
Natural Resources

One Natural Resources Way Springfield, Illinois 62702-1271
www.dnr.illinois.gov

JB Pritzker, Governor
Colleen Callahan, Director

July 1, 2021 thru June 30, 2022

OFFICE OF WATER RESOURCES PERMIT APPLICATION FEE NOTICE

Effective July 1, 2021, the IDNR Office of Water Resources base principal review fees have been adjusted to account for inflation. The U.S. Bureau of Labor Statistics' Consumer Price Index Table for all urban consumers (CPI-U), U.S. city average, all items, base period 1982-1984=100 (Series ID: CUUR0000SA0) has been used to calculate the adjustment factor. The adjustment factor for fiscal year 2022 (July 1, 2021 – June 30, 2022) is: [CPI for May 2021 (269.195) ÷ CPI for June 2013 (233.504)] = 1.153. In accordance with the Part 3700 Floodway Construction, Part 3702 Dam Safety, Part 3704 Public Waters, and Part 3708 Floodway Construction in Northeastern Illinois administrative rules, the base fee amounts in those rules have been multiplied by this factor and rounded to the nearest $10 to compute the fiscal year 2022review fees. **A summary of the July 1, 2021 through June 30, 2022 application review fees follows**:

1) **PERMIT REQUIRED DETERMINATION: $0**

   All applications and written inquiries received will be reviewed free of charge to determine whether or not the dam and/or floodway work proposed requires authorization by the Department, so long as sufficient information is provided for the Department to make that determination. If a permit authorization is not required for the activity proposed, or is already covered by Statewide Permit authorization, the applicant will be notified of such determination. If a permit is required for the activity proposed and is not already permitted by Statewide Permit authorization, permit applicants must pay a non-refundable permit application review fee determined by the Department to allow review of the permit application to continue. The applicant shall be notified of that determination in writing, immediately after this initial review of the application. Applications will be deemed withdrawn if the review fee is not received within 90 days after the applicant is notified of the amount of the fee**.**

2) **REVIEW FEE:** $ varies

   Application processing shall not be initiated until the review fee is received.

   $230 for Department documentation of construction activities that occur within the floodway boundaries of an approved delegated community. This fee must be provided to the Department prior to delegation of the application for review;

   $230 for previously permitted appropriate uses or floodway construction activities requiring new permit authorization in accordance with provisions in the rules preventing the transfer of permits, and not involving any changes from the previously permitted activity;

   $580 for construction activities that meet the terms and conditions of a general permit;

   $1,150 for construction activities that the Department determines would not require review of a hydrologic and/or hydraulic analysis to demonstrate compliance with the rules;

Figure 174. Screenshot. Permit fee notice (Page #1) (IDNR, 2022).

$1,730 for operating authorization for an existing dam (Class I, II, and III);

$2,880 for construction activities such as levees, certain bridge/culvert crossings, and major floodway filling

that the Department determines will require review of a hydrologic and/or hydraulic analysis to demonstrate compliance with the **Part 3700 rules**. The review fee shall be **increased an additional $1,730 for applications requiring public notice;**

$2,880 for **Public Water** construction activities that the Department determines would not likely cause any of the impacts listed in Section 3704.80(a);

$2,880 for removal of a dam (Class I, II, and III);

$2,880 for major modification of an existing Class III Dam;

$3,460 for construction activities in Northeastern Illinois (**3708 rules area**) such as levees, bridges, culverts, channel modifications, and public flood control projects that the Department determines will require review of a hydrologic and/or hydraulic analysis to demonstrate compliance with departmental standards. The review fee will be **capped at $5,000 for applications requiring public notice;**

$4,030 for major modification of an existing Class I or Class II Dam;

$5,000 for construction of a new Class III Dam;

$5,000 for **Public Water** construction activities such as new barge terminals, marinas and water level management structures that would likely cause one or more of the impacts listed in Section 3704.80(a);

$5,000 for construction of a new Class I or Class II Dam;

If the construction activity being applied for also requires authorization under other IDNR/OWR regulations, the review fee for each authorization shall be added to calculate the total review fee. The total review fee shall continue to be capped at $5,000.

In accordance with the Rivers, Lakes and Streams Act, the collected fees will be deposited into the State Boating Act Fund for use by the IDNR alone to help defray a portion of the ordinary and contingent expenses of the IDNR.

Thank you for your cooperation in this matter.

Figure 175. Screenshot. Permit fee notice (Page #2) (IDNR, 2022).

Illinois Department of Transportation

ILLINOIS